

# THE CAMBRIDGE AEROSPACE DICTIONARY

Second Edition



**Bill Gunston**

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# Foreword

Gathering terms for an aerospace dictionary is harder than it looks. I recently studied a list of terms used by the US Air Force to describe the status of each of its component organizations. They explained, ‘These actions are defined in ways that may seem arcane to the non-specialist, but each term has a specific meaning.’ The terms are: Activate, Active list, Assign, Attach, Consolidate, Constitute, Designate, Disband, Disestablish, Establish, Establishment, Inactivate, Inactive list, Organize, Provisional organizations, Re-designate, Re-establish, Relieve from active duty, and Unit. I read their meanings through several times and decided not to include any in these pages.

In a previous edition I was criticised by a reviewer for using words ‘which have no relevance to aerospace’. He cited as an example ‘barrier pattern’, a term which BAe Manchester had asked me to define! *My sole objective is to create a useful product.* To this end I have included brief entries on such words as ‘generic’, ‘oxygen’ and ‘gasoline’, which are not aerospace terms. Incidentally, while ‘gasoline’ is clearly now a preferred spelling, I have had to write quite an essay on ‘kerosene/kerosine’.

I once had to defend myself against an air marshal who was offended by such rubbish (as he saw it) as ‘hardware’ and ‘software’. Today the explosion of home computing has opened up millions to such previously unfamiliar language. Indeed, in recent years the number of software terms has begun to get out of hand. The JSF programme alone involves more than 40 software acronyms, and I have omitted most of them.

Partly for this reason, this dictionary is centred (centered) at least in mid-Atlantic, if not further west, so we have ‘Petrol Gasoline’, the brief definition appearing under the latter. Cross-references are italicised. I have used US spellings wherever they are appropriate, and

in this field they tend to predominate. Note: USA means US Army.

I have attempted to include a brief explanation of aerospace materials, even if they are known by a registered trademark. Also included are the names of many organizations, but, with a few exceptions, not armed forces, airlines, museums or flying clubs, and certainly not the names of manufacturers or particular types of aircraft, though such acronyms as TSPJ – Tornado self-protection jammer – are tempting. On the other hand, there is a grey area in which a company product appears to merit inclusion, an example being Zero Reader. I have had particular trouble with the names of spacecraft and their payloads, but this is a dictionary of aviation, not space flight.

Entries are in *strict alphabetical order*; thus MW50 appears in the place for MW-fifty. The exception is where an entry has a single alphabetical character followed by a numeral. In such cases it appears immediately after other entries featuring that single character. With a subject as complicated as aerospace, where one finds C, c, c<sup>1</sup>, ċ, ĉ, (c), C\* and a host of C+numeral entries, it is difficult to decide which sequence to adopt. Greek terms are listed in Appendix 1, but some – such as Alpha and Beta – merit a place in the body of the dictionary.

On a lighter note, I read an article by Col. Art Bergman, USAF, explaining how to manage the temperamental F100 engine. I had no difficulty with his EECs, UFCs and Plaps, but I was defeated by ‘The F100 needs a lot more TLC than the J79 . . .’ I asked several certified F-15 drivers, and they were all mystified. I called the 527th TFTS, then the European Aggressor outfit. A charming female voice instantly said, ‘Ever think of tender loving care?’ On reflection, I put this meaning in the dictionary. The criterion is

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whether or not an aerospace person might be confused without it.

One obvious problem area is at what point one should give up trying to include foreign terms. Some may think I have been over-generous to our Gallic friends, while other countries may think themselves harshly treated by being ignored. It is impossible to say ‘Leave out all foreign terms and acronyms’, because many have become part of the English language. Nobody would expect ‘aileron’ to be omitted, and before long ‘Fenestron’ will probably be just as universally accepted as ‘fenestron’.

At a rough count the number of new entries this time is in excess of 15,000. Almost all the additions are acronyms. There is little point in again saying that acronyms are an infectious disease, especially in the world of aerospace. Whilst admitting that the incentive to abbreviate is often strong, it is self-defeating if the reader has a choice of more than 20 interpretations and does not know which one to pick.

Some acronyms, such as Cardsharp, appear contrived. Another is Tiger – Terrifically Insensitive to Ground-Effect Radar; I had to force myself to include it. In general, I have omitted acronyms which include the name of a company, an example being Caps – Collins adaptive processor system. I have attempted to indicate whether the spoken acronym or spelt-out version predominates. Thus, we have Papi before PAPI. The outstanding exception is NATO. This is always spoken as a word, but the hierarchy in Brussels still insists that it is not written Nato.

Some acronyms bear little resemblance to the actual initial letters of the original words, while a few are quite a mouthful. We have been in particular trouble with the Joint Strike Fighter. This soon spawned JSF-E&MD and JSFPO-AEP, whilst Boeing was awarded a \$28,690,212 contract to perform the JSFPICPTD. This means the Joint Strike Fighter Program Integrated Core Processing Technical Demonstration and is something I have omitted. Another non-starter has to be

Direct, which the US Air Force tells me stands for Defense IEMATS REmplacement Command and Control Terminal, which would be fine were it not for the fact that IEMATS stands for Improved Emergency MEssage Automated Transmission System. Roger Bacon, the sage of *Flight International*, has drawn attention to Boeing’s ‘no-tail advanced theater transport, tilt-wing super-short takeoff and landing’, which creates the handy name NTATTW/SSTOL. Clearly, we need acronyms within acronyms.

It is often difficult to decide when the name of a specific item has become a more general term which has to be included. In the 1970s the AAH (Advanced Attack Helicopter) meant the AH-64 Apache. This is a particular type of helicopter, so it had no place in these pages. However, over the years AAH has become a term applied to several of the AH-64’s later competitors, so exclusion is no longer justified. In the same way Awacs is now a class of aircraft, while, even though there is only one type of AABNCP, that designation is so important it would be unhelpful to omit it.

Both the AAH and AABNCP begin with ‘Advanced’. This is merely a pointless buzzword. Presumably it is intended to imply that something is the very latest, ‘state of the art’ and better than the competition, but – in aerospace at least – I have seldom heard of anybody designing something that was not ‘advanced’. Can these items still be ‘advanced’ after 40 years? To me, another *bête noire* is ‘integrated’. Already we have a zillion AIAs (advanced integrated acronyms). This is an advanced integrated dictionary.

There is an obvious need for a body with the clout to decree what things shall be called, because the present situation is ludicrous. Did you know that the acronym ATAC can mean ‘Advanced Target Acquisition and Classification’? Fine, but ATDC stands for ‘Assisted Target Detection and Classification’ and also for ‘Automatic Target Detection and Classification’ and also for ‘Automated Target Detection and Classification’. Clearly that is not enough, because ATRC stands for

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‘Aided Target Recognition and Classification’ and ‘Automatic Target Recognition and Classification’. I did not myself invent these. And I have just noticed that the USAF, the world’s leading offender, has become dissatisfied with the mere ERT (extended-range tank). It has changed it to ERFCS, extended-range fuel-containment system. Feeble! The name could be made *far* more complicated!

In the same way, it should be simple to have an agreed abbreviation for an airspace control zone, but we are now confronted by CTLZ, CTR, CTRZ, and CTZ. In the first edition of this work I included FMEA, for which two elucidations were (and are) current: failure modes and effects analysis and failure-mode effects analysis. I now have to add FMECA – failure-mode effects and criticality analysis – and FMETA – failure-mode effects and task analysis. It is inconceivable that the authors of the two new letter-jumbles were unaware of FMEA, and I cannot comprehend the need for the two new identities. If we go on like this I fear for the sanity of whoever takes over this work when I collapse through exhaustion.

Many of the acronyms in these pages already have more than 20 meanings, and are gathering fresh ones all the time. This trend is leading to texts which, even to most aerospace people, must appear mere gobbledegook. There is no more clearly written periodical than *Aerospace*, published by the august Royal Aeronautical Society, and it strives to remain one of the few bastions of good English. They published an article which told us, ‘Currently, BASE is developing a Tereprom SEM-E standard card for use in the H764G, a high-accuracy INS with embedded GPS. It

has two slots, the second being used by an Arinc, MIL-1553A/B or PANIL interface.’ Many readers were doubtless happy with this, and one was impelled to respond with, ‘May I add something to your characterisation of AQP as “an upgrade of CRM” . . . The human factors elements had to be injected into non-jeopardy Loft and LOE . . . With converging developments in CPL NVQ and recurrent CRM, the AQP may be the shape of things to come in the UK.’

A speaker at a recent conference ‘has sat on EUROCONTROL, ICAO, EUROCAE, RTAC and AEEC. In his current position as Programme Manager CNS/ATM he is involved in the CLAIRE and ISATIS using ACARS, a development study of VDL Mode 2 in France. He is evaluation manager of EOLIA and ASD manager in ProATN.’ And an advertisement tells me, ‘Group IV faxes and PCMCIA cards are only supplied with an ISDN S-Bus interface. The ISDN integration provided by the LES means that a SODA is only required at the mobile end.’ I think I need a whisky with my SODA.

### Preface to the Cambridge edition

This updated and enlarged new edition is the first to be published by Cambridge University Press. I would like to thank Phoenix Typesetting for doing a masterful job with mathematics and Greek symbols, and everyone at Cambridge for their diligence and infectious enthusiasm – all too rare these days in book publishing.

Bill Gunston, Haslemere, 2004

# Foreword to the Second Cambridge Edition

I am grateful to the publisher's excellent team in New York and Cambridge, not least for agreeing that a new edition is needed. The avalanche of new aerospace terms, and especially acronyms, shows no sign of abating. There is little point in my reiterating the questionable value of inventing new meanings for three-letter acronyms when the same three letters already have more than 30 different meanings relevant to aerospace. Of course, common sense shows that these cannot be presented in any particular order of importance.

One correspondent asked, 'What's the point of having so many meanings for the same set of letters? It just clutters up your book.' In my reply I asked him which ones he would delete. I am still waiting for his reply.

Obviously, it is impossible to include everything. I have given GSP a single brief line, though I have one definition of this seemingly harmless letter-combination which extends over 14 pages of text. My first explanation of EPS is 'Emergency or [confusing] electrical, power system, or supply, or source'. It was impossible to omit any of these, because all are in current use. The reader can be assured that I am not in the business of myself inventing extra meanings; there are too many already.

As far as possible I have (obviously) tried to avoid including an acronym within the explanation of an acronym. I apologise for the fifth translation of Dars. I have offered 'Deployable ARS12 (NATO).' The seeker after enlightenment may, in an ill humour, look up ARS12, where he will find it means 'Air Control Center, recognised air picture production center sensor-fusion post [ACCS] (NATO).' Quite a mouthful to be represented by three letters.

I have tried to keep down the number of

entries by combining two or more in one entry. For example, under DSU 1 offer:

4 Data-storage unit; R adds receptacle.  
5 Defensive system upgrade; P adds program.

I hope that no reader seeking DSUR will angrily say that it is not there. I have also agonised over many names and functions, especially in structural analysis where I have often failed to concoct explanations which are both brief and accurate. A dictionary ought not to try to emulate a textbook.

Just as this edition was closing for press, I received a letter from Dick Gunnell, an Englishman living in the south of France. He drew my attention to a passage on page 41 of Annette Carson's classic history of aerobatics *Flight Fantastic*:

At the very same time, quietly and almost unnoticed, it seems, the word "aerobatics" entered the English language. A certain Mr E. L. Gunston wrote the following amusing letter to *The Aeroplane*, which was published in its edition of 1st January 1914:

"Since bouclng and boucle is a feat which has come to stay, and which apparently is as common as sane flying, these feats performed by Pégoud, Chevillard and certain other scientific gentlemen will have to be called by a distinguishing name. Why not 'aerobatics'?"

Nice one, Mr Gunston!

My correspondent asks whether Mr E.L.G. was my father ('there appears to be a similarity in the genes'). Regretfully I must claim no known close kinship. I wonder if he invented any other terms now to be found between these covers.

Again, I would like to thank Phoenix Typesetting, and everyone concerned at Cambridge University Press, both in Cambridge and New York, for unfailing meticulous attention to detail.

Bill Gunston, Haslemere, 2009

# A

- A**
- 1 General symbol for area (see S).
  - 2 Aspect ratio (see *As*).
  - 3 Amperes.
  - 4 Atomic weight.
  - 5 Moment of inertia about longitudinal axis, rolling mode.
  - 6 Anode.
  - 7 Amplitude.
  - 8 Degrees absolute.
  - 9 Amber airway, or light.
  - 10 IFR flight plan suffix, fitted DME and 4096-code.
  - 11 JETDS code: piloted aircraft, IR or UV radiation.
  - 12 Airborne Forces category aircraft (UK, 1944–46).
  - 13 Atomic (as in A-bomb).
  - 14 Sonobuoy standard size class, c 1 m/3 ft.
  - 15 Air Branch (UK Admiralty).
  - 16 Calibration (USAF role prefix 1948–62).
  - 17 US military aircraft basic mission or modified mission: attack (USAS, USAAC, USAAF, 1924–48; USN 1948–62; USAF/USN since 1962).
  - 18 Aircraft category, ambulance (USAAS 1919–24, USN 1943).
  - 19 Powered target (USAAC 1940–41).
  - 20 Amphibian (USAF 1948–55).
  - 21 Availability.
  - 22 Aeroplane (PPL).
  - 23 Altitude, followed by digits indicating hundreds of feet.
  - 24 Arm, as distinct from safe.
  - 25 Antarctic (but Tor Bergeron's classification = Arctic).
  - 26 Alternate [airport].
  - 27 Weather: hail
  - 28 Accepted (EFIS or nav. display).
  - 29 Arrival chart.
  - 30 Sport-parachuting certificate: 10 jumps, no accuracy demanded.
  - 31 Autotuned (navaid).
  - 32 Magnetic-vector potential.
  - 33 Aircraft category: free balloon (FAI).
  - 34 Cross-section area of wing torsion box.
  - 35 Common but not universal usage for aft-acting aerodynamic force; not synonymous with drag but the x-axis component of  $F_a$ .
  - 36 Margin [e.g., 0.15 or 0.2] above stall speed.
  - Ā Structural resistance to buckling.
  - Ā Wing-section axial force parallel to chord, per unit span.
  - Ā Angström ( $10^{-10}$ m), very small unit of length, contrary to SI.
  - (A) Local time.
  - a 1 Velocity of sound in any medium.
  - 2 Structural cross-section area.
  - 3 Anode.
  - 4 (Prefix) atto,  $= \times 10^{-18}$
  - 5 (Suffix) available (thus,  $LD_a$  = landing distance available).
  - 6 Ambient.
  - 7 Acceleration.
  - ā Average value of lift-curve slope due to angle of attack.

- ā Kussner factor.
- A0,  $A_0$  Unmodulated (steady note) CW radio emission.
  - A0A1 Unmodulated (steady note) radio emission identified by Morse coding in a break period.
  - A0A2 Unmodulated emission identified by Morse coding heard above unbroken carrier (eg an NDB).
  - A1,  $A_1$  1 Unmodulated but keyed radio emission, typically giving Morse dots and dashes.
  - 2 Flying instructor category; two years and 400 h as instructor (British Commonwealth air forces).
  - a<sub>1</sub> Lift-curve slope for wing or other primary aerodynamic surface, numerically equal to  $dC_L/d\alpha$ .
  - A2 Military flying instructor category; 15 months and 250 h.
  - a<sub>2</sub> Lift-curve slope for hinged trailing-edge control surface [arguably, also flap], numerically  $dC_L/d\epsilon$ .
  - A2C<sup>2</sup> Army airborne [or airspace] command and control [S adds system] (USA).
  - A2C2 Airborne airstrike command and control (GTACS); S adds system.
  - A2IPB Automated assistance with intelligence preparation of the battlespace (USAF).
  - A3 AM radio transmission with double SB.
  - A<sup>3</sup> Affordable acquisition approach (USAF).
  - A3H AM, SSB transmission with full carrier.
  - A<sup>3</sup>I Army/NASA aircrew/aircraft integration (USA/US).
  - A3J AM, SSB transmission with suppressed carrier.
  - A<sup>3</sup>M Advanced air-to-air missiles.
  - A<sup>3</sup>TC Advanced automated air traffic control.
  - A8-20 Airworthiness approval for classic (usually ex-military) aircraft (CAA, UK).
  - A-25 Royal Navy form for reporting aircraft accidents.
  - A400 to A755 See Arinc, ARINC.
  - A-battery** Electric cell to heat cathode filament in valve (tube).
  - A-bomb** Atomic bomb, see *nuclear weapon*.
  - A-check** S-check plus routine inspection of flight-control system. For a modern airline engine, typically 750 h.
  - A-class** 1 Airspace = 18,000+ ft [5486 m] AMSL and controlled.
  - 2 Aircraft accident = involving loss of life or damage exceeding US\$1 million.
  - A-frame hook** Aircraft arrester hook in form of an A; hook at vertex and hinged at base of each leg.
  - A-gear** Arrester gear, where type is not known.
  - A-Licence** Basic PPL without additions or endorsements.
  - A-line** Airway.
  - A-mode** Transponder sends aircraft identification code only.
  - A-sector** Sector of radio range in which Morse A is heard, hence **A-signal**.
  - A-station** In Loran, primary transmitting station.
  - A-Stoff** Liquid oxygen (G).
  - A-type entry** Fuselage passenger door meeting FAA emergency exit requirements; typical dimensions 41 in × 76 in.

## AA

- AA** 1 Anti-aircraft.  
2 Airship Association [office, Folkestone CT20 3LG] (UK).  
3 Acquisition Aiding, technique for matching EM waveforms (esp for ECM).  
4 Air-to-air (ICAO code).  
5 Alert annunciator.  
6 Antenna array.  
7 Airbrokers Association (UK, 1949, became AAB).  
**A/A** Air-to-air (radar mode).  
**AAA** 1 Airport advisory area.  
2 Army Aviation Association (USA), now AAAA.  
3 Antique Airplane Association [office at Airpower Museum Inc., Ottumwa, IA52501] (US).  
4 American Airship Association.  
5 Anti-aircraft artillery (triple-A).  
6 Affordable acquisition approach (usually A<sup>3</sup>, USAF).  
7 Associazione Arma Aeronautica [air force association] (I).  
8 African Airlines Association [office, Nairobi] (Int.).  
**AAAA** 1 Australian Aerial Agricultural Association.  
2 Army Aviation Association of America Inc. [office, Westport, CT06880, (US)].  
3 Antique Aeroplane Association of Australia.  
4 Advanced architecture for airborne arrays.  
5 American Aviation Aerospace Alliance.  
6 Arizona Antique Aircraft Association.  
7 Aircraft Appraisal Assoc. of America [Oklahoma City, OK] (US).  
**AAAC** Australian Army Aviation Corps.  
**AAACF** Airline Aviation & Aerospace Christian Fellowships [a charity, Lightwater, Surrey GU18 5JS] (UK).  
**AAAD** 1 Airborne anti-armour defence.  
2 All-arms air-defence (UK).  
**AAADA** Atlantic Alliance of Aerospace and Defence Associations [Halifax, Nova Scotia] (Int.).  
**AAAE** American Association of Airport Executives. (Washington, DC).  
**AAAF** 1 Association Aéronautique et Astronautique de France. [office, Paris]  
2 Previously the Association des Assurances Aviation de France, now Afsat.  
**AAAI** 1 American Association for Artificial Intelligence [Menlo Park, CA94025].  
2 Association of Australian Aerospace Industries [ACT 2608] (Australia).  
**AAAM** Advanced air-to-air missile.  
**AAAS** American Association for the Advancement of Sciences.  
**AAASS** Australian airborne acoustic systems strategy [sonobuoy system, also rendered A<sup>3</sup>S<sup>2</sup>].  
**AAATC** AAAssociation of American Air Travel Clubs [office, Hallandale, FL] (US).  
**AAAT** Australian Advanced Air-Traffic System [first nationwide ADS-B system in the world].  
**AAAV** Azienda Autonoma Assistenza al Volo, agency for air navigation and air traffic service (Italy).  
**AAAW** Air-launched, or advanced airborne, anti-armour weapon.  
**AAB** 1 Association of Air Brokers, now BACA.  
2 Air Assault Brigade.  
**AABM** Air-to-air battle management.

## AAEE, A&AEE

- AABNCP** Advanced airborne (national) command post (DoD).  
**AAC** 1 Army Air Corps (UK, from 1 September 1957).  
2 Army Air Corps (US, 1926–March 1942).  
3 Army Aviation Centre (Middle Wallop, SO20 8DY, UK).  
4 Air Armament Center (AFMC).  
5 Aviation Advisory Commission (US).  
6 Alaskan Air Command (from 1945).  
7 All-aspect capability.  
8 Advance-acquisition contract (US).  
9 Aeronaautical, or airline, administrative control, or communications (Satnav).  
10 Airborne Analysis Center.  
11 Alberta Aviation Council [office, Edmonton].  
**AACA** Alaska Air Carriers Association Inc. (Anchorage AK)  
**AACAS** Auto air-collision avoidance system.  
**AACC** 1 Airport Associations Co-ordinating Council (Int., office, Geneva).  
2 See A2C<sup>2</sup>, A2C2.  
**AACE** Aircraft alerting communications EMP.  
**AACI** Aircraft and Accident Commission of Indonesia.  
**AACMI** Autonomous air-combat manoeuvring instrumentation; S adds system, T training.  
**AACO** Arab Air Carriers Organisation (Beirut).  
**AACPP** Airport access control pilot program (TSA; note: pilot means initial or preliminary).  
**AACR** Airborne analog cassette recorder.  
**AACS** 1 Army Airways Communications Service [to 1946], Airways and Air Communications Service [1946–51], subsequently AF Com. Service (USAF).  
2 Airborne advanced communications system.  
**AACT** Air-to-air combat test (USN).  
**AACU** Anti-Aircraft Co-operation Unit (UK, various dates 1937–47).  
**AAD** 1 Aging Aircraft Division (WPAFB).  
2 Assigned altitude deviation.  
3 Additional Airworthiness Directive (CAA).  
**AADC** 1 Area Air-Defense Commander (USN).  
2 Analytical air-defence cell (NATO).  
**AADGE** Allied air-defence ground environment (NATO, pronounced a-adge).  
**AADI** Advanced area-defence interceptor.  
**AADP** Advanced-architecture display processor.  
**AADRM** Advanced air-breathing dual-range missile.  
**AADS** 1 Advanced air-data system.  
2 Airborne active dipping sonar.  
3 Airspeed and director sensor.  
4 Aircraft activity display system (program).  
5 Advanced air-delivered sensor.  
**AADV** Autonomous aerial, or air, delivery vehicle.  
**AAE** 1 Above aerodrome/airport/airfield elevation.  
2 Army Acquisition Executive (USA).  
3 Asociación de Aviación Experimental [home-builders], (Spain).  
4 Agrupación Astronáutica Española [E-08006 Barcelona] (Spain).  
**AAED** Advanced airborne expendable decoy.  
**AAEE, A&AEE** Aeroplane & Armament Experimental Establishment (Martlesham Heath 1924–39, then at Boscombe Down to the present but from 1959 under different titles). Now called ATEC. (UK).

## AAEEA

## AARGM

**AAEEA** Association des Anciens Elèves de l'Ecole de l'Air (F).

**AAES** *1* Association of Aerospace Engineering Societies (US).

2 American Association of Engineering Societies.

**AAExS** Army/Air Force Exchange Service (US, became **AAFES**).

**AAF** Army Air Force[s], full title USAAF, (June 1941–1947).

**AAFARS** Advanced aviation forward-area refuelling system.

**AAFBU** AAF Base Unit.

**AAFCE** Allied Air Forces Central Europe (NATO, pronounced af-see).

**AAFEA** Australian Airline Flight Engineers' Association.

**AAFES** Army and Air Force Exchange Service (US).

**AAFIF** Automated air-facility information file, compiled by DMA.

**AAFRA** Association of African Airlines.

**AAFSS** Advanced aerial fire-support system.

**AAG, A/AG** *1* Air-to-air gunnery.

2 Air Adjunct General (USAF, ANG).

3 Asociación Colombiana de Aviacion Civil General (Columbia).

4 Advanced arresting gear [carriers].

**AAGE** The Association of Aeronautical Ground Engineers (UK, 1935–).

**AAGF** Advanced aerial gun, far-field.

**AAH** Advanced attack helicopter (USA).

**AAHIS** Advanced airborne hyperspectral imaging system.

**AAHM** *1* American Airpower Heritage Museum [Midland, TX].

2 Alaska Aviation Heritage Museum [Fairbanks, AK].

**AAHS** American Aviation Historical Society [Santa Ana, CA 92704].

**AAI** *1* Angle-of-approach indicator, or indication (see **VASI**).

2 Angle-of-attack indicator.

3 Airline Avionics Institute (US).

4 Air aid to intercept (AI was more common).

5 Air-to-air interrogator; see **AAICP**.

6 Arrival, or arriving, aircraft interval.

7 Airports Authority of India.

**AAIB** *1* Air Accident Investigation Branch (DETR, UK).

2 Air Accident Investigation Bureau (Singapore).

**AAIC** Air Accidents Investigation Commission (US).

**AAICP** Air-to-air interrogator control panel.

**AAII** Accelerated accuracy improvement initiative (GPS Navstar).

**AAILS** Airmedical airborne information for lateral spacing.

**AAIM** Aircraft autonomous, or acoustic airframe, integrity monitoring.

**AAIP** Analog autoland improvement program[me].

**AAIR** AmSafe aviation inflation restraint.

**AAIRA** Assistant Air Attaché (US, pronounced A-aira).

**AAIS** Association of Aerospace Industries (Singapore) [2002–].

**AAL** *1* also **a.a.l.**, Above airfield level.

2 Australian Air League [W. Marrickville, NSW].

3 Aircraft approach limitations, UK service usage specifying minima for aircraft type in association with specified ground aids.

**AALAAW** Advanced air-launched anti-armour weapon.

**AALAE** Association of Australian Licensed Aircraft Engineers.

**AALB** Ailes Anciennes Le Bourget (F).

**AALC** Autonomous approach [and] landing capability (AFRL).

**AALS** Army Aviation Logistics School [Fort Eustis, VA23604–5414] (US).

**AAM** *1* Air-to-air missile.

2 Azimuth-angle measuring [unit] (Madge).

3 Archive Air Museum (BAA).

**AAMA** Association des Amis du Musée de l'Air (F).

**AAME** Association of Aviation Medical Examiners (UK).

**AAMP** *1* Advanced-architecture microprocessor.

2 Advanced aircraft maneuvering program.

**AAMPV** Advanced anti-materiel/personnel/vehicles (US).

**AAMRL** Harry G Armstrong Aerospace Medical Research Laboratory (USAF).

**AAMS** Association of Air Medical Services [Alexandria, VA22314] (US).

**AAN** Airworthiness approval note.

**AANC** Advanced airborne national command post (US).

**A&AS** Advisory and Assistance Services.

**A&D** *1* Arrival and departure chart.

2 Aerospace and defense (industry sector).

**A&E** Airframe and Engine, qualified engineer.

**A&F** Arming and fuizing (ICBM).

**AANDI** Airworthiness Assurance Non-destructive Inspection validation center [at Sandia National Laboratory, N.M.] (US).

**A&P** Airframe and Powerplant qualified mechanic (US).

**A&R** Assemble and recycle.

**AAO** *1* Air-to-air operation[s].

2 Airborne area of operation.

3 Air Attack Officer (US Forest Service).

**AAP** *1* Apollo Applications Program (NASA).

2 Acceptable alternative product (NATO).

3 Aircraft Acceptance Park (RFC/RAF, to 1918).

4 Ass. of Aviation Pilots (Mexico DF).

5 Ass. of Aviation Psychologists [Columbus, OH] (US).

**AAp** Angle of approach lights.

**AAPA** Association of Asia-Pacific Airlines.

**AAPP** Airborne auxiliary powerplant.

**AAPS** Advanced aviation protection system (EW).

**AAR** *1* Aircraft accident report.

2 Air-augmented rocket.

3 Air-to-air refuelling, or automatic aerial refuelling.

4 Antenna azimuth rate.

5 Airport acceptance rate.

6 Airport arrival rate.

7 Active-array radar.

8 After-action review.

**AARA** Air-to-air refuelling area.

**AARB** Advanced aerial refuelling boom.

**AARF** Aircraft accident report form.

**AARGM** Advanced anti-radiation guided missile.

**AARL** Advanced applications rotary launcher (S adds system).

**AAR points** Ground position of intended hookups.

**AARS** 1 Automatic altitude-reporting system.  
2 Attitude/altitude retention system.  
3 Advance [not advanced] airborne reconnaissance system (BAE Systems).

**AARTA** Army Aviation research and technology activity (USA).

**AAS** 1 Airport Advisory Service (FAA).  
2 Army Aviation School (USA).  
3 American Astronomical Society [office, Washington, DC20009] (US).  
4 American Astronautical Society [office, Springfield, VA22152–2323] (US).  
5 Air Armament School [formerly] (UK).  
6 Advanced automation system (NAS 2).  
7 Aerospace Audiovisual Service [1981–, previously APS, APCS] (USAF).  
8 Alternative access to [space] station (NASA).

**AASA** 1 Aging Aircraft Safety Act [Congress, 1991] (US).  
2 The Airlines Association of South Africa [Springbok, Transvaal].

**AASE** Advanced aircraft survivability equipment.

**AASF** 1 Advanced Air Striking Force [in France, 1939–40] (RAF).  
2 Alaskan Aviation Safety Foundation [office, Anchorage, AK99502] (US).  
3 Army Aviation Support Facility (USA).

**AASM** 1 Advanced air-to-surface missile.  
2 Armement air-sol modulaire (F).  
3 Association of Aviation and Space Museums [Alexandria, VA] (US).

**AASU** Western rendition “Aviation army (or armies) of the Soviet Union” [to 1990].

**AAT** 1 Airworthiness approval tag.  
2 Airports Authority of Thailand.

**AATA** 1 Asociación Argentina de Transportadores Aéreos.  
2 Animal Air Transport Association [Fort Washington, MD] (Int.).

**AATC** 1 American Air-Traffic Controllers’ Council.  
2 ANG/Afres Test Center (USAF).  
3 Alabama Aviation & Technology Campus [Ozark AL36361–1209] (US).

**AATD** 1 Aviation Applied Technology Directorate (USA).  
2 Advanced aviation training device (FAA).

**AATF** Airport and airway trust fund (FAA).

**AATG** Average annual traffic growth.

**AATH** Automatic approach to hover (anti-submarine helicopters).

**AATMS** Airborne air-traffic management system (Euret).

**AATS** 1 Alternate aircraft takeoff systems.  
2 Access-approval test set [or system].  
3 Aviation and Air-Traffic Services.

**AATT** Advanced aviation and transportation technology.

**AATSR** Advanced along-track scanning radiometer.

**AATTC** Advanced Airlift Tactics Training Center (USAF).

**AAU** 1 Aircrew Allocation Unit (UK, 1943–53).

2 Aircraft Assembly Unit (UK, WW2).

3 Association of Aerospace Universities, 21 plus 5 commercial organisations [c/o Coventry University CV1 5FB], (UK).  
4 Audio amplifier unit.  
5 Antenna adaptor unit (IFF).  
6 Articulated audio unit (threat warning).  
7 Assigned amount unit[s] [emissions].

**AAUR** All-altitude upset recovery.

**AAV** Autonomous aerial vehicle.

**AAv** See AAVN.

**AAVN** Army Aviation (UK).

**AAVS** Aerospace Audio-Visual Service (USAF).

**AAW** 1 Anti-air warfare.  
2 Active aeroelastic wing.  
3 Aeromedical Airlift Wing (USAF).

**AAWEX** Anti-air warfare exercise.

**AAWG** Airworthiness Assurance Working Group.

**AAWS** 1 Automatic Aviation Weather Service.  
2 Advanced anti-tank weapon system.

**AAWWS** Airborne adverse-weather weapon system.

**AB** Air base (USAF).

**A/B, AB, a/b** 1 Afterburner.  
2 Airbrake.

**A<sub>b</sub>** 1 Cross-section area of spar boom.  
2 Projected blade area of helicopter rotor.

**ABA** American Bar Association; IPC adds International Procurement Committee.

**ABAA** Australian Business Aircraft Association.

**ABAC** 1 Conversion nomogram, eg for plotting great-circle bearings on Mercator projection.  
2 Association of British Aviation Consultants.  
3 Association of British Aero Clubs and Centres, formed 1926 as Associated Light Aeroplane Clubs, reconstituted as ABAC 1946, became BLAC 1966.  
4 The Association of Balloon and Airship Constructors [San Diego, CA 92169] (US).

**ABAG** Associação Brasileira de Aviação Geral (Brazilian NBAA).

**ABB** Automated beam-builder (space).

**ABBCC** Airborne battlefield control center.

**Abbey Hill** ESM for British warships, tuned to hostile air (and other) emissions.

**ABC** 1 Advance-booking charter.  
2 Advancing-blade concept (Sikorsky).  
3 Automatic boost control.  
4 Airborne commander (SAC).  
5 See Airborne Cigar.  
6 After bottom [dead] centre.

**BCBA** American, British, Canadian, Australian Standardization Loan Programme.

**ABCCC** Airborne Battlefield Command and Control Center (USAF), upgraded to II and III.

**ABCT** Airfields of Britain Conservation Trust (UK).

**ABCU** Alternate [ie alternative] braking control unit.

**ABD** 1 Airborne broadband defence (ECM).  
2 See next.

**ABDR** Aircraft battle damage repair.

**Abeam** Across the borders European ATM(7) systems effects (Euret).

**abeam** Bearing approximately 090° or 270° relative to vehicle.

## Aberporth

## absolute alcohol

**Aberporth** Chief UK missile test centre, formerly administrated by RAE, on Cardigan Bay, now Parc Aberporth.

**aberration** Geometrical inaccuracy introduced by optical, IR or similar electromagnetic system in which radiation is processed by mirrors, lenses, diffraction gratings and other elements.

**ABE** 1 Air-breathing engine [S adds system].

2 Aerodrome beacon.

3 Arinc 429 bus emulator.

**ABET** Accreditation Board for Engineering and Technology (US).

**ABF** 1 Annular blast fragmentation (warhead).

2 Auto beam forming (passive sonobuoys).

3 Advanced bomb family (USN).

**ABFAC** Airborne forward air controller.

**ABFI** Association of Belgian Flight Instructors [Antwerp B-2140] (Belgium).

**ABG** Air Base Group (USAF).

**ABGS** Air Bombing and Gunnery School (RAF).

**ABI** 1 Advanced[d] boundary information.

2 Airborne broadcast intelligence.

3 Advanced baseline imager (NOAA).

**ABIA** Associaçao Brasileira das Industrias Aeronauticas.

**ABICS, Abics**, Ada-based interception [or integrated] control system.

**ABIHS** Airborne broadcast intelligence hardware system (hazard avoidance).

**ABILA** Airborne instrument landing approach.

**ab initio** Aircraft or syllabus intended to train pupil pilot with no previous experience [literally “from the beginning”].

**ABIP** Advisory Board of Interested Parties [EASA] (Int.).

**ABIS** All-bus instrumentation system.

**ABIT, Abit** ADS-B implementation team.

**ABITA** Association Belge des Ingénieurs et Techniciens de l’Aéronautique et de l’Astronautique [office, B-1930, Zaventem].

**ABJPAA** Association Belge des Journalistes Professionnels de l’Aéronautique et de l’Astronautique [B-1030, Brussels] (Belgium).

**ABL** 1 Airborne laser.

2 Atmospheric boundary layer.

3 Armoured box launcher.

4 Allegany Ballistics Laboratory (VS).

**ablation** Erosion of outer surface of body travelling at hypersonic speed in an atmosphere. An ablative material (ablator) chars or melts and is finally lost by vaporisation or separation of fragments. Char has poor thermal conductivity, chemical reactions within ablative layer may be endothermic, and generated gases may afford transpiration cooling. Main mechanism of thermal protection for spacecraft or ICBM re-entry vehicles re-entering Earth atmosphere.

**AB/LD** Airbrakes/lift dumpers.

**ABM** 1 Apogee boost motor.

2 Anti-ballistic missile, with capability of intercepting re-entry vehicle(s) of ICBM.

3 Abeam (ICAO code).

4 Air-burst munition.

5 Aviation business machine.

6 Asynchronous balanced mode.

7 Aircraft base maintenance.

8 Adams Bashforth-Moulton, an LMM.

**abm** Abeam.

**ABMA** US Army Ballistic Missile Agency, 1 February 1956, Huntsville.

**ABMD** Anti- [or advanced] ballistic missile defense; A adds agency, I initiative, P program, S system and T treaty (US).

**ABN** Airborne.

**ABn** Aerodrome beacon.

**Abney level** A spirit-level clinometer (obs.).

**abnormality** The presence of abnormal material forms or physical shapes that are not permitted by the engineering specification (FAA).

**abnormal spin** Originally defined as spin which continued for two or more turns after initiation of recovery action; today obscure.

**A-bomb** Colloquial term for fission bomb based upon plutonium or enriched uranium (A = atomic).

**abort** 1 To abandon course of action, such as takeoff or mission.

2 Action thus abandoned, thus an \*.

**abort drill** Rehearsed and instinctive sequence of actions for coping with emergency abort situation; thus, RTO sequence would normally include throttles closed, wheel brakes, spoilers, then full reverse on all available engines consistent with ability to steer along runway.

**above-wing nozzle** Socket for gravity filling of fuel tanks.

**ABP** Aerodynamic balance panel.

**AB/PM** Air-base protective measure (US).

**ABPNL** Association Belge des Pilotes et Navigants techniciens de Ligne [office, B-1140 Brussels] (Belgium).

**A-BPSK** Aeronautical binary phase-shift keying.

**ABR** 1 Amphibian bomber reconnaissance.

2 Agile-beam radar.

**abradable seal** Surface layer of material, usually non-structural, forming almost gas-tight seal with moving member and which can abrade harmlessly in event of mechanical contact. Some fan and compressor-blade\*\* are silicone rubber with 20% fill of fine glass beads.

**ABRC** Advisory Board for the Research Councils (UK).

**Abres, ABRES** Advanced ballistic re-entry system[s].

**ABRU** Advanced bomb rack unit.

**ABRV** 1 Advanced ballistic re-entry vehicle.

2 Abbreviation.

**ABS** 1 Acrylonitrile butadiene styrene, strong thermosetting plastic material.

2 Anti-blocking system.

3 Anti-lock braking system.

**abs** Absolute scale of units.

**ABSA** Advanced base support aircraft.

**abscissa** 1 In co-ordinate geometry, X-axis.

2 X-axis location of a point.

**ABSL** Ambient background sound level.

**absolute aerodynamic ceiling** Altitude at which maximum rate of climb of aerodyne, under specified conditions, falls to zero. Usually pressure altitude amsl, atmosphere ISA, aircraft loading 1 g, and weight must be specified. Except for zoom ceiling, this is greatest height attainable.

**absolute alcohol** Pure ethyl alcohol (ethanol) with all water removed.

**absolute altimeter**

**absolute altimeter** Altimeter that indicates absolute altitude; nearest approach to this theoretical ideal is laser altimeter, closely followed by instruments using longer EM wavelengths (radio altimeter).

**absolute altitude** Distance along local vertical between aircraft and point where local vertical cuts Earth's surface.

**absolute angle of attack** Angle of attack measured from angle for zero lift (which with cambered wing is negative with respect to chord line).

**absolute ceiling** Usually, absolute aerodynamic ceiling.

**absolute density** Theoretical density (symbol  $\rho$ ) at specified height in model atmosphere.

**absolute fix** Fix (2) established by two or more position lines crossing at large angles near 90°.

**absolute humidity** Humidity of local atmosphere, expressed as  $\text{gm}^{-3}$ .

**absolute inclinometer** Inclinometer reading attitude with respect to local horizontal, usually by precise spirit level or gyro.

**absolute optical shaft encoder** Electromechanical transducer giving coded non-ambiguous output exactly proportional to shaft angular position.

**absolute pressure** Gauge pressure plus local atmospheric pressure.

**absolute system** Of several \*\* of units, or for calculating aerospace parameters, most important is reduction of aerodynamic forces to dimensionless coefficients by dividing by dynamic pressure head  $\frac{1}{2}\rho V^2$ .

**absolute temperature** Temperature related to absolute zero. Two scales in common use: absolute (°A) using same unit as Fahrenheit or Rankine scale (contrary to SI), and Kelvin (K) using same unit as Celsius scale.

**absolute zero** Temperature at which all gross molecular (thermal) motion ceases, with all substances (probably except helium) in solid state. 0K = -273.16°C.

**absorbed dose** Energy imparted by nuclear or ionising radiation to unit mass of recipient matter; measured in rads.

**absorption band** Range of frequencies or wavelengths within which specified EM radiation is absorbed by specified material; narrow spread(s) of frequencies for which absorption is at clear maximum.

**absorption coefficient** 1 In acoustics, percentage of sound energy absorbed by supposed infinitely large area of surface or body.

2 In EM radiation, percentage of energy that fails to be reflected by opaque body or transmitted by transparent body (in case of reflection, part of radiation may be scattered). Water vapour is good absorber of EM at long wavelengths at which solar energy is reflected from Earth's surface, so \*\* for solar energy varies greatly with altitude.

**absorption process** Chemical production of petrols (gasolines) by passing natural gas through heavy hydrocarbon oils.

**absorption cross-section** Absorption coefficient of radar target expressed as ratio of absorbed energy to incident energy.

**ABT** 1 About (ICAO).

2 Air-breathing threat[s].

**Abta, ABTA** Association of British Travel Agents, [office, London].

**ABTJ** Aferburning turbojet.

**ABU** 1 Aviation bird unit (airport).

2 Avionics block upgrade.

**ABV** 1 Air-bleed valve.

2 Above (ICAO).

3 Alternative boost vehicle (BMDS).

**ABW** Air Base Wing (USAF).

**AC** 1 Aligned continuous (FRP1).

2 Aircraft commander.

3 Army co-operation (UK).

4 Aerodynamic centre (a.c. is preferred).

5 Or A<sub>c</sub>, acceleration command.

6 Acquisition cycle.

7 Advisory circular (FAA).

8 Aircraft characteristic (JAR).

9 Automated circumferential (riveting).

10 Airworthiness circular.

11 Air carrier.

12 Air conditioner.

13 Airman certification (US).

14 Active component.

15 Area coverage (Satcoms).

16 Analyst console.

17 Approach control.

**Ac** Altocumulus cloud.

**A/C** Approach Control (FAA style).

**ac** Aerodynamic centre.

**a.c.** 1 Alternating current (electricity).

2 Aerodynamic centre of wing or other surface; often written ac.

**a/c** Aircraft (FAA = acft).

**ACA** 1 Air Crew Association (UK).

2 Aerobatic Club of America (Fort Worth, TX).

3 Advanced cargo aircraft.

4 Ammunition-container assembly.

5 Airspace coordination area (GFS).

6 Arms Control Association (US).

7 Address compression algorithm.

8 Advisory Committee for Aeronautics [1909, became ARC 1920] (UK).

9 Advanced computing architecture.

**ACAA** 1 Air-Carrier Association of America.

2 Australian Civil Aviation Authority.

3 Academic Center for Aging Aircraft (universities + DoD).

4 African Civil Aviation Agency, oversees five regional bodies (2007–).

**ACAAI** Air Cargo Agents Association of India [office, Mumbai].

**ACAR** Aircraft communications addressing and reporting [s adds system].

**ACAB** Air Cavalry Attack Brigade (USA).

**ACAC** 1 Arab Civil Aviation Council (Int).

2 African Civil Aviation Commission [Dakar, Senegal] (Int.).

3 Aircooled air cooler.

**ACAMS** Aircraft communications and management system.

**ACAN** Amicale des Centres Aéronautiques Nationaux [F-7501b Paris] (F).

**ACAP** 1 Aviation Consumer Action Project [1971–, office, Washington, DC 20009] (US).

2 Advanced composite aircraft (helicopter) program (US).

## ACARE

## accelerator pump

**ACARE** Advisory Council for Aeronautical Research in Europe (Int.).

**Acars, ACARS** 1 Aircraft communications and automatic reporting system; most common interpretation.

2 Airborne communication and recording system.

3 Arinc communications addressing and reporting system.

4 Airline communication and reporting system (Rockwell Collins).

**ACAS** 1 Air-cycle air-conditioning system.

2 Assistant Chief of the Air Staff.

3 Aluminium core, aluminium skin.

4 Airborne collision-avoidance system.

5 Aircraft collision-avoidance system (ICAO is currently \*II; 2002).

6 Advisory, Conciliation and Arbitration Service (UK).

7 Airfield chemical-alarm system.

8 Aircraft analytical system (software).

**ACASS** Advanced close air support system (US).

**Acassa** Army close air support situational awareness (USA/USAF).

**Acat, ACAT** 1 Association of Colleges of Aerospace Technology [Weybridge KT13 8TT] (UK).

2 Air Carrier Ab initio Training; MPL adds Multiple crew pilot license (US).

**Acatt** Army combined arms team trainer (Cobra/Apache/Scout).

**ACAVS** Advanced cab and visual system.

**ACAWS** Advisory caution and warning system.

**ACBM** Additional conventional-bomb module.

**ACC** 1 Air, or air traffic, or area, or aerodrome, or airfield control centre.

2 Active clearance control.

3 Air Combat Command (USAF, from 1 June 1992, HQ Langley AFB).

4 Air Co-ordinating Committee (US, military/civilian, 1945–60).

5 Axis-controlled carrier.

6 Avionics computer control.

7 Aeronautical Chamber of Commerce (US, 1921 on).

8 Automatic code change (IFF).

9 Aero Club of Canada [Ontario K7C 4L7].

10 Aerobatic Certificate Course (AOPA).

11 Audio control console.

**AcC** Altocumulus castellanus.

**ACCA** 1 Air Courier Conference of America [office, Falls Church, VA] (US).

2 Air Charters Carriers' Association.

**ACCC** 1 Australian Competition and Consumer Commission.

2 Aluminium [aluminum] conductor, composite core [cable].

**ACCE** Air Command and Control Element (RAF).

**accelerated flight** Although aircraft that gains or loses speed is accelerating in horizontal plane, term should be used only for acceleration in plane perpendicular to flight-path, esp. in vertical plane.

**accelerated history** Test record of specimen subjected to overstress cycling, overtemperature cycling or any other way of 'ageing' at abnormally rapid rate.

**accelerated mission endurance test** An engine or other item is subjected to a non-stop succession of simulated in-service missions.

**accelerated stall** Stall entered in accelerated flight. As common way of inducing stall is to keep pulling up nose, it might be thought all stalls must be accelerated, but in gradual entry flight path may be substantially horizontal. "High-speed stall" is possible in violent manoeuvre because acceleration in vertical plane requires wing to exceed stalling angle of attack. Stall-protection systems are generally designed to respond to rate of change of angle of attack close to stalling angle, so stick-pusher (or whatever form system takes) is fired early enough for critical value not to be reached.

**accelerate-stop** Simulation of RTO by accelerating from rest to  $V_1$  or other chosen speed and immediately bringing aircraft to rest in shortest possible distance; hence \* distance.

**accelerating pump** In piston engine carburettor, pump provided to enrich mixture each time throttle is opened, to assist acceleration of engine masses.

**accelerating well** Originally receptacle for small supply of fuel automatically fed into choke tube by increased suction when throttle was opened. Later became small volume connected by bleed holes to mixture delivery passage. Usually absent from modern engines.

**acceleration** Rate of change of velocity, having dimensions  $LT^{-2}$  and in SI usually measured in  $m s^{-2} = 3.28084 \text{ fts}^{-2}$  [reciprocal, 0.3048]. As velocity is vector quantity, \* can be imparted by changing trajectory without changing speed, and this is meaning most often applied in aerospace.

**acceleration control unit** Major element in engine fuel control unit, usually a servo sensing compressor delivery pressure to make fuel flow keep pace with demand for extra fuel to accelerate engine as throttle is opened.

**acceleration datum** Engine  $N_1$  corresponding to typical approach power, used in engine type testing for 2½ min. rest period before each simulated overshoot acceleration (repeated 8 or 15 times).

**acceleration errors** Traditional direct-reading magnetic compass misreads under linear acceleration (change of speed at constant heading) and in turn (apparent vertical acceleration at constant speed); former is a maximum on E–W headings, increasing speed on W heading in N hemisphere indicating apparent turn to N; Northerly Turning Error (N hemisphere) causes simple compass to lag true reading, while Southerly Turning Error results in over-reading. Simple suction horizon misreads under all applied accelerations, most serious under linear positive acceleration (t-o or overshoot), when indication is falsely nose-up and usually right-wing down (with clockwise rotor, indication is diving left turn).

**acceleration manœuvre** High-speed yo-yo.

**acceleration-onset cueing** Simulator technique in which real acceleration is initially imparted and then reduced, usually to zero, at a rate too low for body to notice; thus trainee can even believe in sustained afterburner takeoff.

**acceleration stress** Physical deformation of human body caused by acceleration, esp. longitudinal.

**acceleration tolerance** See *g-tolerance*.

**accelerator** 1 Device, not carried on aircraft, for increasing linear acceleration on takeoff; original name for *catapult*.

2 Software for boosting throughput of digital data, especially for satellite transmission.

**accelerator pump** Accelerating pump.

**accelerometer** Device for measuring acceleration. INS contains most sensitive \* possible. Usually one for each axis, arranged to emit electrical signal proportional to sensed acceleration. Recording \* makes continuous hard-copy record of sensed acceleration, or indicates peak. Direct reading \* generally fitted in test flying but not in regular aircraft operation.

**Accept** Automated cargo clearance enforcement processing technique, computerised inspection of selected items only, to help identify high-risk items (US customs).

**acceptable alternative product** One which may be used in place of another for extended periods without technical advice (NATO).

**acceptance** One meaning is agreement of air-traffic control to take control of particular aircraft. Hence \* rate is (1) actual rate in one-hour period, or (2) the maximum that can safely be handled.

**acceptance test** Mainly historic, test of hardware witnessed by customer or his designated authority to demonstrate acceptability of product (usually military). Schedule typically covered operation within design limits, ignoring service life, fatigue, MTBF, MMH/FH and fault protection.

**acceptance trials** Trials of flight vehicle carried out by eventual military user or his nominated representative to determine if specified customer requirement has been met.

**Access** Assembly concept for construction of erectable space structures.

**access door** Hinged door openable to provide access to interior space or equipment.

**access light** Until about 1940, light placed near airfield boundary indicating favourable area over which to approach and land.

**access panel** Quickly removable aircraft-skin panel, either of replaceable or interchangeable type, removed to provide access to interior.

**accessories** Replaceable system components forming functioning integral part of aircraft. Except in general aviation, term is vague; includes pumps, motors and valves, excludes such items as life-rafts and furnishing. In case of fuel system (for example) would include pumps, valves, contents gauges and flowmeters, but not tanks or pipelines.

**accessory drive** Shaft drive, typically for group of rotary accessory units, from main engine, APU, EPU, MEPU or other power source.

**access time** 1 Time required to access any part of computer program (typically  $10^{-3}$  to  $10^{-9}$  s).

2 Time required to project any desired part of film or roller map in pictorial cockpit display (typically about 3 s).

3 Time necessary to open working section of tunnel and reach model installed (typically about 1,000 s, but varies greatly).

**ACCGS** Air Cadet Central Gliding School (Syerston, UK).

**ACCID** Notification of aircraft accident (ICAO).

**accident** Incident in life of aircraft which causes significant damage or personal injury (see *notifiable*).

**accident-protected recorder** Flight recorder meeting mandatory requirements intended to ensure accurate playback after any crash.

**accident rate** In military aviation most common parameter is accidents per 100,000 flying hours; other

common measures are fatal accidents, crew fatalities and aircraft write-offs on same time basis, usually reckoned by calendar year. In commercial aviation preferred yardsticks are number of accidents (divided into notifiable and fatal) per 100 million passenger-miles (to be replaced by passenger-km) or per 100,000 stage flights, either per calendar year or as five-year moving average. In General Aviation usual measure is fatal accidents per 100,000 take-offs.

**accident recorder** Device, usually self-contained and enclosed in casing proof against severe impact, crushing forces and intense fire, which records on magnetic tape, wire, or other material, flight parameters most likely to indicate cause of accident. Typical parameters are time, altitude, IAS, pitch and roll attitude, control-surface positions and normal acceleration; many other parameters can be added, and some \*\* on transports are linked with maintenance recording systems. Record may continuously superimpose and erase that of earlier flight, or recorder may be regularly reloaded so that record can be studied.

**ACCIS** Automated command and control information system (NATO).

**ACCISRC** See AC<sup>2</sup>ISRC [alphabetically, AC two . . .].

**acclrm** Accelerometer.

**accompanying cargo/supplies** Cargo and/or supplies carried by combat units into objective area.

**ACCP** Automatic configuration control processor.

**ACC-R** Area control centre radar.

**accredited medical conclusion** Decision by licensing authority on individual's fitness to fly, in whatever capacity.

**accredited sortie** One that puts bomb on target.

**ACCS** 1 Airborne Command and Control Squadron (USAF, NATO).

2 Air command and control system (NATO).

3 Air-cycle [modular] cooling system.

4 Airborne computing and communications system.

**ACCSA** Allied Communications and Computer Security Agency (NATO, Brussels).

**ACCTS** Aviation Co-ordinating Committee for telecommunications Services (US).

**accumulator** 1 Electrical storage battery, invariably liquid-electrolyte and generally lead/acid.

2 Device for storing energy in hydraulic system, or for increasing system elasticity to avoid excessive dynamic pressure loading. Can act as emergency source of pressure of fluid, damp out pressure fluctuations, prevent incessant shuttling of pressure regulators and act as pump back-up at peak load.

3 Device for storing limited quantity of fuel, often under pressure, for engine starting, inverted flight or other time when normal supply may be unavailable or need supplementing.

4 Portion of computer central processor or arithmetic unit used for addition.

**accuracy jump** Para-sport jump in which criterion is distance from target.

**accuracy landing** In flying training or demonstration, dead-stick landing on designated spot (= spot landing).

**accuracy of fire** Linear distance between point of aim and mean point of strikes.

**Accu-Time** Magnetron circuit capable of being precisely tuned to different wavelengths.

## ACD

- ACD** 1 Automatic [or automated] chart display.  
2 Aeronautical Charting Division (NOAA).
- ACDA** Arms Control and Disarmament Agency.
- ACDAC** Asociación Colombiana de Aviadores Civiles [pilots' union; Bogotá] (Colombia).
- ACDB** Airport characteristics data-bank (ICAO).
- AC/DC** Air refuelling tanker able both to dispense and receive fuel in flight (colloq.).
- ACDO** Air-carrier district office (US).
- ACDP** Armament control and display panel.
- ACDS** 1 Automatic countermeasures [or computer-controlled] dispenser [or dispensing] system.  
2 Assistant Chief of the Defence Staff (UK).  
3 Air-, or advanced, combat direction system.
- ACDTR** Airborne central data tape recorder (now generally called RSD).
- ACE** 1 Automatic check-out equipment.  
2 Association of Consulting Engineers [London SW1H 0QL] (UK).  
3 Air combat evaluator (CIU software).  
4 Aircrew (or accelerated copilot) enrichment.  
5 Allied Command Europe (NATO).  
6 Association des Compagnies Aériennes de la Communauté Européenne [all EC7 members of IACA; office, B-1930 Zaventem] (Int.).  
7 Advanced crew-station evaluator (helicopter).  
8 Automated center for electronics, computer control of all phases of circuit design, development, assembly and test (Lockheed).  
9 'Technical acknowledgement' (ACARS code).  
10 Actuator control electronics.  
11 Advanced-certification equipment.  
12 Aerospace Committee (BSI).  
13 Avionics capabilities enhancement.  
14 Analysis [and] control element.  
15 Agile control experiment.  
16 Aerobatic certification evaluator.  
17 Aviation Career Education, or Educator (US).  
18 Aviation Combat Element of MEU  
19 Autonomous combat [manoeuvres] evaluation.  
20 Air-combat emulator.  
21 Adaptive-cycle engine.  
22 Association of Cost Engineers [Sandbach, Cheshire] (UK).  
23 Aviation [airport] capacity evaluation (FAA 2002–).  
24 Aviation Centre of Excellence (45 European members).  
25 Aéro Club d'Egypte [Cairo].  
26 Airborne Command Element (Awacs).  
27 Airside capacity enhancement.
- ace** Combat pilot with many victories over enemy aircraft. WW2 USAAF scores included strafing (air/ground) "victories". Number required to qualify has varied, but in modern world is usually five confirmed in air combat.
- ACEA** 1 Action Committee for European Aerospace (international shop-floor pressure group).  
2 Aero Club of East Africa (Kenya).
- ACEBP** Air-conditioning engine bleed pipe.
- ACEC** Ada-compiler evaluation capability.
- ACED** Air cargo explosives detection; PP adds pilot program (DHS).
- ACEE** Aircraft energy efficiency (NASA).
- ACEL** Air Crew Equipment Laboratory (USN).

## achieved navigation performance

- ACEM** Aerial camera electro-optical magazine.
- ACER** Air Corps Enlisted Reserves (USA).
- ACES** 1 Advanced-concept escape system.  
2 Advanced-concept ejection seat.  
3 Air-carrier engineering support.  
4 Aerial combat enhanced [or evaluation, or evaluator] simulation.  
5 Advanced carry-on Elint/ESM suite.  
6 Adaptation controlled environment system (ATC).  
7 Airborne capability extension system.
- ACeS** Asia cellular satellite system.
- ACESNA** Agence Centrafricaine pour la Sécurité Navigation Aérienne. [office Bangui, Central African Rep.]
- ACESS** Aircraft computerized equipment support system.
- ACET** 1 Air-cushion equipment transporter, for moving aircraft and other loads over soft surfaces, especially over airbase with paved areas heavily cratered (S adds 'system').  
2 Automatic cancellation of extended [radar] target[s].  
3 Affordable capable engine technology, TDP adds technology demonstrator programme [2005–] (UK).
- acetate** Compound or solution of acetic acid and alkali.  
\* dope is traditionally based upon acetic acid and cellulose; was used for less inflammable properties (see *nitrate dope*).
- ACETEF** Air-combat environmental test and evaluation facility (USA).
- acetone**  $\text{CH}_3\text{CO}.\text{CH}_3$ , inflammable, generally reactive chemical, often prepared by special fermentation of grain, used as solvent. Basis of many 'dopes' and 'thinners'.
- ACETS, Acets** Air-cushion equipment transportation system (for post-attack airfields).
- acetylene**  $\text{CH}.\text{CH}$  or  $\text{C}_2\text{H}_2$ , colourless gas, explosive mixed with air or when pressurized but safe dissolved in acetone (trade name Prestolite and others). Burns with oxygen to give 3,500°C flame for gas welding; important ingredient of plastics.
- Aceval** Air-combat evaluation.
- ACEX** Air-coupled electronic transducer.
- ACF** 1 Aircraft Components Flight (RAF).  
2 Advanced common flightdeck.  
3 Area control facility.
- ACFC** 1 Aircooled flight-critical.  
2 Aircooled fuel cooler.
- ACFD** Advanced civil flight deck.
- AC<sup>4</sup>ISR** Adaptive C<sup>4</sup>ISR.
- ACFR** Australian Centre for Field Robotics.
- acft** Aircraft (ICAO), also loosely ACFT.
- ACG** 1 Austro Control GmbH (Austria).  
2 Airfield Construction Group (RAF, WW2).  
3 Airport Compatibility Group.
- ACGF** Aluminium-coated glassfibre (chaff).
- ACGS** Aerospace Cartographic and Geodetic Service (USAF, formerly MAC).
- ACH** 1 Advanced Chain Home (UK WW2).  
2 Advanced compound helicopter.
- ACH/GD** Aircraft-hand, General Duties, "lowest form of life" in RAF (WW2).
- achieved navigation performance** The measure of uncertainty in the position element.

**achromatic** Transmitting white light without diffraction into special colours; lens system so designed that sum of chromatic dispersions is zero.

**ACI** 1 Air Council Instruction (UK).

2 Airports Council International; suffixes denote regions, thus – NA = North America [office, 1215 Geneva 16] (Int.).

3 Avionics caution indicator.

4 Armament control indicator.

**ACID** Aircraft identification.

**acid engine** Rocket engine in which one propellant is an acid, usually RFNA or WFNA.

**acid extraction** Stage in production of lubricating oils in which sulphuric acid is used to extract impurities.

**Acids, ACIDS** 1 Automated communications and intercom distribution system.

2 Air conformal ice detection system.

**ACI-E** Airports Council International – Europe.

**ACINT, Acint** Active acoustic intelligence.

**Acips** Airfoil and cowl ice protection system.

**ACIS** 1 Advanced CCD imaging spectrometer.

2 Armament, or advanced, control/indicator set.

3 Advanced cabin interphone system.

**ACJ** Advisory circular, Joint.

**ACJN** Adaptive joint C4ISR node.

**ACK** Acknowledgement of uplink (Agars).

**ack** Acknowledgement (ICAO).

**Ack-ack** Anti-aircraft (UK WW1, became passé in WW2).

**Ackeret formula** There are many, most important being, for thin wing above  $M_{DET}$ , regardless of camber,  $C_L = 4\alpha / \sqrt{M^2 - 1}$ .

**Ackeret theory** First detailed treatment [1925] for supersonic flow past infinite wing, suggesting sharp leading and trailing edges and low t/c ratio; favoured profiles were biconvex or trapezium (parallel double wedge).

**acknowledged program** A special-access program whose existence is admitted.

**acknowledgement** Confirmation from addressee that message has been received and understood.

**ACL** 1 Anti-collision light.

2 Allowable cabin load.

3 Aeronautical-chart legend.

4 Altimeter check location.

5 Air Cadet League of Canada.

6 ATC1 clearance[s].

**Acclaim** Airborne coherent lidar for air inflight measurement.

**Aclant** Allied Command, Atlantic (NATO).

**ACLC** The Air Cadet league of Canada [office, Ottawa].

**ACLD, ACld** Above cloud[s].

**ACLG** Air-cushion landing gear; underside of aircraft is fitted with inflatable skirt to contain ACV type cushion, suitable for all land, marsh, sand or water surfaces.

**Aclics** Airborne communications location, identification and collection system (USA).

**aclinic line** Isoclinic line linking all points whose angle of dip is zero.

**Aclos, ACLOS** Automatic command to line of sight.

**ACLS** 1 Automatic carrier landing system (Bell/USN).

2 Air-cushion landing system.

**ACLT** 1 Aircraft-carrier landing training.

2 Actual calculated landing time.

**ACLU** American Civil Liberties Union (US).

**ACM** 1 Air-combat manoeuvring, or manoeuvre [US maneuver]; EST adds expert-systems trainer, I instrumentation, R range and S simulator.

2 Air-cycle machine.

3 Anti-armour cluster munition.

4 Air Chief Marshal (not normally abbrev.).

5 Air-conditioning module.

6 Advanced cruise missile (USAF).

7 Aircraft-condition monitoring.

8 Aircraft manual.

9 Attitude-control module.

10 Air Commercial Manual (US Bureau of Air Commerce).

11 Aircraft-cabin mattress.

12 Advanced contouring machine.

13 ATC 1 communications management.

**ACMA** Advanced concepts and material applications (MoD, UK).

**ACMDS** Advanced countermeasures dispensing system.

**ACME** Advanced-core military engine.

**ACMF** Aircraft-condition monitoring function.

**ACMG** Air-Cargo Management Group (US).

**ACMI** 1 Air-combat manoeuvring instrumentation, or installation.

2 Aircraft, crew, maintenance and insurance.

**ACMP** Alternating-current motor/pump.

**ACMR** Air-combat manoeuvring range.

**ACMS** 1 Avionics, or advanced, control and management system.

2 Aircraft, also airport, condition monitoring system.

3 Armament control and monitoring system.

**ACMT** Advanced cruise-missile technology.

**ACN** 1 Aircraft Classification Number (ICAO proposal for pavements).

2 Airborne communications node, C4ISR, now called *ACJN*.

3 Academia Cosmologica Nova (G).

4 Ascension.

**ACNA** Aéro Club National d'Algérie (Algeria).

**ACNDT** Advisory Committee for Non-Destructive Testing.

**ACNIP** Auxiliary, or advanced, CNI panel.

**ACNS** Assistant Chief of the Naval Staff (UK).

**ACNSS** Advanced com/nav/surveillance system.

**ACO** 1 Airspace control, or coordination, order.

2 Airborne Control, or Communications, Officer.

3 Aerostat coordination office.

4 Advanced concepts of applications.

5 Air-combat order.

**ACOC** Aircooled oil cooler.

**acorn** 1 Streamlined body or forebody added at intersection of two aerodynamic surfaces [e.g. fin/tailplane] to reduce peak suction.

2 Streamlined body introduced at intersection of crossing bracing wires to prevent chafing.

3 Streamlined fairing over external DF loop.

**acorn valve** Small thermionic valve (radio tube) formerly added to VHF or UHF circuit to improve efficiency.

**ACOS** 1 Assistant Chief of Staff.

2 Air Crew Officers' School.

## Acost

**Acost** Advisory Committee on Science and Technology (UK).

**ACostE** Association of Cost Engineers (UK).

**Acoubuoy** Acoustic sensor dropped by parachute into enemy land area.

**Acousint, acousint** Acoustic intelligence.

**acoustic** Associated with sound, and hence material vibrations, at frequencies generally audible to human beings.

**acoustic absorption factor** Rate at which acoustic energy is incident on a surface divided by that measured on inner face of material. Varies greatly with frequency.

**acoustical tailpipe** The final nozzle assembly in a hushkit.

**acoustic delay line** In computer or other EDP device, subsystem for imparting known time delay to pulse of energy; typically closed circuit filled with mercury in which acoustic signals circulate (obs.).

**acoustic feedback** Self-oscillation in radio system caused by part of acoustic output impinging upon input.

**acoustic impedance** Resistance of material to passage of sound waves, measured in acoustic[al] ohms.

**acoustic intelligence** Self-explanatory; in the past has primarily involved undersea warfare.

**acoustics** In ASW, sonar and other sensing systems relying on underwater sound; thus \* operators, \* displays.

**acoustic splitter** Streamlined wall introduced into flow of air or gas, parallel to streamlines, for acoustic purposes. Usually inserted to reduce output of noise, for which purpose both sides are noise-absorbent. Many are radial panels and concentric long-chord rings (open-ended cylinders).

**acoustic tube** Miniature acoustic/electric transducer which has replaced carbon or other types of microphone in aircrew headsets.

**acoustic tuning** Fine adjustment of shape to achieve desired aerodynamics, esp. in separation of stores.

**ACP** 1 Airborne [or airlift] command post.

2 Anti-Concorde Project.

3 Altimeter check point.

4 Armament control panel.

5 Africa, Caribbean, Pacific.

6 Audio control panel, or convertor processor.

7 Aerosol collector and pyroliser.

8 Aluminised composite propellant.

9 Acquisition Change Programme [2006–] (MoD, UK).

**ACP, Acp** Acceptance message.

**ACPA** Adaptive-controlled phased array.

**ACP(C)** Automatic communications processor (control).

**ACPL** Atmospheric Cloud Physics Laboratory.

**AC-plonk** AC2 (derogatory reference to this low rank in RAF, 1941–50).

**ACPMR** Automatic communications processor and multiband radio.

**ACPT, Acpt** Accepted.

**acquisition** 1 Act of visually identifying, and remembering location of, object of interest (specific ground or aerial target).

2 Detection of target by radar or other sensor (plus, usually, automatic lock-on and subsequent tracking).

3 Detection and identification of desired radio signal or other broadcast emission.

4 Act of reaching desired flight parameter, such as

## ACSE

heading, FL or IAS, or desired point or axis in space such as ILS G/S or LOC (see *capture*).

**acquisition round** AAM (1) without propulsion, and usually without wings or fins, carried to provide practice in homing head lock-on.

**acquisition scan window** 3-D block of airspace into which a VAV can easily be guided, wherein CARS or UCARS acquires it and feeds it to the RIW.

**ACR** 1 Aerial combat reconnaissance.

2 Air [or airfield, or approach] control radar.

3 Advanced cargo rotorcraft.

4 Active cockpit rig.

5 Avionics communication[s] router.

6 Aeroklub Ceske Republiky (Czech Rep.).

**ACRA, AcrA** Airlift Concepts and Requirements Agency (USA/USAF).

**ACRB** Aéro-Club Royal de Belgique [B-1000 Brussels] (Belgium).

**ACRC** Aircrew Reception Centre, (UK, WW2).

**acre** Old Imperial (FPS) unit of land surface area, equal to 0.40469 ha (1 ha = 2.47105 acres). For covered area (factory buildings etc) usual SI unit is m<sup>2</sup> (= 0.000247105 acre, so 1-acre plant = 4,047 m<sup>2</sup>).

**acreage** Superficial area of flight vehicle, especially spacecraft or aerospace craft, as distinct from nose and other parts that need ablative or other special protection.

**Ac-Rep** Representative, usually of country of manufacture, accredited to accident investigation.

**Acris** Air control recording and information system.

**ACRM** Aircrew resource management.

**acrobatics** Usual term is aerobatics.

**ACRP** Airport Co-operative Research Program (TRB).

**ACRR** Airborne communications restoral relay.

**ACRS** Air Crew Refresher School (RAF WW2).

**ACRT** Additional cross-reference table.

**ACRV** Assured crew-rescue vehicle.

**ACRW** Aircraft [aeroplane] with circular rotating wing.

**acrylics[s]** Thermosetting plastic[s], usually transparent, based on polymerised esters of \* acid; original tradename Perspex (ICI, UK) and Plexiglas (Rohm & Haas, US). Since 1950 improved transparencies result from stretching moulded part prior to setting.

**ACS** 1 Attitude, or armament, or avionics, or active, or audio, or auxiliary, control system.

2 Aeroflight control system, for use by spacecraft within atmosphere.

3 Air-conditioning system.

4 Air Commando Squadron (USAF).

5 Air Control Squadron.

6 Aircraft Certification Service (FAA).

7 Airframe consumable spares.

8 Advanced crew station.

9 Aerial [ie, airborne] common sensor (USA, USN).

10 Air-combat simulator.

11 Assembly & Command Ship (Sea Launch).

**ACSA** 1 Allied Communications Security Agency (NATO).

2 Aero Club of S Africa.

3 Aeronautical Safety for Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras).

**ACSC** Air Command and Staff College (USAF, Maxwell AFB).

**ACSE** Access control and switching, or signalling, equipment (Aerosat ground station).

- ACSG** 1 Armament computer symbol generator.  
2 Aeronautical communications sub-group.
- AcSL** Altocumulus standing lenticular.
- ACSM** 1 Advanced conventional standoff missile.  
2 Assemblies, components, spare parts and materials (NATO).
- ACSR** 1 Active control of structural response.
- 2 Aeroklub Ceskoslovenske Socialisticke Republiky (Prague).
- ACSS** 1 African Centre for Strategic Studies.  
2 Aircraft collision surveillance system.
- ACSSB** Amplitude-commanded single-sideband.
- ACSU** Air Combat Service Support Unit[s] [EAW] (RAF).
- ACSU** Air-Combat Support Unit. [as above].
- ACT** 1 Actual temperature; ISA  $\pm$  deviation.  
2 Active-control technology.  
3 Air-combat tactics.  
4 Anti-communications threat.  
5 Atlas composing terminal.  
6 Airborne crew trainer.  
7 Advanced composite technology.  
8 Additional centre tank.  
9 Advanced-coverage tool.  
10 ASR crew trainer.  
11 Active, activated, activity.  
12 Analysis control team.  
13 Allied Command Transformation, strategic force created 2003 in NATO with HQ in US.
- ACTAU, Actau** Asociación de Controladores de Transito Aereo del Uruguay.
- Act** See ACT 11.
- ACTC** Air Commerce Type Certificate (US 1934–38).
- ACTD** Advanced-concept technology demonstrator, or demonstration.
- ACTE** Association of Corporate Travel Executives (Int.).
- ACTEW, Actew** Acoustic charged transport electronic warfare, low-cost decoy system in which signals are slowed as they pass across GaAs.
- ACTI** Air-combat tactics instructor.
- ACTIFT, Actift** Advanced cockpit technology and instrument-flying trainer.
- actinic ray** EM radiation, such as short-wave length end of visible spectrum and ultraviolet, capable of exerting marked photochemical effect.
- actinometer** Instrument measuring radiation intensity, esp. that causing photochemical effects, eg sunlight; one form measures degree of protection afforded from direct sunlight, while another (see *pyrgeometer*) measures difference between incoming solar radiation and that reflected from Earth.
- action** Principal moving mechanism of automatic weapon; in gun of traditional design typically includes bolt, trigger, sear, bent, striker, extractor and ammunition feed.
- Actions** Air-combat training interoperable with NATO systems, integrated with *Raids* (see *Units*).
- action time** Duration in seconds of significant thrust imparted by solid-propellant or hybrid rocket. Several definitions, most commonly the period between the point at which thrust reaches ten per cent of maximum (or average maximum) and that at which it decays through same level. This period is always shorter than actual

duration of combustion, but longer than burn time. Symbol  $t_a$ .

**action time average chamber pressure, or thrust** Integral of chamber pressure or thrust versus time taken over the action time interval divided by the action time; symbols  $P_c$ ,  $F_a$ .

**Actis** Advanced compact thermal-imaging system.

**Activ** Air-combat training instrumented virtual range.

**activate** To translate planned organisation or establishment into actual organisation or establishment capable of fulfilling planned functions.

**activated carbon** Organically derived carbon from which all traces of hydrocarbons have been removed; highly absorbent and used to remove odours and toxic traces from atmospheres; also called activated (or active) charcoal.

**ACTIVE, Active** Advanced control technology for integrated vehicles.

**Active** Aircrew collective training through immersive virtual events (UK, MoD).

**active** 1 General adjective for a device emitting radiation (as distinct from passive). Also see \* munition.

2 The runway(s) in use.

**active aerodynamic braking** Reversed propulsive thrust.

**active aeroelastic wing** Instead of trying to prevent flexure and twist the AAW seeks to exploit it. Special F/A-18 works by LE flap control.

**active air defence** Direct action against attacking aircraft, as distinct from passive AD.

**active clearance control** Technique for maintaining an extremely small gap between fixed and rotating components of a machine (for example, by blowing bleed air around a turbine casing in a gas-turbine engine).

**active controls** Flight-control surfaces and associated operative system energised by vertical acceleration (as in gust) and automatically deflected upwards and/or downwards, usually symmetrically on both sides of aircraft, to alleviate load; thus active ailerons or tailplanes operate in unison to reduce vertical acceleration.

**active countermeasures** Countermeasures requiring friendly emissions. Subdivisions include microwave, IR and electro-optical.

**active decoy round** Rocket-launched parawing carrying an EW jammer.

**active electronically scanned array** Radar, especially for fighter, whose antenna is fixed; scanning is achieved by a progressive phase-shift from one side of the antenna to the other (or from bottom to top), the greater the shift the larger the steering angle  $\theta$ . Normally slight upward tilt deflects head-on main-lobe reflection to enhance stealth characteristics.

**active guidance** Active homing guidance.

**active homing guidance** Guidance towards target by sensing target reflections of radiation emitted by homing vehicle.

**active jamming** ECM involving attempted masking or suppression of enemy EM signals by high power radiation on same wavelengths.

**active landing gear** One in which the full suspension force is subject to control.

**active loading** LO (Stealth) generates signal to cancel that detected by hostile radar.

**active magnetic bearing** One which holds shaft in position by electromagnetic field, with no physical contact.

**active material** Many meanings, eg: 1, phosphor, such as zinc phosphate or calcium tungstate, on inner face of CRT; 2, parts of electric storage battery that participates in electrochemical reaction.

**active missile** Fire-and-forget missile carrying its own active guidance.

**active model** A computer-generated [e.g., CAD] model able to demonstrate the full range of system function.

**active munition** One having immediate effect (as distinct from a mine, which is passive).

**active noise control** Noise-suppressing or countering systems triggered by noise itself and using sound energy against itself.

**active pilot** On long-haul, the pilot fully alert to FMGS, navigation and other inputs.

**active runway** Runway currently in use (implied that flying operations are in progress).

**active satellite** Satellite with on-board electrical power sufficient to broadcast or beam its own transmissions.

**active stealth** Reduction in signature by generating tailored emissions.

**active visual camouflage** See *counter-illumination*.

**activity factor** See *blade activity factor*.

**ACTP** Advanced Computer Technology Project (UK).

**ACT-R** Air-combat training, rangeless.

**Actram** Advisory committee on transport of radioactive material.

**ACTS** Advanced communications technology satellite.

**ACT-Tilt** Active control technology for tilt-rotor.

**ACT-TO** Actual time and fuel state at takeoff.

**actual ground zero** Point on surface of Earth closest to centre of nuclear detonation.

**actuator** Device imparting mechanical motion, usually over restricted linear or rotary range and with intermittent duty or duty cycle.

**actuator remote terminal** Connects the powered flight-control unit in a distributed flight-control system, databus feeding through digital processor to close pilot analog loop and provide redundancy.

**AC2** Aircraftman, 2nd Class (RAF, most numerous WW2 rank).

**AC<sup>2</sup>ISRC** Aerospace Command and Control Intelligence, Surveillance, Reconnaissance Center (USAF).

**ACU** 1 Gas-turbine acceleration control unit.

2 Avionics [or autopilot, or audio, or auxiliary, or acceleration, or apron, or airborne, or adaptive, or annotation, or antenna] control unit.

3 Airborne computer unit.

**acute dose** Total radioactive dose received over period so short that biological recovery is not possible.

**ACV** 1 Air-cushion vehicle.

2 Escort (or auxiliary) aircraft carrier (CVE from 1943).

3 Achieved coverage volume (satellite antenna).

**ACVC** Ada compiler validation capability.

**ACW** 1 Aircraft control and warning.

2 Air Control Wing (USAF Awacs).

**ACWAR, Aewar** Agile continuous-wave acquisition radar.

**ACyc** Anti-cyclone, anti-cyclonic.

**ACZ** Airfield, or aerodrome, control zone.

**AD** 1 Airworthiness Directive (national certifying authorities).

2 Advisory route (FAA).

3 Aligned discontinuous (FRP).

4 Aerodrome (ICAO).

5 Air defence.

6 Area-denial munition.

7 Aerial delivery (ramp-door position).

8 Autopilot disconnect.

9 Air diagram, followed by number.

10 Armament Division (AFSC).

11 Air Division (USAAC, USAF).

12 Accidental damage.

13 Aerodynamic disturbance (which see).

14 Ashless dispersant.

15 Assistant Director (UK).

16 Administrative domain.

17 Air Depot (RFC, SAAF).

18 Automatic differentiation.

19 Attack display.

**A/D** 1 Air defence.

2 Alarm and display.

3 Aerodrome (common UK usage).

4 Analog/digital.

**Ad** Aerodrome (DTI, CAA).

**a/d** Aerodrome [trad.abb.]

**ADA** 1 Advisory area.

2 Air-defence alert [or artillery].

3 Aeronautical Development Agency (India).

4 Air-defended area.

5 Business-aviation association (R).

6 Americans with disabilities act.

7 Avion de détection aéroportée (Awacs, F).

8 Association de Documentation Aéronautique (F).

9 Adaptive data analysis [see *VDA3*].

**Ada** Standard common high-order language for US DoD software (trademark).

**ADAAM** Air-directed air-to-air missile.

**ADAAPS** Aircraft data acquisition, analysis and processing system.

**ADAC** 1 STOL (F).

2 Active-radar seeker (F).

**Adacs** 1 Alarm distributed-access control system.

2 Airborne digital automatic collection system.

**ADAD** Air-defence alerting device, horizon-scanning IR surveillance system.

**ADAE** Air Display Association Europe (Dunston, Lincs., UK).

**ADAHRS** Air-data attitude/heading reference system.

**ADAIRS** Air-data and inertial-reference system.

**Adam, ADAM** 1 Air deflection and modulation.

2 Automated deposition of advanced (or aircraft) material (filament winding).

3 Automated data for aerospace maintenance.

4 Advanced dynamic anthropomorphic manikin.

5 Aerospace data miner.

6 Air-defence air-mobile [or air defense anti-missile] [in each case, S adds system].

7 [Also ADaM] aerostat design and manufacture [J-lens].

8 Air-defense airspace management (USA).

9 Advanced aero-engines materials [research] (UK).

**ADAMD** Air Defence and Aerospace Management Directorate (NATO).

## Adams

**Adams** 1 Aircraft dispatch and maintenance safety (Int.).

2 Allied deployment and movements system (NATO).

**ADAP** 1 Aircraft Development Aid Program (US DoT).

2 Air-defence air picture.

**Adaps** Automatic data acquisition and processing system.

**Adapt** Air traffic [services] data acquisition, processing and transfer (ATC Switzerland).

**adapter** Interstage device to mate and then separate adjacent stages of multi-stage vehicle. Often called skirt, especially when lower stage has larger diameter.

**adaptive bus** Digital data highway to which (almost) any number of inputs and outputs may be connected.

**adaptive control system** Control system, esp. of vehicle trajectory, capable of continuously monitoring response and changing control-system parameters and relationships to maintain desired result. Adapts to changing environments and vehicle performance to ensure given input demand will always produce same output.

**adaptive-cycle engine** Variable-geometry turbofan providing high specific thrust for acceleration and economical high BPR for subsonic cruise.

**adaptive logic** Digital computer logic which can adapt to meet needs of different programs, environments or inputs.

**adaptive nulling** See *Adars*.

**adaptive optical camouflage** Active, self-variable form of camouflage which, chameleon-like, alters emitted wavelengths to suit varying background tones.

**adaptive radar** Usual [not only] meaning is antenna automatically alters gain, sidelobes and directivity according to received signal.

**Adaps** Adaptive diagnostics and personalised technical support.

**ADAR** Air-deployed active receiver (ASW).

**Adario** Analog/digital adaptive recorder input/output.

**Adars** Adaptive antenna receiver system; antenna (aerial) provides gain towards desired signals arriving from within a protected angle while nulling those arriving from outside that angle.

**ADAS** 1 Airborne data-acquisition system.

2 Auxiliary (or airborne) data-annotation system (for reconnaissance film, linescan or other hard-copy print-out of reconnaissance or ECM mission).

3 Airfield damage assessment system (USAF).

4 Air-deliverable acoustic sensor.

5 Aeronautical-data access station (AFTN).

6 Advanced digital avionics system (STA.6).

7 Automated weather-observing system data-acquisition system.

**ADat-P3** Automatic data-processing [standard]-3 (NATO).

**Adats** 1 Air-defense [and] anti-tank system (US).

2 Airborne digital avionics test system.

**ADAU** Air-, or analog-, or auxiliary-, data acquisition unit.

**ADAV** VTOL (F).

**ADAWS** Action-data automated weapon system.

**ADAZ** Air-defence zone.

**ADB** 1 Automatic drifting balloon.

2 Apron-drive bridge.

3 Aircraft discrepancy book (USN).

**ADC** 1 Air-data computer.

## address selective

2 Air Defense Command (USAAF, 27 March 1946), see next.

3 Aerospace Defense Command (USAF, 15 January 1968, later called Adcom, inactivated 31 March 1980).

4 Advanced design conference.

5 Analog/digital convertor.

6 Aircrew dry coverall (helicopter sea rescues).

**ADCA** Advanced-design composite aircraft (USAF).

**Adcap** Advanced capability, or capabilities.

**ADCC** 1 Air Defence Cadet Corps (UK 1939–41, became ATC).

2 Air-defence, or direction, control centre.

**ADCF** Aligned discontinuous carbon fibre.

**ADCIS** Air-defence command information system (UK).

**ADCN** Aeronautical, or aircraft, data communications network.

**Adcock aerial** Early radio D/F; avoided errors due to horizontal component by using two pairs of vertical conductors spaced  $\frac{1}{2}$ -wavelength or less apart and connected in phase opposition to give a figure-8 pattern.

**ADCOM, Adcom** Aerospace Defense Command (USAF, inactivated 31 March 1980).

**ADCoPP** Air-defence command-post processor.

**ADCP** Advanced-display core processor.

**ADCS** Air-data computer system.

**ADCTS** Advanced distributed combat training system.

**Adcus** Advise Customs.

**Adcuts, ADCUTS** Advanced computerised ultrasonic test system.

**ADCV** Active destination-coded vehicle (baggage).

**ADD** 1 Airstream direction detector (stall protection).

2 Long-range aviation (USSR VVS strategic bombing force).

3 Allowable, or acceptable, deferred deficiency, or defect.

**ADDA** American Design Drafting Association [office, Columbia, SC29211] (US).

**ADDc** Air-defence data, or direction, centre (UK).

**ADDD** Air-defence data dictionary (UK, a mathematical model).

**Addison-Luard** Large hand-held aluminium-body computers, Type B for triangle of velocities and D for adding fourth vector, eg motion of aircraft carrier (c1928–40).

**additive** Substance added to fuel, propellant, lubricant, metal alloy etc to improve performance, shelf life or other quality.

**additive drag**  $D_{add}$ , total drag at inlet to a jet engine, mass flow times difference between inlet and free-stream plus inlet area times difference between inlet and free-stream pressures. These terms should be close to zero.

**ADDL** Aerodrome (or airfield) dummy deck landings; pronounced ‘addle’.

**ADDN, Addn** Addition, additional.

**add-on contract** Extension of existing contract to cover new work in same programme.

**ADDPB** Automatic diluter-demand pressure breathing.

**ADDR** Aeroklub der Deutschen Demokratischen Republik.

**address** Electronic code identifying each part of computer memory, each bit or information unit being routed to different \*.

**address selective** Adsel.

**ADDS** 1 Airborne-decoy [or advanced digital] dispensing system.

2 Aerial delivery dispersal system.

**add time** Time required for single (binary) addition operation in computer arithmetic unit.

**ADE** 1 Automated draughting (drafting) equipment.

2 Aeronautical Development Establishment (India).

3 Ada development environment.

4 Australian Defence Executive.

5 Airframe design environment [software].

**Adecs, ADECS** Advanced digital engine control system.

**ADEG** Air traffic services data-exchange requirements group (ICAO).

**Adela** Aircraft directed-energy laser applications (AFRL).

**Adèle** Alerte detection et localisation des émetteurs (F).

**ADELT** Automatically deployable *emergency locator* transponder, or transmitter.

**Adem** Advanced diagnostic and engine monitoring.

**Aden** Armament Development, Enfield (UK, formerly).

**ADEN** Augmented deflector [or deflecting] exhaust nozzle.

**Adeos** Advanced Earth-observing satellite.

**ADEU** Automatic data-entry unit (punched card input for STOL transport navigation).

**Adews** Air-defense EW system (USA).

**Adex, ADEX** Air defence exercise.

**ADEXP** ATS (1) data-exchange presentation message format.

**ADF** 1 Automatic direction-finding or finder. Airborne radio navaid tuned to NDB or other suitable LF/MF broadcast source. Until 1945 aerial was loop mounted in vertical plane and rotated by motor energised by amplified loop current to rest in null position, with plane of loop perpendicular to bearing of ground station. Modern receivers fed by two fixed coils, one fore-and-aft and the other transverse, suppressed flush with aircraft skin (usually on underside).

2 Australian Defence Force; (A adds Academy).

3 Air-dominance fighter.

4 Anti-icing/de-icing fluid.

5 Airline Dispatcher Federation (office, DC).

**ADFA** Australian Defence Force Academy (Campbell, ACT).

**ADFC** Aligned discontinuous fibre composite.

**ADF sense aerial** Rotatable loop null position gives two possible bearings of ground station;\*\* is added to give only one null in each 360° of loop rotation.

**ADG** 1 Auxiliary drive generator.

2 Air-driven generator.

3 Accessory drive gear, or generator.

4 Aircraft delivery group (USAF).

5 Airplane Design Group (FAA).

**ADGB** Air Defence of Great Britain (1943–44).

**ADGBS** Air-defence ground-based system (RAF).

**ADGE, Edge** Air defence ground environment, or equipment.

**ADGS** 1 Air-defence gunsight.

2 Aircraft docking guidance system.

**ADI** 1 Attitude director [rarely, display] indicator. 3-D cockpit display forming development of traditional horizon and usually linked with autopilot and other elements forming flight-director system. Most can func-

tion in at least two modes, en route and ILS, and in former can provide navigational steering indications.

2 Anti-detonant injection, such as cylinder-head injection of methanol/water, for high-compression piston engine.

3 Air Defense Initiative, partner ideas for SDI-type international joint ventures (US DoD).

4 Aerospace and Defence Industries Directorate [1 to 4] (DTI, UK).

5 Azimuth display indicator.

6 Assistant Director of Intelligence.

**adiabatic** Thermodynamic change in system without heat transfer across system boundary. In context of Gas Laws, possible to admit of exact\* processes and visualise them happening; shockwave, though not isentropic, is not\* in classical sense because thermodynamic changes are not reversible.

**adiabatic flame temperature** Calculated temperature of combustion products within rocket chamber, assuming no heat loss. Symbol  $T_c$ .

**adiabatic lapse rate** Rate at which temperature falls (lapses) as height is increased above Earth's surface up to tropopause (see DALR, ELR, SALR).

**ADIAE** Aerospace and Defence Industries Association of Europe (Int.).

**Adians, ADIANS** Aerospace and Defence Industries Association of Nova Scotia. [1995–].

**ADIB** Air-deployable ice beacon.

**ADID** Aircraft-data interface device.

**ADIMP** Ada improvement programme (UK).

**Adints, ADINTS** Automatic depot inertial navigation test system.

**ADIR** Air-data [and] inertial-reference (see next and ADIRU).

**ADIRS** 1 ADIR system.

2 Airfield damage information and reporting system.

**ADIRU** Air-data [and] inertial reference unit.

**ADIS** 1 Airport-data information system, or source.

2 Automatic data-interchange system (FAA, from 1961).

3 ADS(5) datalink interim system (Australia).

4 Airport display information system (NAS/LATCC).

**ADIT** Automatic detection, identification and tracking (USA).

**ADITT** Aerially deployable ice-thickness transponder.

**ADIVS** Air-defense interoperability validation system.

**ADIZ** Air-defence, or defense, identification zone.

**ADJ** Adjacent.

**adjacent channel** Nearest frequency above or below that on which a radio link is working; can interfere with carrier or sidebands, but \*\* simplex minimises this.

**adjustable propeller** One whose blades can be set to a different pitch on ground, with propeller at rest.

**adjustable tailplane [horizontal stabilizer]** Surface which can be reset to different incidence only on ground.

**adjuster** Mechanical input (manual, powered or remote-control) for altering a normally fixed setting, such as engine idling speed.

**Adkem** Advanced kinetic-energy missile.

**ADL** 1 Automatic drag limiter [S adds system].

2 Arbeitsgemeinschaft Deutscher Luftfahrt-Unternehmen (G).

3 Armament datum line.

4 Authorised data list.

## ADLFP

- 5 Aeronautical data-link.  
6 Advanced distributed learning.
- ADLFP** Air-deployed low-frequency projector [Adsid].
- ADLGP** Advanced data-link for guided platforms.
- ADLP** 1 Aircraft data-link processor.  
2 Airborne data-link protocol.
- ADLS** 1 Aeronautical data-link services.  
2 Automatic drag-limiting system.
- ADLT** Advanced discriminating, or discriminatory, laser technology.
- ADLY** Arrival delay.
- ADM** 1 Air-decoy [or defense] missile (USAF).  
2 Atomic demolition munition.  
3 Airport Duty Manager.  
4 Air-data module[s].  
5 Asynchronous data modem.  
6 Advanced development, or demonstration, model.  
7 Aeronautical data management.  
8 Admiral (not UK usage).  
9 Aircraft Design Memorandum.  
10 Aeronautical decision making.
- ADMA** Aviation Distributors & Manufacturers Association [Philadelphia, PA](US).
- ADMC** Actuator drive and monitor computer.
- Ad-Me** Advanced metal evaporated.
- administrative loading** Loading transport vehicle (eg, aircraft) for best utilisation of volume or payload, ignoring tactical need or convenience.
- Admiral's barge** Aircraft assigned to Flag Officer (FAA, colloq.).
- Admit, ADMT** Air distributed mission trainer.
- admittance** In a.c. circuit, 1/Z, reciprocal of impedance, loosely 'conductivity'; made up of real and imaginary parts; symbol Y, unit siemens.
- ADMS** Airline data-management system.
- ADMU** Air-distance measuring unit.
- ADN** Ammonium dinitramide.
- ADNC** Air-defence notification centre.
- ADNL** Additional.
- ADNS** 1 Arinc data-network service.  
2 Automated digital-network system (USN).
- ADO** 1 Advanced development objective.  
2 Automatic delayed opening (parachute).  
3 Assistant Deputy for Operations.
- ADOC** Air Defence Operations Centre (UK).
- Adocs, ADOCS** 1 Advanced digital optical control system.  
2 Automated deep-operations co-ordination system (DoD, especially used by Norad).
- Adora** Analysis and definition of operational requirements for ATM(7) (Euret).
- ADP** 1 Acoustic, or air, data processor.  
2 Automatic, or airport, data processing.  
3 Air-driven pump [usually means bleed air].  
4 Engine aerodynamic design point; determined by cycle parameters.  
5 Altitude delay parameter.  
6 Aéroports de Paris.  
7 Airport development program.
- ADPA** American Defense Preparedness Association [office, Arlington, VA].
- ADPCM** Adaptive differential pulse-code modulation.
- ADPE** Automated [radar] data-processing equipment.
- ADPEO** Ashless dispersant piston-engine oil.

## Adsel, ADSEL

- ADPG** Air Defence Planning Group.
- ADPS** 1 Asars deployable processing station (USAAF).  
2 Aeronautical data-processing system [SO replaces system by Selection Office] (USAF).
- ADR** 1 Accident, or acoustic, data recorder [according to one authority, recorded].  
2 All-purpose data-stream replicator, or simplified RMCDE.  
3 Air defence region (UK).  
4 Advisory route.  
5 Airfield damage repair.  
6 Air-data reference.  
7 Active decoy round.
- Adram** Advanced dielectric radar absorbent material (Plessey).
- Adras** Aircraft data-recovery and analysis system.
- ADRC** Air defence radar controller.
- ADRD, ADR/D** Air-data reference disagree.
- ADRDE** Air Defence Research & Development Establishment (UK).
- Adrep** Accident/incident data report (ICAO).
- Adres** Aircraft documentation retrieval system.
- ADRG** Arc digital master graphics.
- ADR/Hum** Accident data recorder and health/usage monitor, installed as single integrated package with common inputs.
- Adries** Advanced digital radar imagery exploitation system, low-level target recognition.
- ADRIS** Airport Doppler weather radar information system.
- ADRS** Airfield Damage Repair Squadron (RAF).
- ADRU** Air defence radar unit.
- ADS** 1 Accessory drive system, self-contained yet integrated package.  
2 Autopilot disengage switch.  
3 Audio distribution system (Awacs).  
4 Air-data system.  
5 Automated, or automatic, dependent surveillance [-A adds address, -B adds broadcast, -C contract, -P panel, -PDLC controller/pilot data-link communications, -S system, -U unit].  
6 Aviation data server.  
7 Airborne data service[s].  
8 Aircraft, or airborne, data sensor.  
9 Air-defence ship, study or studies.  
10 Air Defense Squadron (USAF).  
11 Active dipping sonar.  
12 Acoustic detection system.  
13 Advanced deployable system[s] (USN).  
14 Automatic drilling system.  
15 Airlifter defense systems (USAF).  
16 Aufklärungsdrohnen (UAV) system (Switzerland).  
17 Area-denial submunition.  
18 Active denial system (OSD, Raytheon).  
19 Advanced detection software.  
20 Avionics display set.  
21 Aerial delivery system [paradrop kit].  
22 The address (UK usage).
- Adsam, ADSAM** Air-directed SAM (USA/USN).
- Adsams** Advanced SAM systems.
- ADSC** 1 Air-defence siting computer (UK).  
2 See ADS5.
- Adsel, ADSEL** Address Selective. Improved SSR

system in which saturation in dense traffic is avoided by interrogating each aircraft (once acquired) only once on each aerial rotation instead of about 20 times. Transponders reply only when selected by discrete address code, reducing number of replies and mutual interference and opening up space for additional information (such as rate of turn) helpful to ATC computers (see *DABS*).

**ADSI** Air-defense systems integrator (UAV).

**ADSIA** Allied Data-Systems Interoperability Agency [Brussels] (NATO).

**Adsid** Air-delivered seismic detection sensor.

**ADSK** Air-droppable, or air-dropped, survival kit.

**ADSL** Aerosuisse Dachverband der Schweizerischen Luftfahrt [aeronautical society; CH-3001 Bern] (Switzerland).

**ADSM** Air defence suppression missile.

**adsorption** Removal of molecules of gas or liquid by adhesion to solid surface; activated carbon has very large surface area and is powerful adsorber.

**ADSP** 1 Advanced digital signal processor.

2 Automatic dependent surveillance panel.

3 Aeronautical Data and Safety Service (Inmarsat).

**ADSS** 1 Aeronautical decision support system, providing instant paperless access to manuals, maps and emergency procedures.

2 Automatic dependent surveillance system.

3 Aeronautical Data and Safety Service (Inmarsat).

**ADSU** 1 Air-data sensor unit.

2 Automatic dependent surveillance unit.

**ADT** 1 Approved departure time.

2 Automatically deployable transmitter.

3 Air-data transducer.

4 Air-data [or advanced, or alphanumeric, display] terminal.

5 Automatic detection and tracking.

6 Active-denial technology.

7 Accessories drive train.

8 Ada development toolkit.

**ADT<sup>3</sup>, ADT3** Air defence tactical training theatre.

**ADTC** Armament Development Test Center (USAF, Eglin AFB).

**ADTN** Administrative data-transmission network.

**ADTS** 1 Air-defence threat simulator.

2 Approved departure times.

**ADTU** Air-data transfer unit.

**ADU** 1 Alignment display unit (INS).

2 Auxiliary display unit.

3 Avionics [or annotation] display unit.

4 Air-data unit.

5 Actuator drive unit, in digital FCS.

6 Audio distribution unit.

7 Activity display unit (ESM).

8 Air Disarmament Unit (RAF).

9 Aircraft Delivery Unit (UK).

**ADV** 1 Arbeitsgemeinschaft Deutscher Verkehrsflughafen eV [Federal German Airports Association; D-7062 Stuttgart] (G).

2 Air-defence variant.

**ADV, Adv** 1 Advise, or advisory area.

2 Advance (UK usage).

**advance** 1 To \* throttle = to open throttle, increase power.

2 In piston engine, to cause ignition spark to occur earlier in each cycle.

3 Forward movement of propeller (see *propeller pitch*).

**advance, angle of** See *propeller pitch*.

**advanced** Generalised (overworked) adjective meaning new, complicated and typifying latest technology.

**advanced aerobatics** Flight manoeuvres with no limits apart from airframe/pilot limits.

**advanced airfield, base** Base or airfield, usually with minimal facilities, in or near objective area of theatre of operations.

**Advanced aviation training device** Synthetic trainer for procedures [FAR Pts 61 and 141] and various instrument and system checks.

**advanced common flightdeck** Retrofit, initially on FedEx DC-10s, based on MD-11.

**advanced flow-control procedure** Any of six theoretical or experimental techniques for ATC in high-traffic airspace.

**advanced high-frequency material** New coatings [currently classified] for LO aircraft which eliminate the need for laborious maintenance between missions.

**advance/diameter ratio** Ratio between distance aircraft moves forward for one revolution of propeller(s), or helicopter rotor, under specified conditions, and propeller diameter. Expressed as

$$J = \frac{V}{nD}$$

where V is TAS, n rotational speed and D diameter.

**advanced stall** Stall allowed to develop fully, yet usually with some lateral control. Many definitions claim longitudinal control must remain, but nose-down rotation is invariably automatic (see *g-break, stall*).

**advanced tactial targeting** Air-to-air system using Link-16, SADL and other links from TTNT to share information about surface emitters (USAF).

**advanced trainer** Former military category, more powerful and complicated than ab initio/primary/basic trainer and capable of simulating or performing combat duties when fitted with armament.

**advance ratio** See *advance/diameter ratio*.

**advancing blade** In rotary-winged aircraft in translational flight, any blade moving forward against relative wind. Each blade advances through 180° of its travel, normally from dead-aft to dead-ahead.

**ADVCAP** Advanced capability.

**advection** Generally, transfer by horizontal motion, particularly of heat in lower atmosphere. On gross scale, carries heat from low to high latitudes.

**advection fog** Fog, generally widespread, caused by horizontal movement of humid air mass over cold (below dew point) land or sea.

**Advent** Adaptive versatile engine technology (USAF).

**adversary aircraft** Fighter specially purchased and configured to act role of enemy in dissimilar air-combat training.

**adverse rudder** Inputs rolling moment opposite to that commanded by lateral-control system.

**adverse sideslip** Sideslip resulting from kinematic coupling.

**adverse yaw** Negative yawing moment due to roll at high  $C_L$ , problem with sailplanes.

**Adviser** Airborne dual-channel variable-input severe environment recorder (RCA).

## Advisor

**Advisor** Annotated digital video for intelligent surveillance and optimised retrieval (EC aviation security).

**advisory** Formal recorded helpful message repeatedly broadcast from FAA AAS centre to all local aircraft. Abb: ADVY, ADZ, ADZY.

**advisory circular** The printed form of information for pilots (FAA).

**advisory light** Displayed by aircraft (esp. carrier-based) to show LSO status (gear, hook, wing, speed and AOA).

**advisory route** Published route served by Advisory Service, but not necessarily by ATC (1) or separation monitoring and usually without radar surveillance.

**Advisory Service** FAA facility to provide information on request to all pilots, and advice to those who need it. Abb: ADVS.

**Advon** Advanced echelon.

**ADW** 1 Area-denial weapon.  
2 Agent-defeat warhead.

**ADWC** Air Defense Weapons Center (Tyndall AFB).

**ADWES** Air-defence weapons-effects simulation, or simulator.

**ADZ** Advise (ICAO).

**AE** 1 Aviacion del Ejercito [army aviation] (Peru, etc).  
2 Augmentor ejector.  
3 Aluminium-epoxy [paint].  
4 Atmosphere, or atmospheric, explorer.  
5 Avionics environment.

**A<sub>e</sub>** Effective area of antenna aperture.

**AEA** 1 Aeronautical Engineers Association.  
2 Aircraft Electronics Association Inc [office, Independence, MO] (US).  
3 Association of European Airlines [office, B-1050 Brussels] (Int.).  
4 Aircrew equipment assembly.  
5 Aerial Experiment Association (US, 1907–09).  
6 Airborne electronic attack (V adds Variant).  
7 All-electric airplane/aeroplane.

**AEAF** Allied Expeditionary Air Force (WW2).

**AEB** 1 Avionics equipment bay.  
2 Air Efficiency Board (UK).

**AEC** 1 Atomic Energy Commission (USA, 1946–74).  
2 Automatic exposure control.  
3 Aviation Executives Club [Miami Springs, FL].

**AECB** Arms Export Control Board (UK).

**AECC** Aeromedical Evacuation Control Centre

**AéCF** Aéro Club de France [F-75116 Paris] (F).

**AECM** Active ECM.

**AECMA** Association Européenne des Constructeurs de Matériel Aérospatial (Int., in April 2004 merged into ASD5).

**AéCS** Aéro Club de Suisse.

**AECU** Audio [or advanced] electronic control unit.

**AED** 1 Alphanumeric entry device.  
2 Air Engineering Department (TAG).  
3 Automated [or automatic] external defibrillator.  
4 Algol extended for design.  
5 Aviation Environmental Divisions [1 to 4] (DETR, UK).

**AEDC** Arnold Engineering Development Center (USAF, mainly air-breathing propulsion systems, at Tullahoma, Tenn).

**AEDO** Aeronautical engineering duty officer (USN).

**AEDS** Atomic energy detection system (global, run by AFTAC).

## AER

**AEEC** 1 Airlines Electronic Engineering Committee [office, Annapolis MD21401] (US and Int.).  
2 Association of European Express Carriers.

**AEELS** Auto Elint emitter-locator system.

**AFEMA** Australian Electrical & Electronic Manufacturers Association Ltd [Canberra, ACT].

**AEF** 1 American Expeditionary Force (WW1, WW2).  
2 Air, since 2003 Air and Space, Expeditionary Force (USAF).  
3 Aerospace Education Foundation [office, Arlington, VA22209] (US).  
4 Air Experience Flight (RAF).  
5 Armament Engineering Flight (RAF).  
6 Aviation Environment Federation [London EC4V 3DT] (1975–, UK).

**AEFB** AEF (2) Battelab.

**AEFT** Auxiliary external fuel tank[s].

**Aegis** 1 Advanced engine/gearbox integrated system.  
2 CGN ship class (USN).  
3 Airborne early-warning ground-integration segment.

**AEH** Airborne emergency hospital.

**AEHF** Advanced e.h.f. (S adds satellite).

**AEHP** Atmospheric-electricity hazards protection.

**AEHS** Aircraft Engine Historial Society [Brownsboro AL35741-9998] (US).

**AEI** Associazione Elicotteristica [helicopters] Italiana [office, I-20145 Milan], (Italy).

**AeIGT** Aerospace Innovation and Growth Team, [May 2002] (UK).

**AE-I** Aircraft Engineers International (Int.).

**AEIS** Aeronautical en-route information service (ICAO).

**AEJPT** Advanced European [military] jet-pilot training (proposal).

**AEL** 1 Aeronautical Engine Laboratory [S Philadelphia], (USN).  
2 Advanced Engineering Laboratory (Australia).

**AELS** 1 Augmentor/ejector lift system.  
2 Airborne electronic-library system.

**AEM** 1 Air Efficiency Medal (UK).  
2 Automatic emergency mode.

**AEMB** Airborne electromagnetic bathymetry.

**AEMCC** Air and Expedited Motor Carriers Conference (trade association, [office, Alexandria, VA22314] (US)).

**AENA** Aeropuertos Españoles y Navegación Aérea (Spain).

**AEO** 1 Air Electronics Officer [aircrew trade], (RAF).  
2 Air Engineer Officer (USAF).  
3 All engines operating.

**AEOSOP** See *Aesop*.

**AEP** 1 Airports Economic Panel (ICAO).  
2 Autometric edge product.  
3 Alternate (ie, alternative) engine program (JSF).  
4 Audio-entertainment player.  
5 Autopilot engage panel.  
6 Architectural Evolution Plan [2007] (USAF).

**AEPDS** Advanced electronic processing and distribution system (satellite).

**AEPO** Aeronautical Enterprise Program Office (WPAFB).

**AEPT** Air engineer procedures trainer.

**AER** Area expansion ratio in wind tunnel; ratio of

cross-sections at start of diffuser to down-stream end at first bend.

**A/E/R** Ailerons, elevators, rudder.

**AERA** 1 Association pour l'Etude et la Recherche Astronautique et Cosmique (F).

2 Automated en-route ATC.

**Aerad** Commercially published but universally used flight guide and chart system (UK).

**Aerall** Association d'Etudes et de Recherches sur Aéronefs Allégés (F), since 2003 Air and Space.

**aeration** Contamination of fuel by bubbles of gas, e.g., air.

**AERC** Aviation Education Resource Center (US).

**AERE** Atomic Energy Research Establishment (UKAEA, Harwell).

**aerial** 1 Pertaining to aircraft, aviation or atmosphere.

2 Part of radio or radar system designed to radiate or intercept energy, with size and shape determined by wavelength, directionality and other variables (US = antenna).

**aerial array** Assembly of aerial elements, often identical, usually excited from same source in phase and dimensioned and positioned to radiate in pencil beam or other desired pattern (not necessarily phased-array).

**aerial common sensor** Next-generation airborne sensor for tactical reconnaissance, Imint and Sigint (USA).

**aerial delivery system** Complete system for air transport and delivery to surface recipient (usually without aircraft landing).

**aerial supervision module** Aircraft housing both air attack and leadplane pilot.

**aerial survey** Use of aerial cameras and/or other photogrammetric instruments for the making of maps, charts and plans.

**aerial swimming vehicle** A micro air vehicle with major dimensions not exceeding 150 mm (c6 in), able to cruise at c10 ms<sup>-1</sup> propelled by aft-mounted reverse-camber flapping wings. Generally synonymous with delphinopter.

**aerial work** General aviation for hire or reward other than carriage of passengers or, usually, freight; includes agricultural aviation, aerial photography, mapping and survey, cable and pipeline patrol and similar duties usually not undertaken to full-time fixed schedule.

**aerial work platform** Small railed platform for one or two occupants, mounted on vehicle by Z-type [less often scissors] elevating linkage and often providing electric or hydraulic power for occupants.

**AERO** Air Education and Recreation Organisation (UK, office Camberley).

**aero** Concerned with atmospheric flight.

**aeroacoustics** Science and technology of acoustics caused by, and effect upon, aerospace systems. A more general definition is interaction between sound and gas flow, esp. sound generated by the flow.

**aeroballistics** Science of high-speed vehicles moving through atmosphere in which both ballistics and aerodynamics must be taken into account. Often asserted aerodynamics and ballistics are applied separately to different portions of flight path, but both act as long as there is significant atmosphere present.

**Aerobatic catalogue** Derived from *Aresti*, simplified scheme for planning and scoring aerobatic routines (FAI).

**aerobatic oil system** In modern combat aircraft liable to experience prolonged zero-g, meaning is lube system with

multiple scavenge ports round all engine bearing chambers leading back to tank in which synthetic gravity is maintained by rapid rotation.

**aerobatics** Precise and largely standardised manoeuvres, unnecessary in normal flight, executed to acquire or demonstrate mastery over aircraft, for entertainment, or for competition (US = acrobatics). BS: "Evolutions voluntarily performed other than those required for normal flight", which would include a gentle 360.

**aerobic propulsion** Requiring oxygen.

**aerobiology** Study of distribution and effects of living matter suspended in atmosphere (small insects, spores, seeds and micro-organisms).

**aerobrake** 1 Aerodynamic brake for use in extremely low-density atmospheres at Mach numbers of 5 to 25. Typically can be deployed as a saucer shape, concave side facing direction of travel.

2 Deceleration by holding nose high after landing.

**Aero-C** Message and data-reporting satellite service for satcom aircraft.

**aerocapture** Technique harnessing drag of atmosphere of planet (especially Mars) to slow spacecraft to planetary orbital speed.

**Aeroclinoscope** Instrument with semaphore-like arms for indicating wind direction [and, roughly, atmospheric pressure] (obs.).

**aeroconical canopy** Form of parachute canopy suitable for use at all aerospace Mach numbers.

**aerocryptography** Representation of aerobatic manoeuvres by 2-D symbols.

**aerodone** Basic aerodyne, glider relying upon natural stability and having no moving control surfaces. Examples are paper dart and chuck glider, most simple free-flight models, and aeroplanes which continue to fly after being abandoned by their crews.

**aerodrometics** Science of gliding flight, with or without use of control surfaces.

**aerodontalgia** Toothache caused by major changes in ambient atmospheric pressure.

**aerodontia, aerodontology** Branch of dentistry dealing with problems of flying personnel.

**aerodrome** BS.185, 1940: 'A definite and limited area of ground or water (including any buildings, installations and/or equipment) intended to be used, either wholly or in part, in connexion with the arrival, departure and servicing of aircraft.' Becoming archaic (see *airfield*, *airport*, *air base*, *strip*, etc.).

**aerodrome elevation** *Airfield elevation*.

**aerodrome FIS** *Airfield FIS*.

**aerodrome traffic zone** Airspace up to 2,000 ft (609 m) a.a.l. and within 2.5 nm of centre of longest runway or 2,000 ft/609 m of boundary (general aviation). Permission req<sup>d</sup> for entry, and for manoeuvring within\*.

**aerodynamic axis** Imaginary line through aerodynamic centres of every longitudinal element in solid body moving through gaseous medium. In wing, runs basically from tip to tip, but in swept or slender delta can be an acutely curved, kinky line often having little practical application.

**aerodynamic balance** 1 Method of reducing control-surface hinge moment by providing aerodynamic surface ahead of hinge axis (see *Frise aileron*, *horn balance*). 2 Wind-tunnel balance for measurement of aerodynamic forces and moments.

**aerodynamic-balance panel** Shelf fixed to control surface ahead of the hinge axis, contained inside fixed structure.

**aerodynamic braking** 1 Use of atmospheric drag to slow re-entering spacecraft or other RV.

2 Use of airbrakes or parachute (drag chute) in passive \*\*.

3 Use of reversed propulsive thrust (propeller or jet) in active \*\*.

**aerodynamic centre** In two-dimensional wing section, point about which there is no change of moment with change in incidence; point about which resultant force appears to rotate with change of incidence. In traditional sections about one-quarter back from leading edge (25% chord) and in symmetrical section lies on chord and thus coincident with CP. Also called axis of constant moments. Abb: a.c. ac or (incorrectly) AC.

**aerodynamic chord** Reference axis from which angle of attack of two-dimensional aerofoil is measured. Line passing through (supposed sharp) trailing edge and parallel to free-stream flow at zero lift at Mach numbers appreciably below 1 (see *chord, geometric chord, MAC*).

**aerodynamic coefficient** Aerodynamic force (lift or drag, or moment) may be reduced to dimensionless coefficient by dividing by characteristic length (which must be same parameter for all similar bodies, and in a wing is invariably area) and by dynamic head (symbol  $q$ ). Traditional divisor is  $\frac{1}{2}\rho V^2 S$ , where  $\rho$  is air density,  $V$  velocity and  $S$  area, ensuring that units are consistent throughout; if area is  $m^2$  then  $V$  must be  $ms^{-1}$ . The  $\frac{1}{2}\rho V^2$  term, difference between pitot and static pressure, is accurate only at low speeds; if  $M^2$  (square of Mach number) is too large to ignore, a different expression must be found for dynamic head, such as  $H-p$  (pitot minus static). (See *force coefficients, moment coefficients, units of measurement*).

**aerodynamic damping** In flight manoeuvres rotation of aircraft (about c.g. or close to it) changes direction of relative wind to provide restoring moment which opposes control demand and arrests manoeuvre when demand is removed. As altitude increases, combination of increasing TAS (for given EAS) and reduced airflow deflection angles results in \*\* being progressively decreased, although control demand moment and aircraft inertia do not change. Thus at high altitude pilot must apply greater opposite control movements to arrest rotation.

**aerodynamic disturbance** Generalised euphemistic term in SR-71 and similar flight reports covering inlet unstalls and related phenomena.

**aerodynamic efficiency** Most common yardstick is lift/drag ratio ( $L/D$ ). In general \*\* maximised when resultant forces are as nearly as possible perpendicular to direction of motion; tend to be reduced as speed is increased, since lift-type forces may be presumed to remain substantially constant while drag-type forces may be presumed to increase in proportion to square of speed.

**aerodynamic force** Force on body moving through gaseous medium assumed to be proportional to density of medium ( $\rho$ ), square of speed ( $u^2$  or  $V^2$ ), characteristic dimension of body (such as length  $L^2$  or area  $S$ ) and  $R_n$  (Reynolds number raised to power  $n$ ). This broad relationship sometimes called Rayleigh formula. Body assumed to be wholly within homogenous gas, reasonably compact and streamlined (eg not a sheet of paper) and to have smooth surface.

**aerodynamic heating** As speed of body through gaseous medium is increased, surface temperature increases roughly in proportion to square of speed. Effect due variously to friction between adjacent molecules in boundary layer, to degradation of kinetic energy to heat and to local compression of gases. Maximum temperature is reached on surfaces perpendicular to local airflow where oncoming air or gas molecules are brought to rest on surface. At Mach 2 peak stagnation temperature is about 120°C and at Mach 3 about 315°C; at hypersonic speeds temperature can swiftly rise to 3,000 or 5,000°C in intense shockwave around nose and other stagnation points, causing severe radiation heating, ionisation and dissociation of flow. Adiabatic temperature rise is approximately given by  $\Delta T = (\frac{V}{100})^2 \text{°C}$ , where  $V$  is speed in mph; alternatively a poorer approximation is  $41 M^2$  where  $M$  is Mach number.

**aerodynamic mean chord, AMC, MAC, c** Chord that would result in same overall force coefficients as those actually measured. Essentially, but not necessarily exactly, same as mean of aerodynamic chords at each station; very nearly same as geometric mean chord.

**aerodynamic overbalance** Excessive aerodynamic balancing of control surface such that deflection will immediately promote runaway to hard-over position.

**aerodynamic pitch** The distance a propeller blade would move forward in one revolution if slip were zero, symbol  $\lambda$

**aerodynamic twist** Variation of angle of incidence from root to tip of aerodynamic surface, to obtain desired lift distribution or stalling characteristic (see *wash-in, wash-out*).

**aerodynamics** Science of interactions between gaseous media and solid surfaces between which there is relative motion. Classical \* based upon Bernoulli's theorem, concept of boundary layer and circulation. Reynolds number, Kármán vortex street, turbulent flow and stagnation point. High-speed \* ( $M^2$  too large to be ignored) assumes gas to be compressible and introduces critical Mach number, shockwave, aerodynamic heating, and relationships and concepts of Prandtl, Glauert, Ackeret, Busemann, Kármán-Tsien and Whitcomb. At Mach numbers above 4, and at heights above 80 miles (130 km), even high-speed \* must be modified or abandoned because of extreme aerodynamic heating, violent changes in pressure and large mean free path (see *superaerodynamics*).

**aerodynamic trials** Flight tests to clear a modification which changes the shape of a vehicle.

**aerodyne** Heavier-than-air craft, sustained in atmosphere by self-generated aerodynamic force, possibly including direct engine thrust, rather than natural buoyancy. Two major categories are aeroplanes (US = airplanes) and rotorplanes, latter including helicopters.

**aeroelasticity** Science of interaction between aerodynamic forces and elastic structures. \* deflections are increased by raising aerodynamic forces, varying them rapidly (as in gusts and turbulence) and increasing aspect ratio or fineness ratio. All \* effects tend to be destabilising, wasteful of energy and degrading to structure.

**aeroembolism** Release of bubbles or nitrogen into blood and other body fluids as a result of too-rapid reduction in ambient pressure. May be due to return to sea-level from much increased pressure ('caisson sickness', 'the bends')

## aeroflight mode

or from sea-level to pressure corresponding to altitude greater than 30,000 ft (about 10,000 m). Potentially fatal if original, increased, pressure is not rapidly restored.

**aeroflight mode** Atmospheric flight, by aerospace vehicle (eg, Space Shuttle).

**aerofoil (US = airfoil)** 1 Solid body designed to move through gaseous medium and obtain useful force reaction other than drag. Examples: wing, control surface, fin, turbine blade, sail, windmill blade, Flettner rotor, circular or elliptical rotor blade with supercirculation maintained by blowing. Some authorities maintain \* must be essentially 'wing-shaped' in section.

2 A specific meaning is a gas-turbine rotor blade, without root, for fusion to a ring or disc.

**aerofoil section** Traditionally, outline of section through aerofoil parallel to plane of symmetry. This must be modified to 'parallel to aircraft longitudinal axis' in variable-sweep and slew wings, and 'perpendicular to blade major axis' in blades for rotors, turbines and propellers. None of these sections may lie even approximately along direction of relative wind, although usually assumed to. Also called *profile*.

**aerofoil boat** Wing-shaped surface-effect marine craft (or low-altitude aircraft).

**aerogel** Colloid comprising solution of gaseous phase in solid phase or coagulated sol (colloidal liquid).

**aerograph** Airborne meteorological recording instrument; aerometeograph.

**Aero-H** Long-haul cockpit and pax communications, telephony (9.6 kbps), fax (4.8) and data (2.4). H + offers voice codes and better multichannel performance for oceanic use.

**Aero-I** Short-/medium-haul and corporate communications, telephony (4.8 kbps) and fax/data (2.4).

**aero-isoclinic wing** Aerofoil which, under aeroelastic distortion, maintains essentially uniform angle of incidence from tip to tip.

**Aero-J** Medium-gain satcom service for continental use.

**aerojumble** Aeronautical artefacts in jumble sale.

**Aero-L** Low-gain satcom service, two-way data exchange at 0.6 kbps.

**Aerolite** Trade name, low-density bonded sandwich structure based on phenolic-resin-bonded flax fibres (Aero Research, later CIBA).

**aerolite** Stony meteorite, richer in silicates than metals.

**aerology** Study of atmosphere (meteorology) other than lower regions strongly influenced by Earth's surface.

**aerol strut** Early oleo strut relying for energy absorption and damping upon both air and oil.

**Aero-M** Single-channel satcom service.

**aerometeograph, aerometeorograph** Airborne instrument making permanent record of several meteorological parameters such as altitude, pressure, temperature and humidity.

**aerometer** Instrument used in determining density of gases, esp. atmosphere.

**aero mission gear** Video and data communications package for helicopters.

**aeronaut** Pilot of aerostat.

**Aero Mini-M** Service for small corporate and GA, 2.4 kbps data, fax and voice.

**aeronautica** Aeronautical artefacts, esp. those in auction sale.

## aeropause

**aeronautical** Pertaining to aeronautics.

**aeronautical chart** Chart prepared and issued primarily for air navigation. Chief categories include Sectional (plotting), Regional, Radio, Flight Planning, en-route low and high altitude, SID, STAR, TMA, IAP, Great Circle and Magnetic. Most are to conformal projection (esp. Lambert's); non-aeronautical topographic features generally excluded.

**aeronautical Earth station** Satcom or navsat station in an aircraft.

**aeronautical fixed service** Network of ground radio stations.

**aeronautical fixed telecommunications, network** National teleprinter network outputting weather forecasts, airfield status and flight plans.

**aeronautical ground station** Satcom or navsat station on Earth's surface (conceivably, on ship).

**Aeronautical Information Circular** Official publication printed on white paper [admin. matters], green [maps and charts], pink [safety issues], yellow [operations and facilities] and mauve [temporary changes, esp. airspace restrictions] (UK CAA).

**Aeronautical Information Documents Unit** Produces all flight-planning documents for UK military aircrew (RAF Northolt).

**aeronautical information overprint** Overprint on military or naval map or chart for specific air navigation purposes.

**Aeronautical Information Publication** Periodically issued for all civil pilots by national aviation authorities, UK being titled A.I.Circular, see above.

**aeronautical light, beacon** Illuminated device approved as aid to air navigation.

**aeronautical mile** Nautical mile (British Admiralty standard 6,080 ft = 1.85318 km); defined as length of arc of 1° of meridian at Equator.

**aeronautical mobile service** Voice radio linking aircraft and ground stations. AMS(R) serves routes [generally means airways] while AMS(OR) serves off-route airspace.

**aeronautical multicommunications** See *multicommunications service*.

**aeronautical satellite** Satellite provided to assist aircraft by improving navigation, communications and traffic control. Abb. aerosat.

**aeronautical topographic chart/map** Chart or map designed to assist visual or radar navigation and showing features of terrain, hydrography, land use and air navigation facilities.

**aeronautics** Science of study, design, construction and operation of aircraft.

**Aéronavale** Air arm of French Navy.

**aéronef** Aircraft, any species (F).

**Aeronet** Secure closed-community information net, not linked to Internet (SITA).

**aeroneurosis** Chronic disorder of nervous origin caused by prolonged flying stress.

**aeronomy** Study of upper atmosphere of planets with especial reference to effects of radiation, such as dissociation and ionisation.

**aeropause** Vague boundary between atmosphere useful to aircraft, and space where air density is too low to provide lift, or air for air-breathing engines, or aerodynamic forces for stability and control. One definition suggests boundary is layer from "12 to 120 miles"; upper limit meaningful for hypersonic aircraft only.

**aeroplane (US = airplane)** BS.185, 1940: ‘A flying machine with plane(s) fixed in flight’. Modern definition might be ‘mechanically propelled aerodyne sustained by wings which, in any one flight regime, remain fixed’. Explicitly excludes gliders and rotorplanes, but could include MPAs, VTOLs and convertiplanes that behave as \* in translational flight.

**aeroplane effect** Error in radio DF caused by horizontal component of fixed aerial or trail angle of wire (arch.).

**Aeropp** Aeronautical message switching system.

**aeropulse** Air-breathing pulsejet.

**aeroresonator** Resonant air-breathing pulsejet.

**aeros** Aerobatics, plural of aero. (colloq.).

**aerosat** Aeronautical satellite.

**aeroservoelasticity** Study of aeroelasticity in aircraft with automatic control systems.

**aeroshell** High-drag aerodynamic-braking heatshield for returning spacecraft or planetary lander.

**aerosol** Colloid of finely divided solid or liquid dispersed in gaseous (esp. air) continuous phase. Natural examples: smokes, dustclouds, mist, fog. In commercial product active ingredient is expelled as aerosol by gaseous propellant.

**aerospace** 1 Essentially limitless continuum extending from Earth’s surface outwards through atmosphere to farthest parts of observable universe, esp. embracing attainable portions of solar system.

2 Pertaining to both aircraft and spacecraft, as in ‘aerospace technologies’.

3 Activity of creating and/or operating hardware in aerospace, as in ‘the US leads in aerospace’.

**aerospace craft** Vehicle designed to operate anywhere in aerospace, and especially both within and above atmosphere.

**aerospace data miner** Analyses fleet performance (eg of all aircraft of one type).

**aerospace forces** National combat armoury capable of flying in atmosphere or rising into space, including all satellite systems and strategic ballistic missiles.

**aerospace medicine** Study of physiological changes, disorders and problems caused by aerospace navigation. Among these are high accelerations, prolonged weightlessness, vertigo, anoxia, ionising radiation, Coriolis effects, micrometeorites, temperature control, recycling of material through human body, and possibility of developing closed ecological systems to support human life away from Earth.

**aerospace plane** Colloquial term for space vehicle which can re-enter, manoeuvre within atmosphere and land in conventional way on Earth’s surface. Generally assumed to be manned and to include some air-breathing propulsion.

**aerospace relay mirror system** Mirror [s] suspended under airship at 65,000 ft (19.8 km) to relay beam from ground-based laser to track and possibly kill objects in space (AFRL).

**aerospace warfare** Conflict within and above atmosphere.

**aerostat** Lighter-than-air craft, buoyant in atmosphere at a height at which it displaces its own mass of air. Major sub-groups are balloons and airships. In airships aerodynamic lift from hull can be significant, but not enough to invalidate classification under this heading.

**aerostatics** The mechanics of gases at rest, in mechanical equilibrium.

**aerostation** Operation of aerostat.

**aerostructure** 1 The wing [s], engine [s] and tail of a flying boat (term now rare).

2 The supporting and controlling surfaces of an aero-plane (also rare).

3 Today the term is usually synonymous with airframe.

**aerothermal flow** Slipstream past hypersonic vehicle in upper atmosphere.

**aerotermodynamic border** Region, at height around 100 miles (160 km), at which Earth atmosphere is so attenuated that even at re-entry velocity aerodynamic heating is close to zero and can be neglected, as also can drag.

**aerotermodynamic duct** Athodyd, early name for ramjet. Aerothermodynamic in this context does not necessarily conform to definition given below.

**aerothermodynamics** Study of aerodynamic phenomena at velocities high enough for thermodynamic properties of constituent gases to become important.

**aerothermoelasticity** Study of structures subject to aerodynamic forces and elevated temperatures due to aerodynamic heating.

**aerotitis** Pain in the ear caused by pressure difference.

**aero-tow** Tow provided for glider by powered aircraft. Not normally applicable to banner or other towing.

**Aeroweb** Trade name, range of structural and noise-attenuating bonded honeycomb sandwich materials.

**Aerozine** Trade name, family of liquid fuels based on MMH or UDMH.

**AES** 1 Aeromedical evacuation system (USAF, MAC).

2 Auger electron spectroscopy.

3 Air Electronics School.

4 Aircraft (or aeronautical) Earth station (satellites).

5 Air EuroSafe, dedicated non-profit.

6 Armament Experimental Station (RFC).

7 Aerodrome emergency service.

8 Atmospheric Environmental Service (Canada).

9 Airborne emitter system.

10 Advanced encryption standard.

**AESA** Active electronically scanned, or scanning, array/antenna/aperture.

**AESC** Aft equipment service centre (on aircraft).

**Aescon** Aerospace and Electronics Systems Conference (Int.).

**AESF** Avionics electrical systems flight (RAF).

**AESI** Association of European Space Industries [merged April 2004 into ASD5].

**Aesop** 1 Automated engineering and scientific optimisation program (multivariable design tool).

2 Airborne electro-optical special-operations payload.

**AESS** 1 Airborne electronic-surveillance system.

2 Aircraft-environment surveillance system (radar, TCAS, EGPWS).

3 Aerospace and Electronic Systems Soc. [office, New York, NY].

**AESU** Aerospace Executive Staff Union (Singapore).

**AET** 1 Airfields Environmental Trust (UK).

2 Aerosol explosive thermobaric.

**AETA** Association des Anciens Elèves de l’Ecole d’Enseignement Technique de l’Armée de l’Air (F).

**AETB** Alumina-enhanced thermal barrier.

## AETC

**AETC** Air Education & Training Command (USAF, Randolph AFB, established 1 July 1993).

**AETE** Aerospace Engineering and Test Establishment (Cold Lake, Alberta).

**AETG** Aircraft Environment Task Group [2004–] (Balpa).

**AETMS** Airborne electronic terrain mapping system (3-D colour-coded in real time, plan or elevation).

**AETW** AET (2) washed.

**AEU** 1 Airborne, or antenna, electronics unit.  
2 Auxiliary equipment unit.

**AEW** 1 Airborne early warning.  
2 Air [or airborne] electronic warfare.  
3 Air Expeditionary Wing (USAF).  
4 Aircraft empty weight.

**AEWC, AEW&C, AEW + C** Airborne early warning and control.

**AEIEW** Airborne early warning and electronic warfare.

**AEWF** Airborne Early-Warning Force (NATO).

**AEWS** Airborne electronic-warfare system; hence AEWS<sup>2</sup> means system of systems.

**AEWTF** Aircrew Electronic-Warfare Tactics Facility (NATO).

**AF, a.f.** 1 Audio frequency, sounds audible to average human ear (20 to 16,000 Hz). In simple radio communications RF carrier is modulated so that it “carries” AF superimposed upon basic waveform.  
2 Aerodynamic force.  
3 Auto-flight.  
4 Airway facilities.

**a/f** 1 Airfield.  
2 Airframe.

**AF<sup>3</sup>** Anti-fire fighting foam.

**AFA** 1 Air Force Association [office, Arlington, VA 22209–1198 (US)].  
2 Air Force Act (UK).  
3 Aircraft Finance Association [office, Washington DC] (US).  
4 Association of Flight Attendants [office, Washington DC 20005–4006] (US).  
5 Audio-frequency amplifier.  
6 Air Force Academy [Colorado Springs, Est. 1 April 1954] (USAF).  
7 Air Freight Association [Washington DC] (US).  
8 Academia de Força Aérea (Brazil).

**AFAA** 1 Air Force Audit Agency (1 July 1948, Norton AFB, later Washington DC).  
2 Airline Flight Attendants’ Assoc., Buellton CA.

**AFAC** Airborne forward air controller.

**AFADS** Air Force Air Demonstration Squadron (USAF Thunderbirds).

**AFAES** Aviation facilities and aircraft engineering support (MoD, UK).

**AFAF** Australian Federation of Airfreight Forwarders [office Sydney].

**AFAFC** Air Force Accounting and Finance Center (Lowry AFB).

**AFAITC** Armed Forces Air Intelligence Training Center (Denver).

**AFAL** Air Force Armament Laboratory ( Eglin AFB).

**AFALC** Air Force Acquisition Logistics Center (Wright-Patterson AFB).

**AFAMC** See *AMC(5)*.

## AFCI

**AFAMRL** See *AAMRL*.

**AFAP** Australian Federation of Air Pilots [office South Melbourne, Vic. 3205] (Australia).

**AFAPD** Air Force application[s] program, or protocol, development.

**Afarmade** Asociación Española de Fabricantes de Armamento y Material de Defensa y Seguridad [E-28006 Madrid] (Spain).

**AFARPS** See *ARPS*.

**AFAS** Aircraft in the future air-traffic management system.

**AFASD** Air Force Aeronautical Systems Division, formerly part of AFSC, HQ Wright-Patterson AFB, now Aeronautical Systems Center.

**AFATC** Air Force Air Transport Command (1942–47).

**AFATL** See *AFAL*, Taded Testing.

**AFAvL** Air Force Avionics Laboratory, now Wright Laboratory (Wright-Patterson AFB).

**AFB** 1 Air Force Base (USAF).  
2 Air Force Board (RAF).

**AFBCA** Air Force Base Conversion Agency (Arlington, Va, established 15 November 1991).

**AFBMD** Air Force Ballistic Missile Division, became BMO.

**AFC** 1 Air Force Cross (decoration).  
2 Aircraft flyaway cost.  
3 Aramid-fibre composite.  
4 Automatic-feedback control, for interlocking coherent systems.  
5 Audio, or automatic, frequency control, or compensation.  
6 After [1973] fuel crisis.  
7 Aeronautical Frequency Committee (office Annapolis, MD).  
8 Automatic flare control.

**AFCAA** 1 Air Force Cost Analysis Agency (Arlington, Va, established 1 August 1992).  
2 Air Force Computer Acquisition Center (Hanscom AFB, part of AFCC).

**AFCAC** African Civil Aviation Commission (Int., established 1969).

**Afcap** Air Force contract augmentation program.

**AFCAS, Afcas** Automatic flight control augmentation system.

**AFCC** 1 Air Force Communications Command (HQ Scott AFB, formed from AFCS 15 November 1979, became AFC<sup>4</sup>A 28 May 1993).  
2 Office of the Chief of Staff (USAF).

**AFCCCCA** See *AFC<sup>4</sup>A*.

**AFCE** Automatic flight control equipment, linked Norden bombsight to autopilot.

**AFCEA** Armed Forces Communications & Electronics Association, [office, Fairfax, VA 22033–3899]; [European office, Brussels B-1140] (US, Int.).

**AFCEE** Air Force Center for Environmental Excellence (Brooks AFB, established 23 July 1991).

**Afcen, AFCENT** Allied Forces, Central Europe (Brunssum, Netherlands).

**AFCESA** Air Force Civil Engineer Support Agency (Tyndall AFB, established 1 August 1991).

**AFC<sup>4</sup>A** Air Force Command, Control, Communications and Computer Agency (Scott AFB, established 28 May 1993).

**AFCI** Arc-fault circuit interruption.

**AFCLC** Air Force Contract Law Center (Wright-Patterson AFB).

**AFCMC** Air Force Contract Maintenance Center (Wright-Patterson AFB).

**AFCMD** Air Force Contract Management Division (Kirtland AFB, was part of AFSC).

**AFCMR** Air Force Court of Military Review.

**AFCO** Armed Forces Careers Office (UK).

**Afcoms, AFCOMS** Air Force Commissary Service, became Defense Commissary Agency (Kelly AFB).

**AFCP** Advanced flow-control procedure (ATC).

**AFCPMC** Air Force Civilian Personnel Management Center (Randolph AB).

**AFCRL** Air Force Cambridge Research Laboratoriesm became part of ESC.

**AFCS** 1 Automatic flight-control system.  
2 Air Force Communications Service, became AFCC, then part of AFC<sup>4</sup>A.  
3 Active-facility control system.

**AFCWC** Air Force Combat Weather Center (Hurlbeir Field, FL).

**AFD** 1 Air Force Department (UK, MoD).  
2 Adaptive flight display.  
3 Advanced flight deck.  
4 Autopilot flight director.

**A/FD** Airport/facility directory (US).

**AFDA** Association of Finnish Defence and Aerospace industries (1994–).

**AFDAS** Aircraft fatigue-data analysis system.

**AFDC** 1 Autopilot flight-director computer; S adds system.  
2 Automatic formation drone control (USN).  
3 Air Force Doctrine Center (Langley AFB, Va, established 21 July 1993).

**AFDK** After dark.

**AFDMR** Director of Military Requirements (USAAF).

**AFDPS** Automated flight-processing system.

**AFDS** 1 Autopilot [and] flight-director system.  
2 Air Fighting Development Squadron (RAF, WW2).  
3 Advanced flight-deck simulator.  
4 Autonomous flight, or freeflight, dispenser system.

**AFDTc** Air Force Development Test Center (Eglin AFB).

**AFDX** 1 Audio-frequency digital bus [Ethernet].  
2 Avionics full duplex, or fast-switched, Ethernet.

**AFEC** Air Force Experimentation Center [2004–, Ottawa], (Canada).

**AFEE** Airborne Forces Experimental Establishment (UK, June 1942 Sherburn-in-Elmet, January 1945 Beaulieu Heath, to September 1950).

**AEFI** Association for Enterprise Investigation (US).

**AFEP** Air Force education plan (USAF).

**AFEPS, Afeps** Acars front-end processing system.

**AFESA** Air Force Engineering and Services Agency (USAF).

**AEFWC** Air Force Electronic Warfare Center (USAF).

**AEWES** Air Force electronic-warfare evaluation simulator.

**AFFA** Department of Agriculture, Fisheries and Forestry – Australia.

**AFFAA** Air Freight Forwarders Association of America [office, Washington, DC].

**AFFDL** Air Force Flight Dynamics Laboratory (USAF, at AFWAL).

**AFF** 1 Autonomous formation flight.  
2 Airmet fax forecast.  
3 Automatic, or automated, flight following.

**AFFF, AF<sup>3</sup>** Aqueous film-forming foam.

**affinity group** Collection of people having a common interest, that interest often being solely an \*\* charter, at an attractive fare.

**affirmative** R/T response meaning ‘yes’ [replaced by a firm].

**Afford** Aetermate [i.e., alternative] fuel facility for research and development [Ottawa] (Canada).

**affordable moving surface target engagement** Fuses multiple GMTI and SAR to give accurate direction to inexpensive air/ground munitions.

**AFFS** 1 Airborne firefighting system [replaces Maffs].  
2 Aircraft flight-following system [satellite].

**AFFSA** Air Force Flight Standards Agency (Andrews AFB, established 1 October 1991).

**AFFAA** Air Freight Forwarder Association of America (office, Wash. DC).

**AFFMA** Air Force Frequency Management Agency (Arlington, Va, established 1 October 1991 by renaming AFFM Center).

**AFFSCE** Air Forces Flight Safety Committee, Europe (Int.).

**AFFTC** Air Force Flight Test Center (Edwards AFB from 1948).

**AFG** 1 Aerospace focus group.  
2 Airfoil group (LGB).  
3 Arbitrary-function generator.

**AFGE** American Federation of Government Employees.

**AFGL** Air Force Geophysics Laboratory (Hanscom AFB).

**AFGS** Autonomous flight-guidance system.

**AFGWC** Air Force Global Weather Central.

**AFH** 1 Above field height.  
2 Airframe flight hours.  
3 Advanced fibre heater.

**AFHF** Air Force Historical Foundation [Andrews AFB, MD20331–7002] (US).

**AFHRA** Air Force Historical Research Agency (at AFHR Center, Maxwell AFB, established 12 September 1949).

**AFHSO** Air Force History Support Office (Bolling AFB, Washington DC, established 30 September 1994).

**AFI** 1 Assistant flying instructor.  
2 Authorised Flying Instructor, proposed by FAA 1995 to succeed CFI(2).  
3 Authority format identifier.  
4 Africa/Indian Ocean region.

**AFIA** 1 Air Force Inspection Agency (Kirtland AFB, established 1 August 1991).  
2 Aerial Firefighting Industry Association (US).

**AFIC** AFI(1) course.

**AFIF** Australian Federation of International Forwarders [NSW 2035] (Australia).

**AFIG** Aviation Fuels International Group [part of AFTC] (Dubai).

**AFIL** Air-filed [after takeoff] flight plan.

**AFIO** Association of Former Intelligence Officers (US).

**AFIRMS** Air Force integrated readiness measurement system.

**AFIS** 1 Airfield/aerodrome/airport automatic flight-information service; O adds officer.

2 Air Force Intelligence Service (Washington DC).

3 Airborne, or airline, flight-information system [= VHF datalink].

4 Automated fingerprint identification system.

5 Airline inFlight Information System.

**AFISC** Air Force Inspection and Safety Center (Norton AFB).

**AFISDO** Air Force Information Systems Doctrine Office (Keesler AFB).

**AFISQ** AFIS(1) officer.

**AFIT** Air Force Institute of Technology (Wright-Patterson AFB, administered by AU, Maxwell).

**AFITAE** Association Française des Ingénieurs et Techniciens de l'Aéronautique et de l'Espace (F).

**AFIWC** Air Force Information Warfare Center.

**Afk** Aramid-fibre composite (G), also called **Sfk**.

**AFL, afl** Above field level.

**AFLC** Air Force Logistics Command (Wright-Patterson AFB).

**AFL-CIO** American Federation of Labor, Congress of Industrial Organizations.

**AFLM** Air Force Logistics Management Center (AU, Gunter Annex).

**AFLMA** Air Force Logistics Management Agency (Maxwell AFB, established 30 September 1975).

**AFLO** Airborne force liaison officer, stationed at departure airfield.

**AFLSA** Air Force Legal Services Agency (Bolling AFB, established 1 September 1991).

**AFLSC** Air Force Legal Services Center (Washington DC, became LSA).

**AFM** 1 Air Force Medal (RAF and Commonwealth air forces).

2 Air Force Manual (USAF).

3 Aircraft/airplane/approved flight manual.

4 Atomic-force microscopy.

5 Airfield friction meter.

6 Affirmative.

7 Aircraft fleet management.

8 Note, USAF Museum is The Air Force Museum (TAFM).

**AFMA** 1 Armed Forces Management Association (US).

2 Anti-fuel-misting additive.

**AFMC** 1 Aluminium-filled metal ceramic.

2 Air Force Materiel Command (Wright-Patterson AFB, activated 1 July 1992).

3 Auxiliary fuel-management computer.

4 Avionics flight-management computer.

**AFMF** The AF Museum Foundation Inc (WPAFB).

**AFMEA** Air Force Management Engineering Agency (Randolph AFB, established 1 November 1975).

**AFML** Air Force Materials Laboratory.

**AFMOA** Air Force Medical Operations Agency (Bolling AFB, established 1 July 1992).

**AFMPC** Air Force Military Personnel Center (Randolph AFB, TX).

**AFMS** 1 Automatic, or advanced, flight-management system.

2 Auxiliary fuel-management system.

**AFMSA** Air Force Medical Support Agency (Brooks AFB, established 1 July 1992).

**AFMSS** Air Force mission-support system (aircraft, UAVs, guided munitions, many armed forces worldwide).

**AFMSTT** Air Force Modeling and Simulation Training Toolkit.

**AFN** ATS(1) facilities notification.

**AFNA** Air Force News Agency (Kelly AFB, established 1 June 1978).

**Afnor** Association Française de Normalisation [standardization] (F).

**Afnorth** Allied Forces Northern Europe.

**Afnorthwest** Allied Forces NW Europe (High Wycombe, UK).

**AFNWP** Air Force nuclear-weapons surety plan.

**AFO** 1 Aerodrome/airport fire officer.

2 Announcement of [space] flight opportunities.

**AFOAR** Air Force Office of Aerospace Research.

**A-FOD tyre** Tyre designed to avoid picking up material causing FOD.

**AFOG** Air Force Operations Group (Washington DC, established 26 July 1977).

**AFOLTS** Automatic fire overheat logic test system.

**AFOMS** Air Force Office of Medical Support (Brooks AFB).

**AFOR** Aviation forecast, a visual flight (GA) weather service (Europe, not UK).

**AFOSI** Air Force Office of Special Investigations (Bolling AFB, established 1 August 1948).

**AFOSP** Air Force Office of Security Police (Kirtland AFB).

**AFOTC** Air Force Operational Test Center [Elgin AFB] (USAF).

**AFOSR** Air Force Office of Scientific Research (Bolling AFB).

**AFOTEC** Air Force Operational Test and Evaluation Center (Kirtland AFB, three [previously five] detachments, established 1 January 1974).

**AFOVRN** Air Force over-run, standard 1,000 ft of approach lights (USAF).

**AFP** 1 Alternative flight plan.

2 Air Force Publication.

3 Acceleration along flight path.

4 Area forecast panel.

**AFPA** Automatic flight-plan association (an electronic system).

**AFPC** 1 Air Force Personnel Center (Randolph AFB, established 1 October 1995).

2 Advanced Fighter Pilot Course.

**AFPCA** Air Force Pentagon Communications Agency (Washington DC, established 1 October 1984).

**AFP costs** All flight personnel.

**AFPEO** Air Force Program Executive Office (Washington DC, established 1 November 1990).

**AFPM** Association Française des Pilotes de Montagne.

**AFPOA** Air Force Personnel Operations Agency (Washington DC, established 15 August 1993).

**AFPRB** Armed Forces Pay Review Body (UK).

**AFPRO** Air Force Plant Representatives Office.

**AFPSS** Airborne-force protection surveillance system (USAF).

**AFP turn** After passing fix.

**AFQ** Association Française des Qualiticiens.

**AFQI** Air Force Quality Institute (Air University, Maxwell).

**AFR** 1 Air:fuel ratio.

## AFRA

## aftercooling

- 2 Air Force Regulation (USAF).  
3 AF Reserve is called Afres.  
4 AESA-fed reflector.
- AFRA** 1 Active front-end receiver assembly.  
2 Aircraft Fleet Recycling Association (US + European countries).
- AFRAA** African Airlines Association (Int.).  
**AfrATC** African Air Traffic Conference (Int.).  
**AFRBA** Air Force Review Boards Agency (Andrews AFB, established 1 June 1980).  
**AFRC** Air Force Reserve Command: (U adds Unit).  
**AFRCC** Air Force Rescue Co-ordination Center.  
**AFRCU** Air/fuel ratio control unit.  
**AFREA** Air Force Real-Estate Agency (Bolling AFB, established 1 August 1991).  
**Afres, AFRES** Air Force Reserve (Robins AFB, established 14 April 1948).  
**AFRFW** Air Force Research Flying Wing[s].  
**AFRL** Air Force Research Laboratory.  
**AFROC** Air Force Requirements Oversight Council.  
**AFROTC** Air Force Reserve Officers Training Corps.  
**AFRP** Aramid-fibre reinforced plastic[s].  
**AFRPL** Air Force Rocket Propulsion Laboratory (Edwards AFB).  
**AFRS** Auxiliary flight-reference system.  
**AFRSI** Advanced flexible reusable surface insulation (Shuttle).  
**AF/RTL** Auto-flight rudder-travel limit.  
**AFS** 1 Aeronautical fixed service (ICAO).  
2 Auxiliary Fire Service (UK, WW2).  
3 Aerodrome/airport/airfield fire service.  
4 Air Force Station, or specialty (USAF).  
5 Advanced Flying School (RAF).  
6 Automatic, or automated, flight system (ie, AFCS[1]).  
7 Automatic frequency selection.  
8 Air Facilities Service (FAA to 1962).  
9 Airborne file server.  
10 Aviation Flight Standards (FAA division).  
**AFSA** Air Force Services Agency (San Antonio, TX, established 5 February 1991).  
**AFSAA** Air Force Studies and Analyses Agency (Washington DC, established February 1991).  
**AFSAC** Air Force Security Assistance Center (Wright-Patterson AFB).  
**Afsarc** Air Force Systems Acquisition Review Council.  
**AFSAT** See AFSATS.  
**Afsat** Association Française des Sociétés d'Assurance Transports [aerospace insurance; office, F-75082 Paris (F)].  
**Afsatcom** Air Force satellite communications.  
**AFSATS** Air Force Security Assistance Training Squadron (AETC, Randolph AFB).  
**AFSC** 1 Air Force Systems Command (ARDC retitled 1 April 1961; inactivated 1 July 1992 on formation of AFMC).  
2 Air Force Safety Center (Kirtland AFB, AF Safety Agency renamed 1 January 1996).  
3 Air Force specialty code.  
4 Aggregate friction surface coat (runway).  
5 See *AFSPC*.
- AFSCF** Air Force Satellite Control Facility (global network).
- AFSCO** Air Force Security Clearance Office (Washington DC).  
**AFSD** 1 Air Force Space Division, usually called SD, formed as unit of AFSC 1960, incorporated into AFSPC 1982.  
2 Airframe, or aircraft, full-scale development.  
**AFSE** Avionics fast-switched Ethernet.  
**Afsinc, AFSINC** Air Force Service Information and News Center (Kelly AFB).  
**AFSK** Audio frequency-shift keying.  
**AFSOC** Air Force Special Operations Command, (Hurlburt Field, Fla., established 22 May 1990).  
**Afsouth, AF SOUTH** Allied Forces, Southern Europe (Naples).  
**AFSPA** Air Force Security Police Agency (Kirtland AFB, established February 1991).  
**AFSPC** Air Force Space Command (Peterson AFB, established 1 September 1992).  
**AFSS** 1 Association Française des Salons Spécialisés.  
2 Active flutter-suppression system.  
3 Advanced fire-support system.  
4 Air Force Security Service.  
5 Automated flight service station.  
**AFSTC** Air Force Space Technology Center (Kirtland AFB).  
**AFT** 1 Advanced flying training.  
2 Airframe fatigue test.  
3 Aft-fuselage trainer.  
**AFTA** 1 Avionics fault-tree analyser.  
2 Advanced fuels testing [and] analysis.  
**Aftac, AFTAC** Air Force Technical Applications Center (Patrick AFB, established 1 May 1960).  
**AFTC** Arabian Fuels Technology Centre [especially concerned with aviation] (Dubai).  
**ATFENC** Air Force tactical exploitation of national capabilities.  
**afterbody** 1 Rear part of body, esp of transonic supersonic or hypersonic atmospheric vehicle.  
2 Portion of flying-boat hull or seaplane float aft of step, immersed at rest or taxiing.  
**afterbody angle** In side elevation, acute angle between keel of *afterbody* (2) and (a) undisturbed water line or (b) longitudinal axis.  
**afterburn** Undesired, irregular combustion of residual propellant in rocket engine after cut-off.  
**afterburner** Jetpipe equipped for afterburning; in the case of a turbofan, reheat in the core flow only, see *augmentor*.  
**afterburning** Injection and combustion of additional fuel in specially designed jetpipe (afterburner) of turbojet to provide augmented thrust. Fuel, usually same as in engine, burns swiftly in remaining free oxygen in hot exhaust gas. Downstream of turbine, combustion can reach temperature limited only by radiant heat flux on afterburner wall and rate at which fuel can be completely burned before leaving nozzle. Nozzle must be opened out in area, with con-di profile to give efficiently expanded supersonic jet. Can be applied esp. effectively to turbofan or leaky turbojet, with greater proportion of available oxygen downstream of turbine. Very effective in supersonic flight, but less efficient at low speeds and very noisy (UK = reheat).  
**afterchine** Rear chine along afterbody (2).  
**aftercooling** Cooling of gas after compression, esp. of air

## after-flight inspection

or mixture before admission to cylinders of highly blown PE designed for operation at high altitudes.

**after-flight inspection** Post-flight inspection.

**afterglow** 1 Persistence of luminosity from CRT screen, gas-discharge tube or other luminescent device after excitation removed (of importance in design of many radar displays).

2 Pale glow sometimes seen high in western sky well after sunset due to scattering of sunlight by fine dust in upper atmosphere.

3 Transient decay of plasma after switching off EM input power.

**Afterm** AFTN terminal.

**aft-fan engine** Turbofan in which the fan is a free-running assembly behind the core, driven by a turbine linked only by the gas flow.

**aft flap** Auxiliary curved flap mounted behind USB (Coanda) flap to complete turning of USB flow to beyond 90°.

**aft flight deck** Rear area of aircraft flight-deck floor where this is at upper level above main floor. Not necessarily occupied by aircrew.

**AF<sup>3</sup>, AF3** See *AFFF*.

**AFTI** 1 Advanced fighter technology integration.

2 Auxiliary fuel-tank integration.

**AFTIL** Airways Facilities Tower Integration Laboratory (FAA).

**aft limit of CG** Rearmost position of CG permitted in flight manual, pilot's notes, certification documentation or other authority. That at which stability in yaw and/or pitch, and static and manoeuvre margins, are still sufficiently good for average pilot to handle most adverse combination of circumstances in safety. CCV concept is leading to revolution in which much reduced, or negative, natural stability is held in check by AFCS.

**aft-loaded wing** Supercritical wing, in which centre of pressure is exceptionally far aft because of lift generated by cambered trailing edge.

**AFTN** Aeronautical Fixed Telecommunications Network (Int. from 1970).

**AFTNS** Aircraft flight-track and noise system, displays 3-D position and noise of all aircraft near airport.

**AFTO** Air Force Technical Order (USAAF, USAF).

**AFTRCC** Aerospace Flight-Text Radio Co-ordination Council.

**AFTS** 1 Advanced Flying Training School.

2 Air/fuel test switch.

3 Aerobatics Flight Training School (Compton Abbas, UK).

**aft wing** In oblique-(slew-)wing aeroplane, wing pointing rearward.

**AFU** Advanced Flying Unit.

**AFUC** Average flyaway unit cost [see unit cost].

**Afuta** Association Française des Usagers du Transport Aérien (Paris).

**AFV** 1 Armoured fighting vehicle.

2 Automatic flyback vehicle.

**AFVA** Association Française de la Voltige Aérienne.

**AFW** Active flexible wing.

**AFWA** Air Force Weather Agency (Offutt AFB, Nebraska).

**AFWAL** Air Force Wright Aeronautical Laboratory.

**AFWC** Air Force Wargaming Center (established 1986 at Maxwell AFB).

## Agent Defeat

**AFWL** Air Force Weapons Laboratory.

**AFWR** Atlantic Fleet Weapons Range.

**AFWWS** Air Force Weather Weapon System.

**AG** 1 Air gunner.

2 Availability guarantee.

3 Assault glider (US, WW2).

4 Reconnaissance Wing (G).

5 Antenna group.

6 Adjutant-General (USA).

7 Arrester gear.

**A/G** Air-to-ground.

**Ag** Minimum resolvable area within patch illuminated by radar.

**AGA** 1 Airfields, ground aids and routes, main output of AIP(1).

2 Air/ground/air communications.

**AGACS** Automatic ground-to-air communication system [= data-link], not yet achieved.

**Agard, AGARD** Advisory Group for Aerospace (formerly Aeronautical) Research and Development (NATO).

**AGAQ** Association des Gens de l'Air du Québec.

**Agars** Advanced general-aviation research simulator (at CAI [1]).

**AGAS** Affordable guided airdrop system.

**Agate** Advanced general-aviation transport experiments (NASA/industry).

**Agatha** Air/ground anti-jam transmission from helicopter or aeroplane (F).

**AGATMS** Action Group for Air Traffic Management Safety (Europe).

**AGB** Accessory gearbox.

**AGBR** Affordable ground-based radar.

**AGC** 1 Automatic gain control, property of radio receiver designed to vary gain inversely with input signal strength to hold approximately constant output.

2 Affinity-group charter.

3 Adaptive gate centroid (radar tracking algorithms).

4 Active generalised control, digital protected FBW system of Rafale.

5 Active geometry [or geometric] control.

**AGCAS** Automatic ground collision-avoidance system.

**AGCS** 1 Advanced guidance and control system[s].

2 Air/ground communication system.

**AGCU** APU(1) generator control unit.

**AGD** 1 Axial-gear differential.

2 Air generator drive (ie, windmill).

**AGDA** Air-sport association (Guatemala).

**AGE** 1 Aerospace ground equipment (military inventory category).

2 Auxiliary ground equipment (Sigit).

3 Automated ground equipment (space).

**A-gear** Arrester gear.

**age-hardening** Many metal alloys, especially high-strength aluminium alloys, need time to harden after heat treatment, usually in order that partial precipitation may take place; preferably accomplished at room temperature or chosen higher value.

**ageing (US = aging)** Time-dependent changes in microstructure of metal alloys after heat treatment. Some merely relieve internal stress but most improve mechanical properties.

**Agent Defeat** Programme to create an air-delivered

weapon able to destroy chemical and biological agents without causing their dispersal (DoD).

**AGEPL** Association Général des Elèves Pilotes de Ligne (F).

**AGES** Air/ground engagement system [also AGES II]; (AD adds air defense).

**AGETS, Agets** Automated ground engine-test system.

**AGFS** Aviation gridded forecast system (demo 1995).

**AGI** 1 Advanced [or, post 1995, authorized] ground instructor (FAA).

2 ADNS/GDSS interface.

**Agiflite camera** Hand-held, for photographing surface targets, especially ships (RAF).

**AGIFORS, Agifors** Airline Group, International Federation of Operational Research Societies [Int., offices, Frankfurt-am-Main, G, and Harmondsworth, UK].

**AGIL** Airborne general illumination light.

**Agile** 1 Aircraft ground-induced loads excitation (simulates rough runways).

2 Airborne gyrostabilized IR light equipment.

3 Advanced garment integrated life-support ensemble.

**agile manufacturing** Rapid response to fluctuation in demand.

**Agility** Agile information transfer ability, active Satcom antennas.

**agility** 1 Loosely, manoeuvrability, esp. of air-combat fighter.

2 In particular, ability of fighter to change state quickly, to fly different mission.

**AGIMS** Air/ground information-management system.

**AGINT, Agint** Advanced GPS inertial-navigation technology.

**AGIS** Air/ground intermediate system.

**AGL, agl** 1 Above ground level.

2 Airborne gun-laying (radar).

3 Airfield ground lighting.

4 Automatic grenade launcher.

5 Arbeitsgemeinschaft Luftwaffe [D-31675 Bückeburg] (G).

**AGLT** Airborne, or aircraft, gun-laying turret.

**AGM** 1 Air-to-ground guided missile (inventory category, USAF, USN).

2 Missile range instrumentation ship (US code).

**AGMA** American Gear Manufacturers' Association (US).

**AGMC** Aerospace Guidance and Metrology Center (AFSC).

**AGN** Again.

**AGNA** Advisory Group of National Authorities (EASA).

**Agnis** Azimuth guidance for nose-in stands; also rendered as approach guidance nose-in to stand or aircraft guidance nose-in system.

**AGO** 1 Air-to-ground operator [also ago].

2 Andes Geophysical Observatory, Santiago.

**agonic line** Line joining all points on Earth's surface having zero magnetic variation. Two \*\* exist, one sweeping in curve through Europe, Asia and W Pacific and other roughly N-S through Americas.

**AGOS** Department of aviation, seaplanes and experimental construction (USSR).

**Agpanz** Agricultural Pilots' Association of New Zealand.

**agplane** Agricultural aircraft (colloq).

**AGPO** Angle gate pull-off (radar).

**AGPPE** Advanced general-purpose processor element, a USAF common module.

**AGR** Air/ground router.

**Agra** Automatic-gain ranging amplifier.

**agravie** Hypothetical environment without gravitational field. Unrelated to weightless free-fall in gravitational field, or to possible points where net gravitational field of all mass in universe is zero.

**agravie illusion** Apparent movement of human visual field in weightless flight due to minute displacements of structure in inner ear.

**AGREE** Advisory Group on Reliability of Electronic Equipment (DoD/NATO).

**AGRI** Air/ground radar imaging.

**agricultural** Colloq., of hardware, essentially primitive and crude, but not necessarily ineffective or obsolescent.

**agricultural aircraft** Aircraft designed or converted for agricultural aviation.

**agricultural aviation** Branch of general aviation concerned with agriculture, specif. crop spraying, dusting, top dressing, seeding, disease inspection and, apart from transport, work with livestock.

**AGRMS** Air/ground router management system.

**AGRRM** Air/ground router regional manager.

**AGS** 1 Airborne ground, or air-to-ground, surveillance.

2 Aeronautical ground station (satcom).

3 Aircraft Generation Squadron (POMO).

4 Air Gunnery School.

5 Aircraft General Stores (spare parts).

6 Alliance [airborne radar] ground surveillance (NATO).

**AGSS** 1 Aerial gunner and scanner simulator.

2 Acars ground-system standard (AECAC).

**A/G Stn** Air/ground station.

**AGTA** Airline Ground Transportation Association Inc. (US).

**AGTC** Airport ground-traffic control.

**AGTFT** Anti-jam GPS technology flight test.

**AGTS** 1 Automated guideway transit system (airport terminal).

2 Air [or aerial] gunnery target system.

3 Air/ground test station.

**AGTY** Frequency agility.

**AGU** 1 American Geophysical Union [Washington DC20009] (US).

2 Airlink gateway unit (satcoms).

3 Airborne guidance unit (UAV).

**AGV** 1 Automated guided vehicle, part of most FMS (6); S adds system.

2 Avion à grande vitesse [= hypersonic] (F).

**AGWCP** Advanced guided-weapon control panel.

**AGZ** Actual ground zero.

**Ag-Zn, Ag/Zn** Silver/zinc electrical storage battery.

**AH** 1 Artificial horizon.

2 Or  $A_H$ , attitude hold.

**Ah, A-h** Ampere-hour.

**AHA** Aviation and hazard analysis.

**AHAFA** Association of Hong Kong Air Freight Agents (Kowloon).

**AHARS** Airborne heading/altitude reference system.

**AHB** Attack Helicopter Battalion (USA).

**AHC** 1 Assault Helicopter Company (USA).

- 2** Attitude/heading computer.
- AHD** Ahead.
- AHE** Aerospace Hardware Exchange.
- Ahead** *1* Attitude, heading and rate of turn indicating system.
- 2* Advanced hit efficiency and destruction, programmable gun submunition.
- AHF** Aircooled, heavy fuel.
- AHFM** Alternate [ie, alternative] or advanced h.f. material [Northrop Grumman].
- AHI** Aviation Health Institute (UK).
- AHIP** Army helicopter improvement program (USA).
- AHM** *1* Anti-helicopter mine.
- 2* Airplane health management.
- 3* Aircraft heavy maintenance.
- AHMOS** Active health-monitoring system.
- AHMS** Advanced health management system.
- AHWS** Armed-helicopter weapon system.
- AHMR** Aircraft health-monitor recorder.
- AHP** Army heliport (USA).
- AHQ** Air headquarters.
- AHRS** Attitude/heading reference system pronounced A-hars.
- AHRU** Altitude/heading reference unit.
- AHS International** Previously the American Helicopter Society [office, Alexandria, VA22314] (US).
- AHSA** The Aviation Historical Society of Australia [office, South Melborne].
- AHSNZ** Aviation Historical Society of New Zealand, Inc. [office, Wellington].
- AHSW** Aural high-speed warning.
- AHT** *1* Automated hover trainer.
- 2* The Airship Heritage Trust [office, London SE3 9EL] (UK).
- AHTR** Auto horizontal-tail retrimming after landing.
- AHU** Aircraft Holding Unit, for military aircraft temporarily surplus to requirements; also said to mean Aircrew HU.
- AHWG** Aviation Health Working Group (UK Parliamentary Committee 2002).
- AI** *1* Airborne interception (radar).
- 2* Artificial intelligence.
- 3* Air-data/inertial.
- 4* Attitude indicator.
- 5* Alternative interrogator.
- AIA** *1* Aerospace Industries Association of America Inc. [Washington, DC20005–3924] (US).
- 2* Associazione Industrie Aerospaziali [see AIAD].
- 3* Associazione Italiana di Aerotechnica.
- 4* Académie Internationale d'Astronautique.
- 5* Atelier Industriel de l'Air (F).
- 6* Air Intelligence Agency (USAF, Lackland AFB, established 1 October 1993).
- 7* Advanced-information, or imagery, architecture.
- 8* Aviation Insurance Association (Hasbrouck Heights, NJ).
- AIAA** *1* American Institute of Aeronautics and Astronautics [office, Reston, VA20191–4344] (US).
- 2* Aerospace Industry Analysts Association (US).
- 3* Area of intense air activity.
- AIAC** Aerospace [previously Air] Industries Association of Canada [office, Ottawa K1P 5Y7] (Canada).
- AIACS** Association of International Air Courier Services [office, Leatherhead, Surrey] (UK).
- AIAD** Associazione Industrie Aerospaziali e Difesa [office, Rome 2001–00184] (Italy).
- AIEA** All-India Aircraft Engineers Association.
- AIAH** Advanced integrated avionic, or aircrew, helmet.
- AIANZ** The Aviation Industry Association of New Zealand, Inc. [General Aviation, office in Wellington] (NZ).
- AIB** *1* Accidents Investigation Branch [from 1988 AAIB] (UK).
- 2* Aeronautical Information Bureau.
- 3* Airfield, or aerodrome, identification beacon.
- AIBU** Advanced interface blanker unit.
- AIC** *1* Aeronautical Information Circular (CAA).
- 2* Advanced industrial countries.
- 3* Air-inlet control[ler], or computer.
- 4* Aluminium/iron/cerium.
- 5* Automatic integrity check (MLS).
- AICAA** Associazione Italiana Costruttori Amatori d'Aerei (homebuilders).
- AICBM** Anti-ICBM.
- AICC** Aviation Industry CBT Committee (Int.).
- AICCA** Australian International Cabin-Crew Association.
- AICES** Association of International Air Courier and Express Services (office UK).
- AICGS** Advanced imagery common ground station.
- AICMA** Association Internationale des Constructeurs de Matériel Aérospatial.
- AICQ** Associazione Italiana Cultura Qualità [member of IAQQ].
- AICS** *1* Automatic inlet, or intake, control system.
- 2* Airborne integrated communications system.
- 3* Airborne wireless intercom system.
- AID** *1* Aeronautical Inspection Directorate (UK, 1913–).
- 2* Altered-item drawing.
- 3* Agency for International Development (US).
- 4* Airport information desk (FAA).
- 5* Accident/incident/deficiency.
- AIDA** *1* Associazione Italiana di Aerofilatelia [philately]; office, I-20148 Milan] (Italy).
- 2* Aeronautical integrated data-exchange (EL adds economy line).
- 3* Artificial-intelligence discrimination architecture.
- AIDAA** Associazione Italiana di Aeronautica e Astronautica.
- AIDC** Air-traffic services interfacy data communications.
- Aidews** Advanced integrated defensive EW system.
- AIDN** Australian Industry & Defence Network.
- Aids, AIDS** *1* Airborne/aircraft/automatic/advanced integrated data system/suite.
- 2* Acoustic-intelligence data system.
- 3* Aircraft intrusion detection system (temporary parking area).
- AIDU** Aeronautical Information Documents Unit [for military aircrew; address, RAF Northolt].
- Aieda, AIEDA** Association Internationale des Avocats et Experts en Droit Aérien.
- AIEF** Air Intelligence Exploitation Facility (USAF).
- AIEM** Airlines International Electronics Meeting.
- AIEU** Aircraft integrated electronics unit.
- AIEWS** Advanced integrated EW suite (USN).
- AIFF** Advanced identification friend or foe.

**AIFS** Advanced indirect fire system[s].

**AIG** Acas implementation group.

**Aigasa** Associazione Italiana Gestori Aeroporti e Aeroportuali.

**AIGT** Aerospace Innovation and Growth Team [industry and Government] (UK 2004–).

**AII** 1 Anti-icing/anticing inhibitor.

2 Airspace infungement initiative (Eurocontrol).

**AIIDED** Active integrated inlet-duct engine demonstration.

**AIIS, AI<sup>2</sup>S** Advanced IR imaging seeker.

**AIL** 1 Airworthiness Information Leaflet.

2 Aeronautical Instrument Laboratory (USN, from 1943).

**ail** Aileron.

**AILA** Airborne, or automatic, instrument landing, or instrumented low, approach; S adds system.

**ailavator** Control surface functioning as aileron and elevator (see *elevon*).

**aileron** 1 Control surface, traditionally hinged to outer wing and forming part of trailing edge, providing control in roll, ie about longitudinal axis. Seldom fitted to aircraft other than aeroplanes and gliders, and in recent years supplemented or replaced by spoilers, flaperons, elevons and tailerons, while in some high-speed aircraft conventional \* are mounted inboard to counter \* reversal.

2 Effectiveness of lateral-control system, as in phrase ‘to run out of \*’.

**aileron centring device** Another name for a wing leveller. Typically incorporates two springs, able to overcome friction and air loads.

**aileron drag** Asymmetric drag imparted by aileron deflection, greater on down-going aileron (see *differential* \*, *Frise* \*).

**aileron droop** Rigging of manual ailerons so that in neutral position both are at a positive angle relative to the wing.

**aileron reversal** As aircraft speed increases, deflection of aileron can twist wing sufficiently to reduce, neutralise and finally reverse rolling moment imparted to aircraft. Many aircraft designed for Mach numbers higher than 0.9 either have no traditional outboard ailerons or else lock these except at low speeds.

**aileron reversal speed** That at which pilot input is reduced to zero.

**aileron roll** See *slow roll*.

**aileron wedge** See *wedge*.

**AILS** 1 Airborne information for lateral spacing.

2 Automatic ILS.

**AIM** 1 Aeronautical [until 1995 Airmen’s] Information Manual (FAA).

2 Air intercept missile (inventory category, USAF, USN).

3 Aerospace industrial modernisation programme (US).

4 Aluminium/iron/molybdenum.

5 Automatic inflation modulation.

6 Advanced intelligent management.

7 ATC/IFF beacon Mk XII.

8 Accelerated introduction of materials.

9 See *AIMD*.

10 Aircraft integrity monitoring.

11 Arts (3) interface module.

**AIMAS** Académie Internationale de Médecine Aéronautique et Spatiale [also IAASM; office, Montreal].

**aim-bias** Error between aiming point and centre of dispersion area of statistically valid number of projectiles.

**AIMD** Aircraft intermediate maintenance department.

**aim dot** Basic command reference symbol in gunsight or HUD: can show where bullets would hit if gun fired, but usually also gives other indications.

**AIMDS** Aircraft integrated monitoring and diagnostic system.

**AIME** Autonomous integrity monitored extrapolation.

**AIMES** Avionics integrated maintenance expert system (McDonnell Douglas).

**Aim/Far** Aeronautical Information Manual, Federal Aviation Regulations.

**AIMIS, Aimis** Advanced integrated modular instrumentation systems (USN).

**aim-off** Angular allowance when firing at moving target with unguided projectile, usually because of sightline spin resulting in target changing apparent position during projectile’s flight, but in air-to-air combat possibly because of lateral air drag (eg in firing at aircraft abeam at same speed and heading, when sightline spin is zero).

**AIMS** 1 Attitude indicator measurement system.

2 ATCRBS, IFF, Mk 12 transponder, System.

3 Aircraft identification monitoring system (DoD, interceptors).

4 Automated integrated manufacturing system.

5 Airplane, or aircraft, information-management system [reports problems to maintenance staff].

6 Airborne integrated management system.

7 Airport information management system [vast range of data].

8 Advanced imaging multispectral system.

9 Aircraft integrated monitoring system [accident-related and life data].

10 Advanced integrated MAD system.

11 Airspace information monitoring system [major airports, G].

**AIMV** Aluminium/iron/molybdenum/vanadium.

**Aimval** Air intercept missile evaluation (USAF/USN).

**AIN** Airline identification number.

**AINS** 1 INS with prefix advanced, aided, area or airborne.

2 Associazione Internazionale Nomo nello Spazio (I).

**AINSC** Aeronautical industry service communications.

**AIO** Action information organization (mainly warships, in relation to aircraft).

**AOIA** Aviation Insurance Offices Association [ office, Guildford GU2 5QJ (UK)].

**AIP** 1 Aeronautical Information Publication[s], or package.

2 Asars, [1], improvement program.

3 Anti-surface-warfare improvement program[me].

4 Air-independent propulsion.

5 Australian industrial participation.

6 Associação Industrial Portuguesa.

7 Airport Improvement Program (DoT).

**AIPA** Australian and International Pilots’ Association.

**AIPPI** Association Internationale pour la Protection de la Propriété Intellectuelle (Int.).

**AIPT** Advanced image-processing terminal.

**AIR** 1 French aerospace material specification code.

2 Air intercept[or] rocket (inventory category, USAF).

**3** Air-inflatable retarder (similar to ballute).

**4** Air-intercept radar.

**5** Advanced integrated recorder.

**6** Aerospace Information Report (SAE).

**air** Air near Earth's surface usually taken to be (% by volume): nitrogen 78.08; oxygen 20.95; argon 0.93; other gases (in descending order of concentration, carbon dioxide, neon, helium, methane, krypton, hydrogen, xenon and ozone) 0.04. In practice also contains up to 4% water vapour. ISA SL pressure at 16.6°C is 10.332 kg m<sup>-2</sup> (= 761.848 mm Hg) and density 1.2255 kg m<sup>-3</sup>.

**air abort** Abort after take-off.

**Airac** Aeronautical information regulation and control, system for disseminating air navigation information (Notams).

**Airad** Airmen advisory (local).

**AI radar** Airborne interception radar, carried by fighter for finding and tracking aerial targets.

**Air Adviser** RAF officer charged with assisting commander of a multiservice Task Force [e.g. Falklands 1982].

**air attack** An experienced firefighter who not only provides the IC(8) with an overview but also knows how best to allocate resources.

**air-augmented rocket** Usual form of this propulsion system is for first stage of combustion, or primary rocket propellant or gas-generator, to yield fuel-rich range of products which then combine in second stage of combustion with atmospheric air (normally induced through ram intake). Objective is to increase specific impulse, by using oxygen from atmosphere, and also burn time and vehicle range.

**air bag** Rapidly inflated flexible bag to cushion VL of UAV or other object.

**airband** Those frequencies used for aeronautical voice communications.

**air base** *1* Loosely, military or general-aviation airfield (term used mainly by popular media).

*2* In photogrammetry, line joining two air stations.

*3* Length of (2).

*4* Scale distance between adjacent perspective centres as reconstructed in plotting instrument.

**air bearing** Gas bearing using air as working fluid.

**air-bearing table** Table supported on single spherical air bearing and thus free to tilt, without sensible friction, to any attitude within design constraints.

**air-blast switch** Electrical circuit-breaker in which arc formed on breaking circuit is blown away by high-velocity air jet.

**air-blast transformer** In this context, as in some other electric and electronic equipment dissipating large heat flux, air-blast signifies forced air cooling.

**air bleed** See *Bleed* (2).

**air block** Rectilinear volume of atmosphere between designated FLs over published geographical area.

**airblown seal** A seal between two rotating assemblies, usually of labyrinth type, fed with air at pressure slightly higher than surroundings, thus excluding oil or other contaminants.

**airborne** Sustained by atmosphere or vertical component of propulsive thrust. Implication is that vehicle is not above sensible atmosphere; term not normally used in connection with spaceflights not involving aerodynamically supported vehicles, but applicable to wingless jet-lift devices.

**airborne alert** Generally, long-duration mission flown by strategic bomber, in all respects ready to make real attack, to reduce reaction time and remove possibility of destruction by ICBM or SLBM attack on its base. Until World War 2 'air alert' was method of deploying interceptor (pursuit) forces, keeping them on sustained flight in likely combat area under ground vector control.

**Airborne Cigar** Powerful transmitters on which RAF bombers broadcast misleading instructions to German night fighters in WW2.

**airborne early warning, AEW** Use of aircraft to lift powerful search radar to greatest possible height to extend line-of-sight coverage (very approximately, LOS radius in statute miles is square root of 1.5 times observer's height in feet). Modern AEW can give a PPI covering 170,000 sq miles, throughout which two low-level aircraft in close formation can be individually distinguished against ground clutter.

**airborne fog blind** Translucent blind or hood admitting light to cockpit or flight deck whilst removing external visual cues.

**airborne force** Force constituted for airborne operations.

**airborne gunlaying turret, AGLT** Bomber-defence gun turret incorporating automatic provisions for aim-off and other corrections when engaging aerial targets.

**airborne interception, AI** Use of aircraft to find, and close with, another aircraft; specifically, use of fighter to intercept, challenge by IFF and, if dissatisfied, destroy another aircraft.

**airborne operation** Movement of combat forces and logistic support into combat zone by air.

**airborne radio relay** Use of airborne relay stations to increase range, flexibility or security of communications.

**airborne target handover system** Coded data-link enabling aircraft to hand over target (usually on ground) to a friendly station, without voice.

**Air Box** Air Ministry (RAF, collog.).

**airbrake** Passive device extended from aircraft to increase drag. Most common form is hinged flap(s) or plate(s), mounted in locations where operation causes no significant deterioration in stability and control at any attainable airspeed. Term not normally applied to flaps, drag chute or thrust-reverse systems.

**air-breathing** Aspiring air, specifically aircraft propulsion system which sustains combustion of fuel with atmospheric oxygen. Imposes constraints on vehicle speed and height, but invariably offers longer range than rocket system for same vehicle size or mass.

**airbridge** *1* Elevated metal 'bridges' linking logic gates on an integrated circuit chip.

*2* See *bridge*.

**Air Britain** Despite name, international enthusiast body, formed 1948, now has (Historians) added to title [office Dunstable, UK].

**Airbrokers Association** Formed 1949, became BAC1 [office London].

**airburst** Detonation of explosive device well above Earth's surface. Almost all nuclear weapons are programmed for optimised airburst height, which varies with weapon and target.

**AIRC** Airline[s] Industrial Relations Conference [Washington, DC] (US).

**air carrier** Organization certificated or licensed to carry passengers or goods by air for hire or reward.

**air cartography** Aerial survey, esp. aerial photography for purpose of mapmaking.

**Air Cavalry** Helicopter-borne attack/reconnaissance ground troops (USA).

**AIRCMM** Advanced infra-red countermeasures munition.

**aircom** Traffic on an Acars link (SITA).

**AIRCON** Air communications network, specif. serving US air carriers. Characterised by wide geographical extent, very large information flow, ‘on-line, real time, full-time’ storage, and computer-compatible electronic switching.

**air conformal ice detection system** Measures thickness and characteristics by scattering of light from fibre optics.

**air controller** In military operations, an individual trained for and assigned to traffic control of particular air forces assigned to him within a particular sector.

**air control team** Team organised to direct CAS3 strikes in the vicinity of forward ground elements.

**air-cooled** Heat-generating device, esp. piston engine, maintained within safe limits of temperature by air cooling. Invariably cooling is direct, in case of piston engine by radiating heat to air flowing between fins around cylinder head and barrel, or around hot rotor casing(s) of RC engine.

**air corridor** 1 Defined civil airway crossing prohibited airspace.

2 Restricted air route in theatre of military operations intended to afford safe passage for friendly air traffic.

**aircraft** Device designed to sustain itself in atmosphere above Earth’s surface, to which it may be attached by tether that offers no support. Two fundamental classes are aerodynes and aerostats. Aircraft need have no means of locomotion (balloons are borne along with gross motion of atmosphere, while kites are tethered and lifted by motion of atmosphere past them), or any control system, nor means for aerodynamic or aerostatic lift (eg, jet VTOL aircraft need be no more than jet engine arranged to direct eflux downwards). Free-falling spacecraft qualifies as aircraft if, after re-entry, its shape endows it with sufficient L/D ratio to glide extended distance, irrespective of whether or not it can control its trajectory.

**aircraft cabin mattress** Unpacked from storage bag, converts two facing seats + intermediate table into foam bed.

**aircraft cable** Specially designed tensile cable, usually either solid wire or any of eight built-up constructions, used for operating flight control and other mechanical systems.

**aircraft carrier** Marine craft, traditionally large surface vessel, designed to act as mobile base for military aircraft.

**aircraft categories** 1 For genealogical purposes, family tree of possible classifications.

2 For certification purposes, subdivision of aeroplanes (most important family of aircraft) on basis of performance. In UK aeroplanes certificated before 1951 are categorised as No Performance Group Classification; after 1951 subdivided into Performance Group A, large multi-engined; Performance Group C, light multi-engined; and Performance Group D. Also Group X for

large multi-engined aeroplanes built outside UK before specified date.

**aircraft certificate** In US all aeroplanes (airplanes) and most other aircraft except models are categorised and licensed according to four classes of certificate, each having status of legal document: airworthiness, production, registration and type.

**aircraft commander** See *commander*.

**aircraft communications and automatic reporting system** Monitors and records many parameters, mainly engine data.

**aircraft container** See *container*.

**aircraft dispatcher** In US air transport, official charged with overseeing and expediting dispatch of each flight. Traditional post analogous to train dispatcher of US railroads. Today duties include provision of met. information, flight planning, arranging unloading and loading, stocking with consumables, apron servicing and other turnaround tasks, calling for large staff.

**aircraft dope** See *dope*.

**aircraft fabric** See *fabric*.

**aircraft fuel** See *gasoline, kerosene*.

**Aircraft Holding Unit** Accepted new aircraft off production, or in-service aircraft after major overhaul or repair, and tested them before allocation to operating unit (RAF, RN).

**aircraft integrated data system** Supplements ‘black box’ by monitoring and recording many additional engine and system parameters.

**aircraft lifting bag** Usually made of stout neoprene woven fabric, inflated to assist recovery of disabled or crashed aircraft; among other terms are pneumatic elevator and pneumatic aircraft jack.

**aircraft log** One or more volumes recording detailed operating life of individual aircraft, listing daily and cumulative flight time, notifiable irregularities or transient unserviceability of any part, all inspections, overhauls, parts replacement, modification and repair.

**Aircraftman, Aircraftwoman** RAF/WRAF non-commissioned rank, with junior and senior grades, having no bearing on trade in which rank-holder is qualified.

**aircraft management simulator** Essentially the same as a pre-1960 simulator, equivalent to a modern FFS but without 6-axis motion or synthetic external scenes; capable of training on all cockpit instruments and systems.

**aircraft missile** Missile launched from aircraft.

**aircraft mover** Apron vehicle for towing or pushback.

**aircraft network interface unit** Provides link between aircraft satcoms system and passenger [or possibly crew] PCs.

**aircraft pallet** See *pallet*.

**aircraft performance monitoring** Software calculates deviation(s) from specific range caused by aerodynamic deterioration of airframe.

**aircraft prepared for service** See *weight*.

**aircraft rocket** Missile launched from aircraft.

**aircraft system controller** Avionics subsystem performing flight engineering control and monitoring functions to automate hydraulic or electric or fuel or ECS or other system.

**aircraft unit-load device** See *Unit load*.

**aircrew** Crew required to operate aircraft in flight, esp. crew, numbering more than one, of military aircraft.

Large civil aircraft normally operated by flight crew and cabin crew; \* is not used.

**aircrew equipment assembly** Standard modular fitting incorporating PEC and various other items carried on flying clothing, forming single 'umbilical' for military flight-crew member.

**air cushion** Volume of air at pressure slightly above local atmospheric, trapped or constantly replenished by suitably arranged air jets (possibly issuing from base of flexible skirt) to support ACV.

**air data** Parameters derived from measurements of the air mass surrounding the aircraft.

**air-data computer** Digital computer serving as central source of information on surrounding atmosphere and flight of aircraft through it. Typical ADC senses, measures, computes or transmits (to AFCS and other aircraft systems) pressure altitude, OAT and total temperature, Mach number, EAS, angle of attack, angle of yaw and dynamic pressure. All are corrected for known errors and converted into signals of form required by supplied systems. ADC may have 60 to 90 output channels, most used throughout each flight.

**air defence** Defence against aerial attack, ie attack by aircraft, atmospheric missiles and RVs entering atmosphere from space.

**air defence identification zone** Defined airspace within which all traffic must be identified, located and controlled (ADIZ).

**air defence operations area** Geographical area, usually large, within which air and other operations are integrated.

**air defence region** Geographical subdivision of an AD area.

**air defence sector** Geographical subdivision of an AD region.

**Air-Dek** PSP (1), a US registered name.

**air despatcher** Person trained to supervise release or ejection of cargo [or parachutists] from aircraft in flight.

**air distance** Distance flown through the air, ie with respect to atmosphere.

**air distributed mission trainer** Features Ro-Ro cockpit to enable aircrew to receive individual or networked training on various aircraft types.

**Air Division** Largest administrative unit in USAF below Air Force.

**air dominance** Unquestioned military supremacy in aerospace.

**air drag** Drag.

**air drill** 1 Training or display by group of military aircraft which repeatedly change formation or perform manoeuvres.

2 Drill driven by high-pressure air.

**air-driven horizon** Artificial horizon in which gyro is driven by one or more high-velocity air jets, usually arranged to impinge on cups machined in periphery. In most, instrument case is connected to vacuum line, often generated by venturi, and jets are atmospheric air. Performance reduced at altitude and by contamination by foreign matter blocking or penetrating filter.

**airstrome** Incorrect corruption of aerodrome.

**airdrop** Delivery of personnel or cargo from aircraft in flight, usually by parachute.

**airdrop platform** Platform designed to carry large indivisible loads for airdrop or LAE.

**AIRE** Atlantic Interoperability initiative to Reduce Emissions [2007–, FAA, EC] (Int.).

**Airep** Air report, in plain language, either spoken weather report by airborne aircrew or written air weather report.

**Airex** Patented low-density polyetherimide foam.

**air exchange** Release of a proportion of the air in closed-circuit tunnel on each pass and its replacement by fresh cooler air from atmosphere; hence, \* system, control doors, cooling etc, and \* rate expressed as % of tunnel airflow. Purpose is to regulate tunnel temperature and overall static pressure level.

**air expeditionary force** Multi-arms force quickly assembled to meet needs of a local commander and sent to a crisis point within hours (US).

**airfield** Land area designated and used, routinely or in emergency, for takeoff and landing by full-scale aerodyne(s). Definition excludes aerostats and model aircraft, but admits VTOLs and RPVs. No facilities need be provided.

**airfield elevation** Height above MSL, usually of highest point on runway or other used surface.

**airfield FIS** Flight-information service provides information to, but not control of, aircraft using that airfield.

**airfield surface movement indicator** Airfield surveillance radar.

**airfield surveillance radar** Radar on or near airfield with scanner well above ground level rotating continuously to give fine-definition PPI display, especially showing aircraft on ground and vehicles.

**air-filed** Flight plan sent by aircraft in flight.

**airflow** Air flowing past or through body. For immersed solids moving through air, major factors are speed (IAS, EAS, CAS, TAS), angle of attack or yaw, dynamic head, OAT and total temperature. For turbine engine, \* normally mass flow, ie mass per unit time passing through engine.

**airfoil** Aerofoil.

**air force station** Usually means location of an air force unit where there is no airfield.

**airframe** BS.185/1940: 'A flying machine without the engines', today BS.185 has added 'power driven'. Better definition is: assembled structure of aircraft, together with system components forming integral part of structure and influencing strength, integrity or shape. Includes transparencies, flush aerials, radomes, fairings, doors, internal ducts, and pylons for external stores. In case of ballistic rocket vehicle would not include thrust chambers of liquid-propellant engines, nor separable solid motors, but could include payload fairings. Items where argument exists include: RVs; MAD booms; rigid refuelling booms; mission equipment carried demonstrably outside structure proper (eg, AWACS aerial); and podded engine cowlings. Airframe usually includes landing gear, but not systems, equipment, armament, furnishings and other readily removable items.

**airframe attributable** Accident or notifiable incident caused by defect or malfunction in airframe.

**airframe parachute** Large parachute deployed from aerodyne in emergency to provide ground impact at not over 30 ft/s.

**airframer** Loosely, company or other organization whose primary business is manufacture of aircraft.

Arguably, includes assembler of aircraft from major sections manufactured by partners.

**airframe tuning** Modifying the structure to move natural frequencies [especially of the occupied regions of the fuselage] away from the forcing frequencies of the propeller[s] or rotar[s].

**air/fuel ratio** Ratio by mass of air to fuel in air-breathing engine or other combustion system. With hydrocarbon fuels ratio usually in neighbourhood of 16:1.

**air gap** 1 Clearance between stationary and moving portions of electrical machine, crossed by magnetic flux.

2 Air space between poles of magnet.

3 Gap left in core of chokes and transformers used in radio or radar circuits to prevent saturation by d.c.

**air-gap** Traditional type of piston-engine spark plug; or gas-turbine igniter in which c25,000V is required to make a spark jump through fuel/air mixture from electrode to body.

**airglow** Quasi-steady radiation, visible at night, due to chemi-luminescence in upper atmosphere energised by solar radiation. Today often taken to embrace radiation outside visible range.

**air gunner** Member of aircrew assigned, for whole or part of mission, to manning guns to defend aircraft [today's nearest equivalent = DSO (2)].

**air hardening** Age hardening at room temperature.

**airhead** 1 Designated area in hostile or disputed territory needed to sustain air landing; normally objective of airborne assault.

2 Air supply and evacuation base in theatre of operations.

3 In undeveloped region, nearest usable airfield.

4 CTOL base for support of dispersed VTOL operation.

**air hostess** Stewardess.

**air inlet, air intake** Admits air to duct inside aircraft, esp. to engine.

**air interception** Radar or visual contact between a friendly and another aircraft.

**air interdiction** Air attack on enemy forces sufficiently far from friendly forces for integration with the latter not to be required; esp. attack on enemy supply routes rather than theatre forces. Differs from BAI in that it interferes with enemy's major operational movement and prevents movement of forces into battle area.

**air lag** See *lag*.

**air/land warfare** Simultaneous warfare on land and in airspace above.

**air launch** Release from aircraft of self-propelled or aerodynamically lifted object: missile, target or other aircraft (manned or RPV) previously attached to it (not towed).

**The Air League** UK air-minded association; not abb, founded 1909, in 1932–70 added : of the British Empire [office, London SW1H 9NS] (UK).

**air lever** On early aeroplanes, hand throttle governing engine airflow (not fuel) See fine adjustment..

**air liaison officer** Tactical air force or naval aviation officer attached to surface forces.

**airlift** 1 Carriage by air of load, esp. by means other than routine airline operation.

2 Transport operation (usually military) in which aircraft make round-trip flights to transport large load such as army division or refugee population.

3 Continuing, open-ended logistic supply operation, such as Berlin \*, 1948–49.

**airlifter** Aeroplane [usually large] designed primarily for cargo, esp. military.

**airline** 1 Certificated air carrier.

2 Public image of air carrier, created by house logo, aircraft livery and advertising, even where no such single carrier may exist.

3 Any great-circle route.

4 Ground supply pipe conveying air at typically 80 lb/in<sup>2</sup>.

**airline quality rating** Monthly scores of passenger satisfaction for largest US carriers.

**airliner** Not defined, but generally applied to large passenger aircraft operated by scheduled carrier; usage UK rather than US and becoming dated.

**air load** Aggregate force exerted on surface by relative airflow. In case of aerofoil or control surface, force exerted on three-dimensional entity, not on just one of its surfaces.

**air lock** 1 Small chamber through which personnel must pass to enter or leave larger chamber maintained at atmospheric pressure significantly different from ambient. Provided with two doors in series, never more than one door being open at a time.

2 Unwanted volume of air or other gas trapped at high point in liquid system in such a way as to prevent or degrade proper operation.

**air log** Instrument for measuring air distance flown.

**air mail** Mail prepaid and sent by air where there is an alternative, cheaper surface route. European letters and postcards travel by air if this speeds delivery; no separate \*\* service.

**Airman** Aircraft maintenance analysis.

**airman** 1 Loosely, any aviator, aeronaut or man who navigates by air.

2 Tradesman certificated by appropriate licensing authority to work on aircraft.

3 Air force rank category (but not a rank) below NCO, equivalent to Army 'other ranks'.

4 (Capital A) lowest uniformed rank in USAF, with class subdivisions.

**Air Maneuver** Buzzword suggesting helicopters can have an effect in rapid battlefield movement (UK but US spelling).

**airmanship** Skill in piloting aircraft. Embraces not only academic knowledge but also qualities of common sense, quick reaction, awareness and experience. RAF view: "ask 100 pilots to define, will get 100 different answers."

**Air Marshal** Armed Federal officer riding incognito as ordinary passenger on flights by US carriers to deter terrorism. In view of prior existence of RAF rank, confusion would be reduced by standardizing on Sky-Marshall.

**air mass** Very large parcel of atmosphere which at lower levels exhibits almost uniform characteristics of temperature and humidity at any given level. According to Bergeron classification, grouped according to origin (Arctic, Polar, Tropical, Equatorial), subdivided into Continental or Maritime within each group, and then again into warm (w) or cold (k).

**Airmec** International Aircraft Maintenance and Engineering Exhibition and Conference.

**Airmen Advisory** Notice to Airmen (see *NOTAM*)

## AIRMET, Airmet

normally issued locally, often verbally during pre-flight or in-flight briefing.

**AIRMET, Airmet** 1 In-flight weather advisory category less severe than SIGMET but potentially hazardous to simple aircraft flown by inexperienced pilot (US).

2 Telephone weather service (CAA UK).

**air meter** 1 Instrument on testbed [e.g., for engines] for measurement and recording of airflow mass per unit time.

2 Confusingly, a 1935 dictionary offers “A type of portable anemometer,” which measures velocity.

**air mile** 1 Aeronautical mile = nautical mile.

2 One mile flown through the air, following Hdg. at TAS; wind must be added to give distance along Tr. at G/s. Hence \* per gallon.

**air mileage unit, AMU** Mechanical calculating instrument, 1942–55, to derive continuous value for air distance flown. Output, more accurate and reliable than air log, was fed to air mileage indicator (AMI) and often other instruments.

**air-minded** Of general public, concerned to further aviation for prosperity, defence or sport.

**air ministry** In many countries, national department charged with administering military (sometimes all) aviation. In UK, replaced by MoD (RAF).

**Airmis** Airline management information system, EDP for smaller airlines.

**airmiss** Incident reported by at least one member of aircrew who considers there was “definite risk of collision” between two airborne aircraft (US). See *airprox*.

**airmobile, air-mobile** Ground troops equipped and trained for insertion by air, making conventional landing (fixed or rotary wing).

**air-mobile band** Band of communications frequencies assigned to air-mobile forces.

**air-mobile operation** Operation by ground forces carried in air vehicles.

**Air Mounting Centre** Airfield for army traffic (South Cerney, UK).

**air movement** Military air transport operation involving landing and/or airdrop.

**air movement table** Detailed schedule of utilisation of aircraft load space, numbers and types of aircraft, and departure places and times.

**AIMS** Airport interference monitoring system.

**Air National Guard, ANG** Part-time voluntary auxiliary to USAF equipped with fighter, tactical strike and transport aircraft, organised as self-contained arm by each state.

**air nautical mile** See *air mile*.

**air navigation** Art of conducting aircraft from place of departure to predetermined destination, or along intermediate routes (eg to follow precise tracks in surveying). Originally pure pilotage (contact flying); by 1918 moved into nautical realm of dead reckoning and celestial observation (astro-nav); by 1960 all \*\* relied upon ground and airborne aids, except in gliders and simple light aircraft.

**Air Navigation Commission** Body charged with setting standards and operating practice. Reports to the Council, see next.

**Air Navigation Council** Governing body of ICAO.

**air navigation facility** Navaid; surface facility for air navigation including ‘landing areas, lights, any apparatus or equipment for disseminating weather information, for

## airport runway configuration

signalling, for radio direction-finding, or for radio or other electronic communication . . .’ (FAA). Today add ‘for electronic position-finding.’

**Air Navigation Orders** Statutory instruments decreeing laws of civil air operations, including flight-crew licensing (UK).

**AIRO** Airborne IR observatory.

**air officer, Air Officer** 1 Loosely, officer commissioned in an air force.

2 Specif., officer of Air Rank in RAF.

**air/oil strut** Telescopic member utilising properties of air and oil to absorb compressive shocks (rarely, tensile) with minimal or controlled rebound.

**air operator** One who engages in flying for hire or reward, hence \* Certificate.

**air phone** HF air/ground telephony.

**airplane** Aeroplane (N America).

**Airplane Design Group** Class of aircraft, from I to VI, according to weight, dimensions, turning circle and other factors affecting airport requirement (FAA).

**air plot** 1 Continuous air navigation graphic plot constructed (usually on board aircraft) by drawing vectors of true headings for lengths equivalent to air distances flown, today archaic.

2 Similar plot constructed for airborne object derived from visual or radar observation of its flight.

3 Automatic or manually constructed display showing position and movements of airborne objects (if in a ship, relative to the ship).

**air pocket** Sudden and pronounced gust imparting negative vertical acceleration; down-draught. Suggest archaic.

**airport** Airfield or marine base designated and used for public air service to meet needs of quasi-permanent community. There need be no facilities for aircraft replenishment or repair, customs facilities, nor scheduled service; but there must be facilities for passengers and/or cargo. Community served can be mainly or even exclusively employees of one company (eg at oilfield).

**airport advisory area** Area within 5 miles of geographical centre of uncontrolled airport on which is located FSS so depicted on appropriate sectional aeronautical chart (FAA).

**airport advisory service** Terminal service provided by FSS located at airport where control tower is not operating.

**airport code** Three-letter code identifying all commercial airports (eg, LHR, JFK, LAX).

**airport commission** Board of management of most US airports.

**Airport-G** Airport integrated research and development project for operational regulation of traffic guidance (Euret).

**airport information desk** Unmanned facility at local airport provided for pilot self-service briefing, flight planning and filing of flight plans (FAA).

**airport marker** See *marker*.

**airport movement area safety system** Uses surface and airspace radar linked to predictive software to warn of future conflict on runway, taxiway or apron.

**airport of entry** Airport provided with customs facilities through which air traffic can be cleared before or after international flight.

**airport runway configuration** Current runways in use for takeoffs and landings, changes notified in advance.

## airport surface detection/movement

## airspeed, air speed

**airport surface detection/movement** See *ASDE, ASMI*.  
**airport surveillance radar** Approach-control radar used to display position of all traffic in TMA [up to 60 miles/100 km] providing range/azimuth but not height (FAA).

**airport traffic area** Unless otherwise designated (FAR Pt 93), airspace within 5 miles of geographical centre of airport with TWR operating, extending up to, but not including, 3,000 ft AAL (FAA).

**airport traffic control service** ATC service provided by airport TWR for aircraft operating on movement area and in vicinity (FAA).

**airport traffic control tower** Facility providing airport ATC service (FAA).

**air position** Geographical position airborne aircraft would occupy if entire flight was made in still air; point derived by plotting Hdg. and TAS.

**Air Proving Ground Command** USAAF/USAF establishment at Eglin AFB for testing weapons, became AFDTDC June 1957.

**air-position indicator, API** Instrument which continuously senses Hdg. and TAS (usually not allowing for compressibility error) to indicate current air position.

**airprox** Unintended near-miss by two airborne aircraft, considered sufficiently dangerous to be reported (UK term for airmass).

**air rage** Anti-social behaviour [usually caused by alcohol or drugs] by airline passenger.

**air raid** Aerial attack on surface target, esp. against civil population.

**Air Rank** Senior to Group Captain; Air Officer, equivalent to naval Flag Officer.

**Air Refuelling Control** Office responsible for planning route [including choice of flight levels] and arranging optimum locations for tankers, if over US including CARF clearance (RAF).

**air refuelling control point** Location in space at which boom-type tanker is 1,000 ft higher than receiver, heading on reciprocal 9 to 11 miles away laterally and 22 to 29 miles away longitudinally, whereupon 180° turn inwards is started.

**air report, AIREP** Meteorological report sent by aircraft in flight.

**air-riding seal** Air or gas seal around a rotating shaft in the form of a [usually refractory] element which in operation lifts just clear of the shaft surface and runs on a cushion of air induced dynamically.

**air route** Defined airspace between two geographical points, subject to navigational regulations. See *airway*.

**air route surveillance** Surface radar giving display(s) showing geographical position and height of all traffic along designated civil route (usually airway).

**air route traffic control centre, ARTCC** Facility providing ATC service to aircraft operating on IFR flight plan in controlled airspace and principally during en route phase (FAA).

**air-run landing** Final deceleration in ground effect followed by vertical landing (fixed-wing V/STOL).

**air-run take-off** Vertical take-off followed by horizontal acceleration in ground effect (fixed-wing V/STOL).

**AIRS, Airs** 1 Airborne integrated reconnaissance system (USN).

2 Advanced inertial reference sphere, or system.

3 Airline inventory redistribution surplus.

4 Aircrew incident-reporting system.

5 Advanced IR seeker.

6 Atmospheric IR sounder (on Aqua EOS).

7 Airborne IR surveillance.

8 Alliance icing research study (Int.).

**Air Safety Report** Filed by crew after a flight in which they encounter an untoward or potentially dangerous situation, which may be partly or entirely of their own making.

**Airsar** Airborne synthetic-aperture radar.

**airscape** Broad vista of sky, not necessarily including Earth's surface, from aerial viewpoint.

**air scoop** Colloq. ram intake, esp. projecting from exterior profile of aircraft.

**airscrew** BS.185, 1951: 'Any type of screw designed to rotate in air'. Word never common in US, but in UK used in early days of powered flight to denote rotary aerodynamic device intended to impart thrust. From about 1920–50 explicitly denoted tractor device ('propeller' being 'an airscrew joined to the engine by a shaft in compression'). Today redundant. See *fan, propeller, rotor, windmill*.

**airscrew-turbine engine** Turboprop.

**air/sea rescue, ASR** Use of aircraft to rescue life in danger at sea, esp. permanently established service for this purpose (UK, RAF; US, USCG).

**airship** BS.185 1951: "A power-driven lighter-than-air aircraft". Thus need not be provided with means for controlling its path, though if \* is to be of use such means must be provided. Traditional classes are: blimp, a small non-rigid; non-rigid, in which envelope is essentially devoid of rigid members and maintains shape by inflation pressure; semi-rigid, non-rigid with strong axial keel acting as beam to support load; and rigid, in which envelope is itself stiff in local bending or supported within or around rigid framework.

**airshow** A previously publicised event at which aircraft are displayed on the ground and in flight; the public may or may not be admitted, and the principal purpose may be either product marketing or entertainment.

**airside** 1 All parts of airport containing aircraft.

2 For passengers, beyond departure customs, prior to arrival customs.

**air snatch** 1 Recovery of passive body from atmosphere by passing powered aircraft, esp. recovery of space payload descending by parachute.

2 Recovery of human being from hostile territory or sea by passing aircraft unable to hover (see *Fulton*).

**air sounding** 1 Measurement of atmospheric parameters from sea level to specified upper level by transmitting or recording instruments lifted by rocket or aircraft (esp. balloon).

2 Record thus obtained.

**airspace** Volume of atmosphere bounded by local verticals and Earth's surface or given flight levels. May be controlled or uncontrolled, but always an administrative unit defined by precise geographical or Earth-referred locations.

**airspace denial** Military mission flown by fighter to destroy all hostile aircraft entering particular airspace, usually that above friendly troops.

**airspeed, air speed** Relative velocity between tangible object, such as raindrop or aircraft, and surrounding air. In most aircraft measured by pitot-static system

## **airspeed indicator, ASI**

connected to airspeed indicator (ASI) to give airspeed indicator reading (ASIR). When corrected for instrument error (IE), result is indicated airspeed (IAS). When corrected for position error (PE), result is rectified airspeed (RAS). Most ASIs calibrated according to ideal incompressible flow ( $\frac{1}{2}\rho V^2$ ), so from RAS subtract compressibility correction to give equivalent airspeed (EAS). Finally density correction, proportional to difference between ambient air density and calibration density (1,225 gm<sup>-3</sup>), applied to give true airspeed (TAS). This sequence ignores errors, usually transient, due to major changes in angle of attack (eg, in manoeuvres). Some ASIs calibrated to allow for compressibility according to ISA SL, indicating calibrated airspeed (CAS). Confusion caused by fact most authorities now use 'calibrated airspeed' to mean ASIR corrected for IE and PE; CAS thus defined would have to be corrected for density and compressibility. Thus since 1980 CAS must be regarded as ASIR + IE + PE; if allowing for compressibility then at ISA/SL CAS = TAS.

**airspeed indicator, ASI** Instrument giving continuous indication of airspeed.

**airspeed transducer** In flight testing, or performance measurement of unmanned vehicle in atmosphere, transducer giving electrical signal proportional to airspeed. In simple systems signal is d.c. voltage.

**airsplint** Lightweight splint, inflated for rigidity.

**air spotting** Correcting adjustment of friendly surface bombardment based on air observation.

**airspray nozzle** Fuel burner in gas-turbine engine which itself mixes fuel spray with primary air, avoiding smoke from fuel-rich combustion and incidentally reducing required fuel feed pressure.

**AIRSS** 1 Advanced IR suppressor, or suppression, system.

2 Alternative IR satellite system (USAF).

**air staging** Gas-turbine combustion chamber having variable geometry to redistribute air under different engine operating conditions.

**air staging unit** Military unit stationed at airfield to handle all assigned air traffic calling at that airfield.

**airstairs** Passenger and/or crew stairway forming integral part of aircraft and, after use, folded or hinged up and stowed on board.

**Airstar** Airborne surveillance and target-acquisition radar.

**airstart, air start** Action of starting or re-starting aircraft main propulsion or lift engines in flight.

**air-starter unit** Apron vehicle or trailer providing air at 2.8–3.5 bar.

**airstream, air stream** 1 Moving air mass, esp. that penetrates and divides more stationary mass.

2 Loosely, any localised airflow.

**airstrip** Prepared operating platform for aeroplanes, usually from STOL to CTOL, distinguished from airfield by either: hasty construction under battlefield conditions; lack of permanent paved surfaces; lack of permanent accommodation for personnel or hardware; or lack of facilities, other than temporary fuel supply or ATC.

**air superiority** Degree of airspace dominance sufficient to prevent prohibitive enemy interference with one's own operations.

**air-superiority fighter** Combat aircraft designed specif. to clear airspace of hostile aircraft.

## **air-transportable units**

**air supremacy** Degree of air superiority sufficient to prevent effective enemy interference with one's own operations.

**air surface zone** Restricted area established to protect friendly surface vessels and aircraft and permit ASW operations unhindered by presence of friendly submarines.

**air surveillance** Systematic observation of airspace by visual electronic or other means to plot and identify all traffic.

**air survey** See *aerial survey*.

**AIRT** Air-intercept radar training.

**air taxi** Aircraft below 12,500 lb TOGW, licensed to ply for hire for casual passenger traffic.

**air taxiing** Positioning helicopter or other VTOL or STOVL aircraft by short translational flight at very low altitude. Standardised \*\* manoeuvres form part of VTOL flying instruction.

**air terminal** Facility in city centre at which passengers can check in for flights and board coach to airport.

**air time** Elapsed time from start of takeoff run to end of landing run.

**Airto** Association of Independent Research & Technology Organisations (UK).

**air-to-air** From one aerial position to another, esp. between one airborne aircraft and another.

**air-to-ground** Between aerial position, esp. airborne aircraft, and land surface.

**air-to-surface** Between aerial position, esp. airborne aircraft, and any part of Earth's surface or target thereon.

**air-to-underwater** Between aerial position, esp. airborne aircraft, and location below water surface, esp. flight profile of ASW weapons and operating regime of ASW detection systems.

**AIRTP** Air Troop.

**Air Track Landing** Early form of ILS developed by NBS and Washington Institute of Technology.

**air traffic** Aircraft operating in air or on airport surface, exclusive of loading ramps and parking areas (FAA); aircraft in operation anywhere in airspace and on manoeuvring area of aerodrome (BSI). To air carriers 'traffic' has entirely different meaning, but this is never qualified by 'air'.

**air traffic clearance** See *clearance (1)*.

**air traffic control radar beacon system** Beacons along airways which trigger responses from airborne transponders providing identity, location and [usually] FL of equipped traffic. See *secondary radar*.

**air traffic control centre** Unit combining functions of area control centre and flight information centre.

**air traffic control service** Service provided for promoting safe, orderly and expeditious flow of air traffic, including airport, approach and en route ATC service.

**air traffic engineer** Maintains navaids and airport communications systems.

**air traffic service assistant** Provides admin. & support, such as flight-plan acceptance and preflight briefing for pilots.

**air train** Aerial tug towing two or more gliders in line-ahead.

**air-transportable hangar** Modular lightweight hangar erected over temporary site, such as crashed repairable aircraft.

**air-transportable units** Military units, other than

airborne, whose equipment is all adapted for air movement.

**air transportation oversight system** Method of checking air-carrier safety procedures and programmes (FAA).

**air transport operation** BS.185 1951: ‘The carriage of passengers or goods for hire or reward’; this eliminates all military air transport, business flying and several other classes of \*\*\*.

**air trooping** Non-tactical air movement of personnel.

**air-tube oil cooler** Oil cooler in which air passes through tubes surrounded by oil.

**air turnback** 1 Point at which mission already airborne is abandoned, for any reason.

2 Specif., point at which non-Etrops aircraft has to abandon planned flight.

**air umbrella** Massive friendly air support over surface operation or other air activity at lower level.

**air vane** 1 Small fin carried on pivoted arm to respond to local changes in incident airflow; arm usually drives potentiometer pick-off sending signal of angle of attack or yaw.

2 Powered surface to control trajectory of ballistic vehicle in atmosphere (see *jet vane*).

**air vector** In DR navigation, Hdg. and TAS (air plot).

**air volume** In aerostat, volume of air displaced by solid body having same size and shape as envelope or outer cover. Volume used in airship aerodynamics.

**air ward system** Aircraft used for surveillance, fisheries or customs patrol, police duties, reconnaissance and similar tasks.

**airway** BS.185, 1951: ‘An air route provided with ground organisation’. Most civil air routes are flown along ICAO IFR airways, typically 10 nm wide with centreline defined by point-source radio navaids spaced sufficiently close for inherent accuracy to be less than half width of airway at midpoint. Each airway has form of corridor, of rectangular cross-section well above Earth. Airspace within is controlled, and traffic separated by being assigned different levels and from ATC having position reports and accurate forecasts of future position (typically, by ETA at next reporting point). In general, made up of a series of route segments each linking two waypoints.

**airway beacon** Light beacon located on or near airway (see *NDB*).

**airways-equipped** Equipped with functioning statutory avionics and instruments (eg, two pressure altimeters) to satisfy ICAO requirements for flight in controlled airspace.

**airways flying** Constrained to dogleg along centrelines of airways instead of flying direct to destination.

**airway traffic control** Civil air traffic control formerly exercised on ‘airways’ basis; today no separate system for designated airways.

**Air Wheel** Wheel/tyre combination introduced by Goodyear after World War 1, characterised by small wheel and fat tyre to absorb landing shocks.

**air work** In flying instruction, student air time as distinct from classroom time.

**airwork** Today usually one word, to explore aircraft’s handling or perform tests or demonstrations in flight.

**airworthiness** Fitness for flight operations, in all possible environments and foreseeable circumstances for which aircraft or device has been designed.

**airworthiness circular** A message broadcast by the certifying authority giving new information, usually on a specific type of aircraft.

**Airworthiness Directive, AD** Message from national certifying authority requiring [often immediate] mandatory inspection and/or modification.

**Airworthiness Notice, ND** Not mandatory, but strong recommendation or advice.

**airworthy** Complying with all regulations and requirements of national certifying authority.

**airybuzzer** Aeroplane (colloq.).

**AIS** 1 Aeronautical Information Service [AG adds automation group] (ICAO, and UK unit at LHR [Heathrow] which published AICs).

2 Advanced [or airborne] instrumentation subsystem (ACMR).

3 Avionics intermediate shop.

4 Academic instructor school.

5 Aircraft indicated (air) speed (IAS is preferred).

6 Automated information system.

7 Airport information service.

8 Automatic identification system.

**A12G** Department of Air Intelligence, Technical [MoD, RAF] (UK).

**AI<sup>2</sup>S** Advanced IR imaging seeker.

**AISA** 1 Ada instruction set architecture.

2 Aerospace Industry Subcontractors Association [office, Montreal] (Canada).

**AISAP** AIS(1) Automation panel.

**AISD** Airlift Information Systems Division (Scott AFB).

**AISFS** Avionics integration support facilities.

**AISIS** Airborne integrated Sigin system.

**aisle** Longitudinal walkway between seats of passenger aircraft.

**aisle height** Headroom along aisle.

**aisle stand** Pilot’s instrument panel mounted on pillar in all-glazed nose [as in B-29].

**AIT** 1 Alliance Internationale de Tourisme (Int.).

2 Assembly, integration and test.

3 Airborne integrated terminal [G adds group].

4 Atmospheric intercept [or] testbed [or technology].

5 Automated information transfer.

6 Advanced intelligence tape.

**AITAL, Aital** Asociación Internacional de Transportes Aéreos Latinoamericanos (Int.).

**AITFA** Association des Ingénieurs et Techniciens Français des Aéroglisseurs (hovercraft) (F).

**AITS** Advanced information technology services [JPO adds Joint Program Office] (DoD).

**AIU** 1 Analog, or aircraft, or armament, or avionics, interface unit.

2 Astro-inertial unit.

3 Airborne-installation unit.

4 Auto-ignition unit.

5 Audio integration unit.

**AIV** 1 Accumulator isolation [or isolator] valve.

2 Aviation-impact variables (program).

**AVSC** Aviation Industry Vocational Standards Council (UK).

**AIWS** Advanced interdiction weapon system, a stand-off ASM.

**AIX** Advanced interactive executive.

**AIZ** Aerodrome/airfield information zone.

**AJ** Anti-jam.

**A<sub>j</sub>** Nozzle throat area [occasionally AJ, often confusingly called jetpipe area].

**AJA** Aft jamming antenna.

**Ajacs, AJACS** Advanced Joint Air Combat System [stealthy transport] (USAF).

**Ajax unit** Device for providing artificial feel in pitching plane as function of stick displacement, altitude and airspeed.

**AJB** Audio junction box.

**AJCN** Adaptive, later advanced, joint C4ISR node.

**AJE** Augmented-jet ejector; VL adds vertical lift.

**AJJ** Adaptive-jungle jammer, sophisticated ECM self-adapting to variable enemy transmissions.

**AJM** Anti-jam modem.

**AJPAE, Ajpaé** Association des Journalistes Professionnels de l'Aéronautique et de l'Espace [F-75116 Paris] (F).

**AJPO** Ada Joint Program Office.

**AJPS** Afeps journal processing system.

**AJS** Attack, Jakt, Spaning, attack, fighter, recon (Sweden).

**AJSP** Association des Journalistes Scientifques de la Presse d'Information [F-75008 Paris] (F).

**AJT** Advanced jet trainer.

**AK** Nitrogen tetroxide; suffix number gives percentage (Russia).

**A/K** Aluminium/Kevlar (armour).

**AKU** Avionic[s] keyboard unit.

**AL** 1 Approach and landing chart (FAA).

2 Spec prefixes for methanol or water/methanol (AL-24 piston engines, AL-28 gas turbines).

**Al** Aluminium [US aluminum].

**A/L** 1 Approach/land, operative mode for airborne system.

2 Airline.

3 Autoland.

**ALA** 1 Alighting area (ICAO, marine aircraft).

2 Asociación de Lineas Aéreas (Spain).

3 Approach and landing accident[s].

**ALAA** Aviation Légère de l'Armée de l'Air (F).

**ALADC** Australian Light Aircraft Development Council.

**Aladdin** Algorithm adaptive and diminished dimension.

**ALAE** Association of Licensed Aircraft Engineers [1981–, office Bagshot, Surrey GU19 5AQ] (UK).

**ALAFS** Advanced lightweight aircraft fuselage structure [or system].

**ALAM** Advanced land-attack missile.

**ALAR** Aircraft [or approach and] landing accident reduction.

**Alarm** 1 Air-launched anti-radiation missile.

2 Automatic light-aircraft readiness monitor.

**Alarms** Airborne laser-radar mine sensor.

**ALARR** Air-launched, air-recoverable rocket.

**ALAT** Aviation Légère de l'Armée de Terre (F).

**Alats** Advanced laser targeting system.

**ALAVIS** Advanced low-altitude IR reconnaissance system.

**ALB** 1 Air/land battle.

2 Aircraft lifting bag, for recovery after belly landing, etc.

**albedo** 1 Percentage of EM radiation falling on unpolished surface that is reflected from it, esp. percentage

of solar radiation (particularly in visible, or other specified, range) reflected from Moon or Earth.

2 Radiation thus reflected.

**ALBM** 1 Air-launched ballistic missile.

2 Air/land battle management (Lockheed).

**ALBT** Air-launched ballistic target.

**ALC** 1 Air Logistics Command [now Air Mobility Command] (USAF).

2 Air Logistics Center.

3 Automatic level, or levelling, control (radio).

4 Air logic control, for automated systems.

5 Ambient light[ing] control.

**ALCA** Advanced light combat aircraft.

**ALCAC** Air Lines Communications Administrative Council (US).

**Alcam** Air-launched conventional attack missile.

**ALCC** 1 Airborne launch control centre.

2 Airlift control centre.

**ALCE** Airlift control element (MAC).

**Alclad** Trade name (Alcoa) of high-strength light alloys (usually sheet) coated with corrosion-resistant high-purity aluminium. Originally developed for marine aircraft.

**ALCM** Air-launched cruise missile.

**alcohol** Large family of hydrocarbons containing hydroxyl groups, esp. methyl alcohol CH<sub>3</sub>OH (toxic) and ethyl alcohol (ethanol, C<sub>2</sub>H<sub>5</sub>OH, potable), both used as fuels, anti-detonants and rocket propellants.

**Alcoseal** Range of film-forming foam compounds for extinguishing fires involving water-miscible solvents; \* VSA has vapour-suppressing additive.

**ALCS** 1 Active lift control system, to reduce peak wing stresses in gusts.

2 Airborne launch-control system.

**Alcusing** Light alloy (aluminium, copper, silicon).

**ALD** 1 Arbitrary landing distance, standard comparison distance along runway, from touchdown to stop, using specified landing technique; used in determining field-length requirements.

2 Available landing distance.

3 JETDS code: piloted aircraft, countermeasures, combination of purposes.

4 Air-launched demonstrator [missile].

**ALDCS** Active-lift distribution control system.

**Alder** Advanced laser devices and effects research.

**Aldis** 1 Patented hand signalling lamp with optical sight, trigger switch (kept on throughout use) and second trigger to tilt mirror to deflect light beam intermittently down to target.

2 Airport land-dues information system.

**ALDP** Airborne laser designator pod.

**ALDS** Airborne laser defensive system.

**ALE** 1 Aviazione Leggera Esercito (Italian army aviation).

2 Automatic [radio] link establishment.

**ALEA** 1 Airborne Law Enforcement Association [office, Tulsa, OK74101] (US).

2 Air Line Employees Association, International [office Chicago] (Int.).

**Aleastryl** Refractory material for re-entry heat shields, a resin-impregnated silica fabric.

**ALEK** See *anchor-line extension kit*.

**Alerfa** Alert phase of SAR operation.

## Alert

## ALJS

**Alert** 1 Attack [and] launch early response [or reporting] to theater (USAF).

2 Air-launched extended-range transporter.

**alert** 1 Specified condition of readiness for action, esp. of military unit.

2 Warning of enemy air attack.

3 ATC action taken after 30 min “uncertainty” period (5 min in case of aircraft previously cleared to land) when contact cannot be established.

4 Response by manufacturer and/or certifying authority to unacceptable incidence of service failures by hardware item.

**alert area** Airspace which may contain high volume of pilot-training activities or unusual type of aerial activity (FAA).

**Alerte** Anti-aircraft laser enemy ranging and targeting equipment.

**Alerter** Hand-held device which vibrates/flashes to warn deaf people [e.g., staff, pax] of fire.

**alerting centre** Centre designated by appropriate authority to perform functions of RCC where none exists (BS.185).

**alerting service** Service provided to notify and assist all appropriate organisations capable of aiding aircraft in need of search or rescue.

**alert-level standard** Agreed reliability performance below which special and urgent action must be taken (eg 0.3 IFSD per thousand engine hours).

**alerting unit** Encoding-altimeter device which, in potentially dangerous flight conditions, triggers a warning.

**alert phase** Aircraft seriously overdue.

**Alerts** Airborne-laser EW receiver training system.

**ALES** 1 Autonomous Link-Eleven system.

2 Electro-exploded aluminium, an exceedingly fine powder (IR flares).

**Alex** 1 Automated launching of expendables (EW).

2 Electro-exploded aluminium, an extremely fine powder (IR flares).

**ALF** 1 Auto/lock-follow (target tracker).

2 Auxiliary landing field.

3 Aloft.

4 Airborne, or adaptive, or advanced, low frequency; EAS adds electro-acoustic sonar, S sonar.

**Alfa, ALFA** Aéroports de langue Française associés.

**Alfed** Aluminium Federation [office, Birmingham B15 1TN] (UK).

**Alfens** Automatic, or advanced, low-flying entry, or enquiry, notification system (UK NATS/MoD).

**Alfensops** Automated low-flying and flight-planning enquiry and notification systems operations centre (UK).

**ALFH** Advanced lightweight flying helmet.

**Alflex** Automatic-landing flight experiment (J).

**ALFS** Airborne, or air-dropped, low-frequency sonar.

**ALG** 1 Autonomous landing guidance.

2 Advanced landing ground.

3 Along.

4 Also Ali, altimeter.

**AlGaAs** Aluminium/gallium arsenide.

**algae** Primitive plants (thallophytes) which elaborate food by photosynthesis, investigated as human food for extended space travel.

**algal corrosion** Degradation caused by algae and other

microorganisms, especially those dwelling at fuel/air interface.

**Algol** Algorithmic language.

**algorithm** 1 Established method of computation, numeric or algebraic.

2 Computation with steps in preassigned order, usually involving iteration, for solving particular class of problem.

**ALGP** Aviation Loan Guarantee Program (US, post 11–9).

**ALH** 1 Advanced light helicopter.

2 Active laser homing.

**ALI** 1 Advanced land imager.

2 Automatic line integration.

3 Aegis Leap intercept.

4 Aerospace Lighting Institute (US).

5 Air/land integration.

**ALIA** International Association of Lawyers Jurists & Experts in Air Law [office, Rome].

**aliasing** Wide variety of errors possible when breaking down image into pixels, such as irregular edges or tendency of small polygons to blink on/off; hence anti-\*.

**ALIC** 1 Aerodrome/airfield/airport locator indicator code.

2 Aircraft launcher interface computer.

**Alicat** Advanced long-wave IR circuit and array technology.

**Alice** 1 Air-launched integrated countermeasure[s], expendable.

2 Alcatel integrated control environment.

**alidade** Optical sight [microscope or telescope] used to read linear scale on mensuration system.

**alien interference** On weather radar, by other radars in scanning area.

**alight** To land, esp. of marine aircraft on water.

**alighting channel** Part of water aerodrome navigable and cleared for safe alighting or taking off.

**alighting gear** See *landing gear*.

**align** 1 In INS, to rotate stable platform before start of journey until precisely aligned with local horizontal and desired azimuth.

2 In radio, radar or other equipment having resonant or tuned circuits, to adjust each circuit with signal generator to obtain optimum output at operating frequencies.

3 Normal meaning of word is relevant to erection of airframe jigging, lasers often being used when structures are large.

**aligned mat** Intermediate semi-prepared composite structure in which strong and/or stiff reinforcing fibres (rarely whiskers) are arranged substantially parallel in two-dimensional mat.

**alignment time** In INS or guidance system, minimum time required to spool-up gyros and align platform, preparatory to allowing significant movement of vehicle.

**ALIMS** Automatic laser inspection and measurement system.

**ALIS, Alis** 1 Airline interactive services.

2 Airport luggage identification system.

3 Autonomic logistics information system.

**Alithalite** Range of medium-density general-purpose Al-Li alloys (Alcoa).

**ALJEAL, Aljeal** Association of Lawyers, Jurists and Experts in Air Law (Int.).

**ALJS** Airborne-laser jamming system.

**alkali metal** Group of metals in First Group of Periodic Table characterised by single electron in outermost shell which they readily lose to form stable cation (thus, strongly reactive). Lithium, sodium, potassium and caesium (cesium) are important in electrical storage batteries and as working fluids in closed-circuit space power generation.

**alkylation** Addition of alkyl group (generally, radical derived from the aliphatic hydrocarbons); important in manufacture of gasolines (petrols) having high anti-knock (octane) rating.

**ALL** Airborne laser laboratory.

**ALLA, Alla** Allied Long Lines Agency (NATO).

**all-black** Made entirely of [not necessarily black] composite material

**all-burnt** Rocket propulsion system which has consumed all propellant (where there are two, which has consumed all of either); specif., time and flight parameters when this occurs.

**all-call** Transponder Mode-S broadcast interrogation, thus \* address, \* reply.

**ALLD** Airborne laser locator designator.

**alleviation** Reduction of structural loads (eg wing bending moment) in vertical gusts by active controls.

**alleviation factor** Numerical multiplier of calculated vertical acceleration or structural load on encountering gust, taking into account fact gust is not sharp-edged and aircraft is already rising before peak intensity is reached. Later refined by making it a function of the ratio of mean chord to gradient distance, aspect ratio and mass parameter.

**alleviation lag** Time difference between actual and ideal response of a GAC active control system.

**alleviation technique** Method of reducing heat flux on atmospheric re-entry by controlling plasma sheath surrounding vehicle.

**all-flying tail** Term formerly used to describe variable-incidence tailplane used as primary control surface in pitch, separate elevators serving merely as additional part of surface or as a means of increasing camber.

**Al-Li** Aluminium-lithium alloys.

**Alliance ground surveillance** Programme for reconnaissance aircraft (NATO 1980, approved 1993, operational possibly 2010).

**all lithium** Generic name for aluminium-lithium alloys; also (capital A) trade name.

**ALLM** Aft lower-lobe module (AEW radar).

**all-moving tail** All-flying tail.

**'all out'** Signal signifying glider or other towrope taut, towed vehicle ready for takeoff.

**allowable deficiency** Missing, damaged, inoperative or imperfectly functioning item which does not invalidate C of A and does not delay scheduled departure (eg, rudder bias system, fuel flowmeter and almost any item not part of structure or aircraft system). In US called despatch deviation or MEI (1).

**allowance** 1 Intentional difference between dimensions (with tolerances permitted on each) of mechanically mating parts, to give desired fit.

2 Calculated quantity of fuel beyond minimum needed for flight carried to comply with established doctrine for diversion, holding and other delays or departures from ideal flight plan.

3 In sheet-metal construction, extra material needed to form bend of given inside radius and angle.

**alloy** Mixture of two or more metals, or metal-like elements, often as solid solution but generally with complex structure. Small traces of one element can exert large good or bad influence. Most aircraft made principally of alloys of aluminium (about 95%, rest being copper, magnesium, manganese, tin and other metals) or titanium (commercially pure or alloyed with aluminium, vanadium, tin or other elements), with steels (alloys of iron) at concentrated loads.

**all-shot** Aerial target hit by every round from one gunnery pass.

**all-speed aileron** Lateral-control surface operable throughout flight envelope, as distinct from second aileron group on same aircraft operable at low speeds only.

**'all systems go'** Colloq., absence of mechanical malfunction; not authorised R/T procedure.

**ALLTV** All light-levels TV.

**all-up round** Munition, especially guided missile, complete and ready to fire.

**all-up weight** See *AUW*.

**all-ways fuze** Fuze triggered by acceleration in any direction exceeding specified level.

**all-weather** Former category of interceptor which could not, in fact, fly in \*\*. Strictly true only for aircraft with triplex or quad AFCS and blind landing system plus ground guidance.

**all-wing aircraft** Aerodyne consisting of nothing but wing. Some aeroplanes of 1944–49 were devoid of fuselage, tail or other appendages, and approached this closely.

**ALM** 1 Air loadmaster.

2 Air-launched munition[s]; IPT adds integrated project team.

3 Aircraft line maintenance.

4 Air and littoral manoeuvre (DSTZ).

**ALMD** Airborne laser mine-detection; S adds system.

**ALMS** 1 Aircraft landing measurement system, typically using IR beams and geophones to produce hard-copy print-out of final approach and touch-down.

2 Air lift management system (software).

**ALMV** Air-launched miniature vehicle [A-sat].

**Alnico** Permanent-magnet materials (iron alloyed with Al, Ni, Co – hence name – and often Cu) showing good properties and esp. high coercive force.

**Alnot** Alert notice.

**ALNZ** The Air League of New Zealand Inc. [office, Wellington].

**ALO** Air Liaison Officer.

**ALOC** Air line of communication, airlift for spare parts (USA).

**Alochrome** Surface treatment for light-alloy structure to ensure good key for paint: chemical cleaning, light etching and final passivating.

**Alodine** Proprietary treatment similar to Alochrome.

**Aloft** Airborne light-optical-fibre technology.

**Alofts** Active low-frequency towed sonar [H adds helo].

**ALON, ALON** Aluminium oxynitride.

**along and across** Configuration of track position display unit in which separate windows show continuous reading of distance to go (along) and distance off track (across), usually driven by Doppler.

## alongside

**alongside** Of a carrier, in port.

**ALOS** Advanced land-observing, or observation, satellite.

**ALOTS** Airborne lightweight optical tracking system [precision photograph of ballistic vehicles].

**ALP** 1 Aircraft landing permit.  
2 Aegis Leap program.

**AIP** Aluminium powder.

**ALPA** 1 Airline Pilots Association [Washington, DC20036] (US, Canada).  
2 Air Line Pilots Association International [Herndon, VA20172–1169] (Int.).

**Alpas** Air Line Pilots' Association of Singapore.

**Alpax** Aluminium alloy containing c13 per cent Si, for intricate castings (1932).

**alpha** Angle of attack of main wing ( $\alpha$ , AOA).

**Alpha eta rho** International aviation fraternity (office at St Louis University, Cahokia IL).

**alpha exit** The first available runway turnoff.

**alpha floor** Mainly to protect against windshear, system which automatically applies full power if AOA exceeds preset value, and earlier if rate of change of TAS/GS passes preset thresholds.

**alpha hinge** 1 Crossed-spring pivot (eg in tunnel balance).  
2 Confusingly, drag hinge.

**alpha max** The maximum attainable AOA with stick fully back.

**alphanumeric** Character representing capital letter or numeral portrayed in precisely repeatable stylised form either by electronic output (computer peripheral or display) or printed in same form for high-rate reading by OCR system.

**alpha particle** Nucleus of He atom: 2 protons, 2 neutrons, positive charge.

**Alpha prot** Short for protection, the maximum attainable stick-free AOA. Auto trim stops there, because there is no reason to maintain this condition.

**alpha speed,  $\alpha$ -SPD** Safe stall-margin speed (auto-throttle mode setting).

**alpha vane** Transducer measuring AOA.

**Alply** Trade name (Alcoa) of sandwich comprising polystyrene foam between two sheets of aluminium.

**ALQA** Automatic link quality analysis.

**ALQDS** All quadrants.

**ALQR** Air-launch quick reach.

**ALR** 1 Alerting message [S adds Service].  
2 Aircraft (or airborne) liferaft.  
3 JETDS code: piloted, countermeasure, passive.  
4 Arbeitsgruppe für Luft und Raumfahrt (Switzerland).

**ALRAAM** Advanced long-range air-to-air missile.

**Alrad** Airborne laser ranger and designator.

**ALRI** Airborne long-range radar input.

**Alround** Translated= association of aerospace SMEs (G).

**ALS** 1 Approach light system (FAR Pt 1).  
2 Airfield, or aerodrome, lighting system (CAA).  
3 Alert-level standard.  
4 Automatic takeoff and landing system (RPV).  
5 Advanced launch system, HLLV for SDI (US).  
6 Air [or airborne] launch system.  
7 All-weather landing system, or (Matcals) subsystem.  
8 Augmented , or acquisition, logistics support.

## altimeter errors

9 Application layer structure.

10 Advanced life support.

**ALSC** Advanced logistic systems center (ALFC).

**ALSCC** Apollo lunar-surface close-up camera.

**ALSCU** Auxiliary level sense control unit [fuel transfer].

**ALSEP** Apollo lunar-surface experiment[s] package.

**ALSF** Approach lights, sequenced flashing.

**ALSIP** Clear.

**ALSL** Alternative landing ship, logistic (UK RAF).

**AL/SL** Weapon capable of being air-launched or surface-launched (ie from surface vessel) (USN).

**ALSS** 1 Air-launched saturation-system [missile].  
2 Advanced logistic support site[s].

**ALSTG** Altimeter setting (ICAO).

**alt, ALT** 1 Altitude [especially barometric], or altimeter.  
2 Alternate [i.e., alternative] airfield or destination.  
3 Automatic altitude hold.  
4 Attack light torpedo.  
5 Approach and landing tests (Shuttle).  
6 Automatic, or airborne, link terminal.  
7 Airborne laser tracker.

**ALTA** 1 Association of Local Transport Airlines [office, Washington DC] (US).  
2 Asociación Latinoamericana de Transportadores Aéreos [C adds cargo].  
3 Airborne [or advanced] lightweight tactical antenna.

**Altair** ARPA long-range tracking and instrumentation radar.

**ALTBMD** Active layered theatre ballistic-missile defence.

**alternate** 1 Incorrectly, has come to mean "alternative" in flight operations; alternative destination, designated in flight plan as chosen if landing not possible at desired destination.  
2 As applied to landing gear, flaps, etc, means using emergency power such as electrically driven pump(s).

**alternate hub airport** Secondary civil airport at large traffic centre.

**alternating light** Intermittent light of two or more alternate [correct usage] colours.

**Alternative simplified credit** Laws enabling companies to claim benefit [currently 12 per cent] on qualified research spending (US).

**alternator** A.c. generator.

**ALTF** Automatic launch test facility, carries out confidence check on XPDR as aircraft taxies to runway.

**ALTG** Air and Land, or Air/Land, Technology Group (UK MoD).

**Alt Hold** Altitude-hold mode.

**altigraph** Recording altimeter; generally aneroid barograph, and thus subject to inaccuracy in pressure/height relationship assumed in calibration.

**altimeter** Instrument for measuring and indicating height. Pressure \* is aneroid barometer or atmospheric pressure gauge calibrated to give reading in height. Sensitive \* has stack of aneroid capsules, refined drive mechanism to multiply capsule movements with minimal friction or free play, and setting knob to adjust to different SL or airfield pressures (or to read zero at airfield height). In servo-assisted \* mechanism is replaced with more accurate electrical one (see *engine* \*, *radio*\*).

**altimeter errors** Apart from servo-assisted altimeter, all pressure altimeters suffer significant lag, so rapid reversal

of climb and descent will give a reading up to 200–300 feet in arrears; called lag or hysteresis. There are errors in drive friction and lost motion. Static pressure sensed is subject to PE(2) and compressibility errors, and to transient excursions during manoeuvres. Most significant, parameter measured depends on atmospheric pressure variation, temperature variation and variation in lapse rate between departure airfield and aircraft height (see *altimeter setting*).

**altimeter fatigue** Supposed tendency of aneroid system to become 'set' in distorted position in long flight at high altitude; this error, not confirmed by most authorities, is called fatigue or, confusingly, hysteresis.

**altimeter lag** See *altimeter errors*.

**altimeter setting** For safe vertical separation all altimeters in controlled airspace must be set to uniform datum. Standard is 1013.25 mb (see *ISA*) throughout most en route flying. Instrument then registers vertical separation between aircraft and pressure surface 1013.25 mb, usually below local ground level and may be below local SL or MSL. Second common setting is QNH, at which reading is difference between aircraft height and MSL. Third common setting is QFE, at which reading is difference between aircraft height and appropriate airfield height AMSL; thus at that airfield instrument reads zero. Two other settings, QFF and QNL, seldom necessary. See next.

**altimeter setting region** Geographical area for which the lowest value of QNH is broadcast hourly by control centres.

**altimeter switch** Triggered by reaching preset altitude, one application to trigger explosive charge.

**altimetric valve** Device sensitive to increasing cabin altitude (ie, falling pressure) and set to release drop-out oxygen at given level.

**altitude** 1 Vertical distance of level, point or object considered as point, measured from MSL (normally associated with QNH) (DTI, UK). In this dictionary meanings are given for 17 other measures of \*.

2 Arc of vertical circle, or corresponding angle at centre of Earth, intercepted between heavenly body and point below it where circle cuts celestial horizon.

3 In spaceflight, distance from spacecraft to nearest point on surface of neighbouring heavenly body (in contrast to "distance", measured from body's centre).

4 In aircraft performance measurement and calculation, pressure \* shown by altimeter set to 1013.25 mb.

**altitude acclimatisation** Gradual physiological adaptation to reduced atmospheric pressure.

**altitude chamber** Airtight volume evacuated and temperature-controlled to simulate any atmospheric level.

**altitude clearance** Clearance for VFR flight above smoke, cloud or other IFR layer.

**altitude datum** Local horizontal level from which heights or altitudes are measured (see *true altitude, pressure altitude, height*).

**altitude delay** 1 Deliberate time-lag between emission of radar pulse and start of indicator trace, to eliminate altitude hole or slot.

2 See next entry.

**altitude-delay parameter** Time delay which elapses between pilot nose-up command and establishment of positive climb, esp. during landing approach. ADP is

serious in large aircraft with pitch control by tail surfaces, not canard, and without DLC.

**altitude hole** Blank area at centre of radial (eg PPI) display.

**altitude line** On environmental plot, line joining points of minimum range at which WX main beam intersects ground.

**altitude power factor** In piston engine ratio of power developed at specified altitude to power at same settings at ISA SL.

**altitude parallax** In altitude (2), angle between LOS from body to observer (assumed on Earth's surface) and LOS from body to centre of Earth.

**altitude recorder** Altigraph.

**altitude reservation, ALTRV** Airspace utilisation under prescribed conditions, normally employed for mass movement or other special-user requirements which cannot otherwise be accomplished (FAA).

**altitude ring** Continuous return across WX display at range equivalent to aircraft's altitude.

**altitude sensing unit** Capsule-based unit in engine fuel system sensing aircraft speed/altitude.

**altitude sickness** Malaise, nausea, depression, vomiting and ultimate collapse, caused by exposure to atmospheric pressure significantly lower than that to which individual is acclimatised.

**altitude signal** In airborne radar operating in forward search mode, unwanted return signal reflected by Earth directly below.

**altitude slot** Blank line at origin of SLAR display.

**altitude switch** Barometric instrument which makes or breaks electric circuit at preset pressure altitude; contacting altimeter.

**altitude testing** Testing an item [e.g., a gas-turbine engine] in a facility capable of reproducing inlet ram total temperature and pressure appropriate to the test altitude and Mach numbers, and also the appropriate exit static pressure.

**altitude tunnel** Wind tunnel whose working section can simulate altitude conditions of pressure, temperature and humidity. In view of advantages of high pressure and driest possible air, conditions chosen usually compromise.

**altitude valve** In some carburettors, progressively closed by aneroid to reduce fuel flow at high altitudes.

**ALTN, Altin** 1 Alternate airfield.

2 Alternating (two-colour light).

**altocumulus, Ac** Medium cloud, about 12,000 ft in groups, lines or waves of white globules.

**altostratus, As** Stratiform veil 6,000–20,000 ft with ice-crystal content of variable thickness (giving mottled appearance) but usually allowing Sun/Moon to be seen.

**ALTP** Air Line Transport Pilot licence; confusingly, now often called ATPL.

**ALTR** Approach/landing thrust reverser.

**ALTRV** Altitude reservation.

**ALTS** Altimeter setting.

**ALTV** Approach and landing test vehicle.

**ALU** Arithmetic and logic unit.

**Alumel** Ni-Al alloy or coating.

**Alumigrip** Trade name of paint used on airframe exterior.

**Alumilite** Trade name for sulphuric-acid anodizing process for aluminium and alloys.

**alumina** Aluminium oxide  $\text{Al}_2\text{O}_3$ , occurring naturally but also manufactured to close tolerance in various densities. Hard, refractory, white or transparent ceramic.

**aluminium (N America, aluminum)**, Al Metal element, density about 2.7, MPt 661°C, BPt 2,467°C, most important structural material in aerospace, commercially pure and, esp., alloyed with other metals (see *duralumin*).

**aluminium alloys** Most important of so-called light alloys; 3,500+ used in aerospace. most recent families being 2000 Al-Cu, 5000 Al-Mg, 6000 Al-Mg-Si, 7000 Al-Zn and 8000 Al-Li. The strongest are not corrosion-resistant, and need coating with [typically aluminium-epoxy] paint.

**aluminium-cell arrester** Lightning arrester/conductor in which insulating film of aluminium plates breaks down and conducts at high applied voltage.

**aluminium dip brazing** Method of metallising printed-circuit boards, by closely controlled dipping in molten aluminium.

**aluminum** Aluminium (N America).

**Alvin** Air-launched vehicle investigation (MALV).

**ALVRJ** Air-launched low-volume ramjet.

**ALW** Air/land warfare.

**ALWS** Airborne laser warning system.

**ALWT** Airborne (or advanced) light weight torpedo.

**AM** 1 Air Ministry (defunct in UK).

2 Aircraft mover.

3 Airspace management.

4 Or a.m., amplitude modulation.

5 Air Marshal.

6 Confusingly, ambient.

7 Asynchronous machine.

8 Airlock module.

**am** 1 Ambient.

2 Attometre,  $10^{-18}$ m.

**a.m.** Ante-meridian, before noon.

**AM-2** Standard military prefab airstrip or landing mat, of 0.16 in aluminium (US).

**AM<sup>3</sup>** Affordable multi-missile manufacturing [program] (US).

**AMA** 1 Air materiel area (USAF).

2 Aerospace Medical Association [office, Washington, DC] (US).

3 Advanced mobility aircraft.

4 Adaptive multifunction antenna.

5 Area minimum altitude.

6 American Management Association.

7 Academy of Model Aeronautics [office Washington, DC] (US).

**AMAC** Airborne multi-application computer.

**AMACH** Mach number (data-processing).

**AMACUS** Automatic microfilm aperture card updating system (Singer).

**AMAD** Airframe-mounted accessory [or auxiliary] drive.

**AMAGB** Airframe-mounted accessory gearbox.

**amagnetic** Having no magnetic properties.

**AMAL** Air Medical Acceleration Laboratory (USN).

**AMARC** Aerospace Maintenance and Regeneration Center [the Boneyard] (US DoD).

**AMARV** Advanced manoeuvring re-entry vehicle.

**AMAS** Automated manoeuvring attack system.

**Amascos** Airborne maritime situation control system.

**Amass** Airport movement-area safety system (FAA).

**Amatol** High explosive (AMmonium nitrate And TOLuene).

**AMB** 1 Air Mobile Brigade.

2 Airwarp Modernization Board (1957–58).

3 Agile multi-beam.

4 Active magnetic bearing.

**Ambac** R-Nav system (see *Mona*).

**AMBE** Advanced multi-band excitation.

**Amber** 1 Colour identifying global groups of airways aligned predominantly N–S.

2 Colour = caution, also called yellow.

3 Day/night training equipment, often called two-stage amber, in which pupil pilot is denied visual cues outside cockpit by wearing blue-lens glasses while cockpit transparency is amber; two stages together cut off 99% of light, while allowing pupil to see blue instruments and instructor to see amber outside world (obsolete).

**ambient** Characteristic of environment (eg that around aircraft but unaffected by its presence).

**ambit** Radar search by missile for target.

**AMBL** Air Maneuver Battle Lab (USAF).

**AMC** 1 Aerodynamic mean chord.

2 Acceptable means of compliance.

3 Avionics Maintenance Conference [Annapolis, MD21401] (US and Int.).

4 Air Materiel Command (USAF).

5 Air Mobility Command (USAF, 1 June 92).

6 Automatic modulation control.

7 Air management computer.

8 Authorised maintenance centre.

9 Advanced mission computer.

10 Advanced microelectronics converter.

11 Air Mounting Centre.

12 Advanced mobility concept (USA).

13 Airspace management cell [Langen] (Eurocontrol).

14 ATC 1 microphone check.

**AMCA** Airborne mission control aircraft (USAF).

**AMCC** Air Movements Co-ordinating Centre (NATO).

**AMC-C<sup>2</sup>IPS** AMC (5) C<sup>2</sup> information-processing system.

**AMCD, AMC&D** Advanced mission computer[s] and displays [program] (USN).

**AMCM** Airborne mine countermeasures.

**AMCOM, Amcom** Aviation and Missile Command (USA); MAT adds multimode airframe technology.

**AMCP** Aeronautical mobile communications panel.

**AMCS** 1 Adaptive microprogrammed control systems (IBM).

2 Airborne missile control system (aircraft-mounted).

3 Airborne mine countermeasures system.

**AMCTS** Air maneuver collective training system.

**AMD** 1 Aerospace Medical Division (USAF, Brooks AFB).

2 Automatic map display.

3 (rare) Air mileage distance.

4 Angular-momentum desaturation.

5 Amend[ed].

6 Archway metal detector.

7 Aerospace, Maritime and Defence (industrial association, S. Africa).

**AMDA** Airlines Medical Directors Association [office, St Paul, MN].

**Amdar, AMDAR** Automated mission data airborne recording.

**AMDB** Airport-mapping database.

**AMDP** Air Member for Development and Production (UK, WW2)

**AMDS** 1 Automatic manoeuvre device system.  
2 Anti-missile discarding sabot.

**AMDSS** Airborne mine-detection and survival system (USN).

**amdt** Amendment (FAA).

**AMDWS** Air and missile defense work station (USA, USAF).

**AME** 1 Authorised medical examiner.  
2 Alternate [alternative is meant] mission equipment.  
3 Air Mobility Element (USAF).  
4 Angle-measuring equipment.  
5 Amplitude-modulation equivalent, or equipment.  
6 Aircraft, multi-engine [L adds land, S sea].  
7 Aviation Maintenance Engineers Association [Fredericton, NB, Canada].

**AMEA** Aircraft Maintenance Engineers Association (US).

**AMEC** Advanced multifunction embedded computer.

**AMeDAS** Automated met data-acquisition system (J).

**AMEL** 1 Active-matrix electroluminescent [D adds display].  
2 Aircraft maintenance engineer's licence.

**amended clearance** Clearance altered by ATC while flight en route, typically requesting change of altitude or hold, to avoid future conflict unforeseen when clearance filed.

**American National** Family of 60° screw (bolt) threads, basically divided into National Coarse (NC), National Fine (NF) and National Special (N), which have in part superseded SAE and ASME profiles.

**AMES** 1 Airborne mission-equipment subsystem.  
2 Advanced multiple-environment simulator.

**Ames** Major NASA laboratory, full title Ames Research Center, Moffett Field, Calif., mainly associated with atmospheric flight (from 1939).

**AMET** 1 Advanced military engine(s) technology.  
2 Accelerated mission endurance test.

**AMF** 1 Allied [Command Europe] Mobile Force [-A adds Air].  
2 Armé Marin & Flygfilm (Sweden).  
3 Airborne maritime and fixed [radio stations].

**AMFA** Aircraft Mechanics Fraternal Association [office, St Ann, MO] (US).

**AMFI** Aviation Maintenance Foundation International [office, Basin, WY] (US).

**AMF-JTRS** Airborne and maritime fixed-station joint tactical radio system (USAF/USN).

**AMFP** Adaptive matched-field processor, or processing.

**AMG** 1 Antenna mast group.  
2 Aero mission gear.

**AMGCS** Advanced movements guidance control system (airport).

**AMHF** American Military Heritage Foundation.

**AMHMS** Advanced magnetic helmet-mounted system.

**AMHS** Aeronautical message handling system.

**AMI** 1 Airline modifiable information.  
2 Avionics midlife improvement.

**A/MI** Airspeed/Mach indicator.

**AMICS** Adaptive multidimensional integrated control system.

**AMID** 1 Airborne mine[field] detection [ARS adds and reconnaissance system, S adds system].  
2 Airport management and information display [S adds system].

**Amids, AMIDS** 1 Advanced missile-detection system.  
2 Airport management information and display system.

**AMII** Air manoeuvre information infrastructure.

**AMIK** Automic target-recognition system (Sweden).

**AMIMU** Advanced multisensor inertial measurement unit.

**amino** Group  $-NH_2$  which can replace hydrogen atom in hydrocarbon radical to yield amino acids; these play central role in metabolic pathways of living organisms; thus of interest in space exploration.

**AMIPS** Adaptive multiple-image projector system.

**AMIR** 1 Air Mission Intelligence Report, detailed and complete report on results of air mission.  
2 Anti-missile infra-red.

**AMIRS** Advanced multirole IR sensor.

**AMIS** 1 Anti-materiel incendiary submunition.  
2 Aircraft-movement identification section.

**AMIZ** Australian Maritime Identification Zone [up to 1,000 n.m. planned].

**AMJ** Advisory material joint.

**AMK** 1 FAA-approved airplane modification kit.  
2 Anti-misting kerosene.

**AML** 1 Adaptive manoeuvring logic.  
2 Aeronautical Materials Laboratory (USN, established 1935).  
3 Admiralty Materials Laboratory (Holton Heath).  
4 Approved model list (FAA).

**AMLCD** Active-matrix [or advanced multifunction] liquid-crystal display.

**AMM** 1 Aircraft maintenance manual.  
2 Aircraft maintenance and modification.  
3 Anti-missile missile.

**AMMC** Aeronautical materiel management center.

**AMMCS** Airborne multiservice/multimedia communications system.

**ammeter** Instrument for measuring electric current (d.c. or a.c., or both in case of 'universal testers') with reading usually given in amperes.

**AMMF** Approximate model-management framework[s].

**AMMM** Affordable multi-missile manufacturing [program].

**ammo** Ammunition (UK colloq.).

**Ammod, AMMOD** Automatic man-made object detection (UAV).

**Ammonal** High explosive (AMMONium nitrate + ALuminium, and often finely divided carbon).

**ammonia**  $NH_3$ , gas at ISA SL, pungent, toxic, present in atmosphere of Jupiter (ice crystals and vapour) and more distant planets (frozen solid). Ammonium chloride in 'dry batteries', nitrate in many explosives, perchlorate plasticised propellants in large solid rocket motors, sulphate soldering and brazing flux and in dry cells, and several compounds in fireproofing.

**AMMP** Attack-mission management processing.

**AMMTIAC** Advanced Materials Manufacturing Training and Information Analysis Center (USAF).

**ammunition** Projectiles and propellants for guns; increasingly, guided weapons are logically treated as \* but term normally excludes them.

**ammunition quality** Coefficient of, symbol  $r_p = \frac{P}{mW}$  where P is hit probability of each shot, m is mass of projectile and W is required average hits for kill.

**ammunition tank** Compartment or container housing ammunition for airborne automatic weapon, usually in form of belt arranged in specified way; reloadable, usually when removed from aircraft.

**AMNS** Airborne mine-neutralization system. (USN)

**AMNTK** Aircraft engine design office (R).

**AMO** 1 Air Ministry Order[s].

2 Air mass zero, test condition for solar arrays and other space hardware.

3 Approved maintenance organization.

4 Airspace Management Officer.

5 Air and marine operations (US CBP).

**AMOC** 1 Air & Marine Operations Center (US Customs Service at March AFB).

2 Alternative methods, or means, of compliance (FAA).

**AM1** Single-crystal material for HPT blades.

**Amors** Airborne multifunction optical radar system.

**amortisation** Fiscal process of writing-down value of goods and chattels over specified period. Typically, transport aircraft \* over five, seven or ten years, after which book value is zero. Rate exerts major influence on DOC.

**AMOS** Automatic meteorological observation system, or observing station.

**Amosa** Association of Aviation Maintenance Organisations in Southern Africa (Johannesburg).

**AMOSP** Airborne multimission optronic stabilized payload.

**AMOSS, Amoss** Airline maintenance and operations support system [self-diagnoses in flight and tells ground computer].

**AMP** 1 Assisted maintenance period (aircraft carrier).

2 Avionics master plan (USAF).

3 Advanced mission planning, update of CPGS [A adds aid, S adds system].

4 Audio management panel.

5 Aerospace materials program.

6 Advanced modular processor.

7 Avionics, or aircraft modification, or modernization program[MI].

8 Atomic materialization process.

9 Application message protocol.

10 Advanced manoeuvre program [me].

11 Air Member for Personnel (UK).

12 Accelerated maturation program.

13 Air mobility platform.

**amp** Ampere[s].

**AMPA** Advanced mission-planning aid.

**Ampac** Air-mobility precision-approach capability.

**AMPD** Advanced multi-purpose display[s].

**ampere** SI unit of electric current (quantity per unit time), symbol A; named for A.M. Ampère but no accent in unit except in F. Hence: ampere-hour (1 A flowing for 1 h); ampere-turn (unit magnetising force, 1 A flowing round 1 turn of coil).

**AMPG, a.m.p.g.** Air-miles per gallon, air distance flown per gallon of fuel consumed. UK gallon was Imp; distance

was statute miles (not "air miles"). In US, st. mi. and US gal (0.83267 Imp gal). New unit must be found; SI suggests air metres per litre, unless fuel measured by mass (see *AMPP, NAMP*).

**amphibian** Aerodyne capable of routinely operating from land or water. In US occasionally amphibion.

**amplidyne** D.c. generator whose output voltage governed by field excitation; formerly used as power amplifier in airborne systems.

**amplification factor** In thermionic valve (radio vacuum tube), ratio of change in plate voltage to change in grid voltage for constant plate current (UK, plate = anode).

**amplifier** Device for magnifying physical or mechanical effect, esp. electronic circuit designed to produce magnified image of weak input signal whilst retaining exact waveform.

**amplitude** 1 Maximum value of displacement of oscillating or otherwise periodic phenomenon about neutral or reference position.

2 Angular distance along celestial horizon from prime vertical (ie due N–S) of heavenly body, generally as it rises or sets at horizon.

**amplitude modulation** MCW or A<sub>2</sub> emission in which AF is impressed on carrier by varying carrier amplitude at rate depending on frequency, and depth of modulation depending on audio amplitude.

**amplitude modulation equipment [or equivalent]** Processes info. and carrier separately and reconstructs them to make equivalent AM signal.

**AMPP, a.m.p.p.** Air miles per pound (of fuel), air distance flown for each pound avoirdupois of fuel consumed, former measure of specific range (see *AMPG, NAMP*).

**AMPS** 1 Advanced multi-sensor payload system.

2 Aviation mission-planning system (USA).

3 Automatic message-processing system.

**AMPSS** Advanced manned precision strike system.

**AMPT** 1 Air miles per tonne [of fuel].

2 Advanced missile propulsion technology [generally means airbreathing].

**AMPTE** Active Magnetospheric Particle Tracer Explorer(s).

**AMR** 1 Airport movement radar.

2 Atlantic Missile Range, military (DoD) range originally run by Pan Am and RCA from Patrick AFB and also serving NASA's KSC at Cape Canaveral.

**Amraam, AMRAAM** Advanced medium-range AAM.

**AMRC** Aerospace Maintenance and Regeneration Center [previously MASDC].

**AMRDEC** Aviation and Missile RD&E Center [Redstone Arsenal] (USA).

**Amrics** Automatic management radio and intercom system.

**AMRL** 1 Aerospace Medical Research Laboratory (USAF).

2 Aeronautical and Maritime Research Laboratory [Melbourne, Vic. 3001] (Australia).

**AMRS** Advanced maintenance-recorder system.

**AMS** 1 Aeronautical Mobile Service, radio-communication service between aircraft or between aircraft and ground stations.

2 Air Maintenance Squadron (USAF).

3 Aircraft management simulator [or system].

4 Academy of Military Science (USA).

5 Air [or aerospace, or aircraft] material specification.  
 6 Advanced missile system (USN).  
 7 Apogee and manoeuvring stage.  
 8 Automated message switch.  
 9 Airborne maintenance subsystem.  
 10 Avionics, or airspace, management system, or service.  
 11 Altitude management [and alert] system.  
 12 American Material Standard.  
 13 American Meteorological Society [office, Boston, MA02108] (US).  
 14 Automatic marking system, or subsystem.  
 15 Automatic meteorological system.  
 16 Apron management service.  
 17 Automated manifest system.  
 18 Aviation Manpower and Support (USMC).  
 19 Aircraft Maintenance Standards (CAA).  
 20 Aerospace Material Specification[s] (SAE).  
**AMSA** Advanced manned strategic aircraft.  
**AMSA** Army Materiel Systems Analysis Activity (USA).  
**Amsam** Anti-missile SAM (1).  
**Amsar, AMSAR** 1 Airborne multimode, or multirole, or multipurpose, solid-state, active-array radar.  
 2 Airborne multifunction steerable-array radar.  
**Amsat** Amateur radio-satellite organization [Silver Spring, MD20910-4703] (Int.). **Amsat UK**, office, Henfield BN5 9YB.  
**AMSC** Automatic message-switching centre.  
**AMSD** Aircraft Maintenance Standards Department (CAA).  
**AMSE** Automatic message-switching equipment.  
**AMSG** Air Mobility Support Group (USAF).  
**AMSL, a.m.s.l.** Above mean sea level.  
**AMSO** Air Member for Supply and Organisation (UK, WW2).  
**AMSR** Advanced microwave scanning radiometer.  
**AMS(R)S** Aeronautical mobile satellite (route) service.  
**AMSS** 1 Advanced multi-sensor system (EW, SOJ, AEW).  
 2 Aeronautical mobile satellite service [P adds panel].  
 3 Airborne mission-support system.  
 4 Automatic message-switching system (AFTN).  
**AMST** Advanced medium STOL transport.  
**AMSTE** Affordable moving surface-target engagement.  
**AMSU** 1 Aircraft-motion sensor, or sensing, unit [digital FCS].  
 2 Air-motor servo unit.  
 3 Advanced microwave sounding unit.  
**AMT** 1 Accelerated mission test[ing].  
 2 Aircraft [or aviation] maintenance technician.  
 3 Advanced metal-tolerant tracker [or tracking system].  
 4 Air maneuver [and] transport, C-130/C-17 capability plus V/STOL (USA).  
 5 Association for Manufacturing Technology (US).  
 6 Aviation Maintenance Technology [Vincennes University, IN 47591-0086] (US).  
**amt** Amount.  
**AMTC** Aerospace Medicine Training Centre.  
**AMTD** 1 Aircrew maintenance-training device.  
 2 Adaptive moving-target detector, detection, or device.

**AMTE** Adjusted megaton equivalent.  
**AMTI** Airborne, or air, moving-target indicator, or indication.  
**Amtorg** Former organisation for importing and licensing US products (USSR).  
**Amtos, AMTOS** Aircraft-maintenance task-oriented support [second S adds system].  
**AMTS** 1 Adaptive marked-target simulator.  
 2 Aeronautical message transfer service.  
 3 Aerial, or air-to-air, missile target system.  
**AMTT** See *AMT* (3).  
**AMU** 1 Air mileage unit.  
 2 Astronaut maneuvering unit.  
 3 Aircraft maintenance unit; F adds facility.  
 4 Audio-, or avionics-, management unit.  
 5 Antenna-matching unit.  
 6 Auxiliary memory unit.  
 7 Air Mobility Unit (USAF).  
**AMUST** Airborne manned/unmanned system technology; -D adds demonstration.  
**AMUX** Audio multiplexer.  
**AMW** Air Mobility Wing (USAF).  
**AMWD** Air Ministry Works Department [airfield and building construction, formerly] (UK).  
**AMWM** Aircraft maintenance wiring manual.  
**amyl** Family of univalent hydrocarbon radicals, all loosely  $C_5H_{11}$ , esp.: amyl acetate (banana oil) solvent and major ingredient of aircraft dopes; and amyl alcohol, in lacquers.  
**AN** 1 Air navigation.  
 2 Prefix to designation codes of US military hardware denoting “Army-Navy”; now rare, though code system remains.  
 3 Airworthiness Notice.  
 4 [or A/N] alphanumeric.  
**A<sub>n</sub>** Acceleration normal to flight path, usually along OZ axis.  
**AN<sup>2</sup>** Product of gas-turbine annulus area at turbine rotor-blade mid-length and square of rotational speed.  
**ANA** 1 Air Navigation Act.  
 2 Association of Nordic Aeroclubs (Int.).  
 3 Association of Naval Aviation Inc. [53 chapters, office Alexandria, VA] (US).  
 4 Aeroportos e Navegacao Aerea (Portugal).  
**ANAAA** Association of N American Air Ambulances [office, Blackwood, NJ] (US, Canada).  
**anabatic wind** Wind blowing uphill as result of insolation heating slope and adjacent air more than distant air at same level.  
**ANAC, Anac** 1 Automatic nav/attack control(s).  
 2 Civil aircraft certification authority (Brazil).  
**Anaca** Associazione Nazionale Assistenti e Controllori della Navigazione Aerea [office, I-00181 Rome] (Italy).  
**anacoustic region** Extreme upper level of atmosphere (say, 100 miles above Earth) where mean free path too great for significant propagation of sound.  
**ANAE** Académie Nationale de l'Air et de l'Espace [Toulouse] (F).  
**ANAEM** Aircraft noise and aviation emissions mitigation.  
**anaglyph** Picture, generally photographic but often print-out from some other system, comprising stereoscopic pairs of images, one in one colour (eg red) and other

in second colour (eg blue). Viewed through corresponding (eg blue/red) spectacles, result appears three-dimensional.

**analog computer** 1 Computational device functioning by relating or operating upon continuous variables (in contrast to digital computers, which operate with discrete parcels of information). Simplest example, slide-rule.

2 Electronic computer in which input data are continuously variable values operated upon as corresponding electrical voltages. Actual hardware can be coupled directly in so that, for example, control response, angular movement and aeroelastic distortion of control surface can be investigated *in situ* and in real time.

**analog/digital converter, ADC** Device for converting analog output into discrete digital data according to specified code of resolution; also called digitiser and, esp. for linear and rotary movement, encoder.

**analog output** Transducer signal in which amplitude (typically quasi-steady voltage) is continuously proportional to function of stimulus.

**analyser** In piston engine installations, device intended to indicate mixture ratio by sampling composition of exhaust gas (hence EGA, exhaust-gas \*). Some for static-test purposes depend on chemical absorption of carbon dioxide, but airborne instrument uses Wheatstone bridge to measure variation in resistance due to proportion of carbon dioxide in gas.

**analysis** Stress analysis.

**ANAO** Australian National Aerospace Organization [office Yagoona, NSW].

**anaprop** Anomalous propagation.

**ANASA** Azerbaijan National Aerospace Agency.

**Anasics** Alaska National Airspace System Interfacility Com. System.

**Anazot** A resin foam for fuel-tank protection.

**ANB** 1 Air Navigation Bureau (ICAO).

2 Adaptive narrow beam(s).

**ANC** 1 Air navigation charges.

2 Air Navigation Commission, or Council (both ICAO).

3 Army/Navy/civil (US).

4 Aviate/navigate/communicate.

5 Active, or acoustic, noise cancellation, or control.

**ANCA** Airport Noise and Capacity Act [Congress] (US).

**Ancat** Abatement of nuisance caused by air transport.

**ANCB** Association Nationale Contre les Bangs (supersonic) (F).

**anchor-centred** Also anchor charge, anchor grain: solid rocket propellant charge in which initial combustion surface has cross-section resembling radial array of anchors, flukes outward.

**anchor light** Riding light.

**anchor line, cable** Cable running along interior of airdrop aircraft to which parachute static lines (straps) are secured.

**anchor-line extension kit** Assembly arranged to extend anchor line to allow airdropping through rear clamshell doors or aperture with such doors removed.

**anchor nut** Large family of nuts positively securable by means of screwed or bolted plate projecting from base (see *nut, nutplate, stiffnut, stopnut*).

**ANCOA** Aerial Nurse Corps of America.

**ANCS** Active noise control system.

**AND** 1 Active-nutation damping.

2 Aircraft nose-down.

3 Army/Navy drawing.

**ANDA** Associazione Nazionale Direttori di Aeroporto (I).

**ANDAG** Associazione Nazionale Dipendenti Aviazione Generale (I).

**ANDB** Air Navigation Development Board (US 1948–57).

**Anderson shelter** Small air-raid shelter assembled from sheet galvanized-steel pressings in pit and covered with deep layer of earth (UK, WW2).

**AND gate** Bistable logic function triggered only when all inputs are in ON state; in computers used as addition circuit, performing Boolean function of intersection. Hence AND/OR gate, AND/NOR, AND/NOT.

**AND pad** Standard Army/Navy drive accessory pad.

**ANDR** Air, or airborne, navigation data recorder.

**androgynous** Mating portions of docking system which are topologically identical (eg US and Soviet docking faces).

**ANDS** 1 Automatic navigation differential station.

2 Accelerate N, decelerate S, mnemonic for NTE (2).

**ANDVT** Advanced narrow-band digital voice terminal. **anechoic** Without echoes; thus, \* facility, \* room, in which specially constructed interior walls reduce reflections to infinite number of vanishingly small ones. Chamber can be designed to operate best at given wavelength, with sound, ultrasound, ultrasonic energy, microwaves and various other EM wavelengths. Mobile facilities used for boresighting nose radar of combat aircraft.

**anemogram** Record produced by anemograph.

**anemograph** Instrument designed to produce permanent record of wind speed (ie recording anemometer) and, usually, direction. Dines \* incorporates weathercock vane carrying pitot and static tubes.

**anemometer** Instrument for measuring speed of wind, usually 10 m (32.8 ft) above ground level. Robinson Cup \* has free-rotating rotor with three or four arms each terminating in a hemispherical or conical cup.

**anemoscope** Instrument for checking existence and direction of slow air currents.

**ANEPVV** Association Nationale d'Entraide et de Prévoyance du Vol à Voile [gliding; office, F-75006 Paris] (F).

**anergolic** Not spontaneously igniting; thus, most rocket-propellant combinations comprising two or more liquids. Opposite of hypergolic.

**aneroid** Thin-walled airtight compartment designed to suffer precisely predictable and repeatable elastic distortion proportional to pressure difference between interior and exterior. Most are evacuated steel capsules in form of disc with two corrugated faces which can approach or recede from each other at centre. To increase displacement a stack can be used linked at adjacent centres. Common basis of pressure altimeter, ASI and Machmeter.

**aneroid altimeter** Pressure altimeter; aneroid barometer calibrated to read pressure altitude.

**aneroid altitude** Pressure altitude.

**ANFCMA** Associazione Nazionale Famille Caduti e Mutilati dell'Aeronautica (I).

**ANF** Anti-navire futur (F).

**ANG** Air National Guard (US); B adds base.

**angels**

**angels** 1 Historic military R/T code word for altitude in thousands of feet; thus, ‘angels two-three’ = 23,000 ft.

2 Distinct, coherent and often strong (40 dB above background) radar echoes apparently coming from clear sky. Probable cause strong pressure, temperature or humidity gradient in lower atmosphere giving even sharper gradient in refractive index.

**Angit** Aircraft next-generation identification transponder.

**angled deck** Aircraft-carrier deck inclined obliquely from port (left) bow to starboard (right) stern to provide greater deck space, greater catapult capacity and unobstructed flight path further from island than with axial deck, with safe parking area towards bow.

**angle of . . .** In general, see under operative word.

**angle of attack indicator** Instrument served by \*\*\* sensing system.

**angle of attack sensing system** Incorporated in aircraft, esp. aeroplane, to trigger stall-warning, stall-protection system or other desired output, and possibly serve an indicator. Sensing unit (SU) comprises freely pivoted vane or series of pitot tubes set at different angles of incidence and each connected to different supply pipe to give dP output. SU on wing leading edge, to sense movement of stagnation point, or on side of fuselage, repeated on opposite side to eliminate error due to sideslip. SU anti-iced and must allow for changes in aircraft configuration.

**angle of depression** Acute angle between axis of oblique camera and horizontal.

**angle of downwash** Downwash (I).

**angle off** Acute angle between own-fighter sightline and longitudinal axis of target aircraft.

**angle of incidence indicator** Instrument giving continuous reading of angle of foreplane, horizontal tail (especially tailplane where not primary pitch control) or wing, where incidence variable.

**angle of view** Angle subtended at perspective centre of camera lens by two opposite corners of format.

**Anglico** Air/naval gunfire liaison company (USMC).

**ANGR** Air navigation (general) regulation[s] (UK).

**ANGRC** Air National Guard Readiness Center.

**ANGSA** Air National Guard support aircraft.

**Angström Unit** Å or AU, unit of length equal to  $10^{-10}$  m, formerly used to express wavelengths of light; nearest SI is nanometre; 1 nm = 10 Å.

**angular acceleration** Time rate of angular velocity of body rotating about axis which need not pass through it; unit rad/s<sup>2</sup>.

**angular displacement** 1 Angular difference between two directions or axes, esp. between reference axis of hinged or pivoted body and same axis in neutral or previous position.

2 In magneto, angular difference between neutral position of rotor pole and later position giving highest-energy spark (colloq., E-gap).

**angular distance** 1 Angular displacement.

2 Smaller arc of great circle joining two points expressed in angular measure.

3 In all sine-wave phenomena (radio, radar, astronomy, etc), number of waves of specified frequency between two points (numerically multiplied by 360 or  $2\pi$  depending on whether unit is degree or radian).

**angular measure** 1 SI unit of plane angle is radian (rad), angle subtended by arc equal in length to radius of circle

on which arc centred. Thus one revolution =  $2\pi$  rad, and 1 rad =  $57.296^\circ$ . Degree ( $^\circ$ ) defined as 1/360th part of one revolution, itself subdivided into 60 minutes ('') each subdivided into 60 seconds ("); pedantically distinguished from units of time by calling them arc-minutes and arc-seconds. Thus 1 rad =  $57^\circ 17' 45''$ . For small displacements milliradian (mrad) to be used; roughly  $3' 26\frac{1}{4}''$ ; thus 1' = 0.2909 mrad.

**angular momentum** For rigid body of significant mass (not elementary particle), product of angular velocity and moment of inertia; or, if axis of rotation at some distance from it (as in axial turbine blade), mass, instantaneous linear velocity and radial distance of CG from axis. Thus,  $L = I\omega = mv r$ .

**angular resolution** Angular distance between LOS from radar, human eye or other “seeing” system to target and LOS from same system to second target which system just distinguishes as separate object; usually only a few mrad, esp. if targets are pinpoints of light against dark background.

**angular speed** 1 Loosely, angular velocity.

2 Rate of change of target bearing, esp. as seen on PPI.

**angular velocity** Symbol  $\omega$ , time rate of angular displacement of body rotating about axis which need not pass through it. Preferred measure is rad s<sup>-1</sup> or mrad s<sup>-1</sup>; in traditional engineering most common is rpm. Multiplied by radius gives *tip speed*, or peripheral speed.

**anharmonic** Not harmonic, irregular.

**anhedral** 1 Negative dihedral, smaller angle between reference plane defining wing (such as lower surface or locus of AMCs) which slopes downward from root to tip, and horizontal plane through root. In early aircraft dihedral considered desirable as means to natural stability, esp. in roll; in some, and many modern gliders, wing flexure converts static \* into dihedral under 1 g in flight. Tendency to design modern wing with \* to counter excessive roll response to sideslip or side gusts, esp. in high-wing or supersonic aircraft. VG aeroplane angle may be varied with sweep. In the new century the term appears to be dying, replaced by dihedral with a minus sign

2 Some authorities define as ‘absence of dihedral’ (from Greek root of prefix *an* = not), and suggest “cathedral” for downward-sloping wing.

**ANIAF** Associazione Nazionale Imprese Aerofotogrammetriche (I).

**Anics** Alaskan NAS(2) interfacility communications system.

**ANIE** Associazione Nazionale Industrie Elettroniche ed Elettroniche (I).

**aniline** Phenylamine, aminobenzene, C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>, colourless, odorous amine, MPt -6°C (thus, normally liquid), BPt 184°C, turns gradually brown on exposure to air, reacts violently with RFNA or other strong nitric acids with which often used as rocket propellant.

**anion** Negative charged ion or radical, travels towards anode in electrolytic cell.

**anisotropic** Exhibiting different physical properties along different axes, esp. different optical properties or, in structural material, different mechanical properties, esp. tensile strength and stiffness.

**ANIU** Aircraft network interface unit.

**ANK** Automatic navigation kit.

**ANL** 1 Auto noise limiter (communications).

2 Automatic noise levelling.

**ANLP** Arinc network layer protocol.

**ANLS** Automatic navigation launch station.

**ANM** AFTN notification message.

**ANMI** Air navigation multiple indicator.

**ANMPG** Air nautical miles per gallon.

**ANMS** 1 Aircraft navigation and management system.

2 Automatic navigation mission station (UAV).

3 Automated noise monitoring system.

**ANN** Applied neural network.

**ann** Annunciator.

**annealing** Heat treatment for pure metal and alloys to obtain desired physical properties by altering crystalline microstructure. Usually involves heating to above solid-solution or critical temperatures, followed by gentle cooling in air. General aim to make metal less brittle, tougher, more ductile and relieve interior stress.

**annotation** Identifying and coding reconnaissance outputs, such as visual-light photographs, IR print-outs, ECM records, etc, with digital data: date, time, place, unit, altitude, flight speed, heading and data specific to reconnaissance system.

**annual** Annual mandatory inspection of aircraft, or renewal of C of A.

**annual variation** Amount by which magnetic variation at specified place on Earth varies in calendar year. In UK about  $-7^{\circ}$ (min), reducing local variation to zero in year 2140.

**annular combustion chamber** In gas-turbine engine, chamber [including flame tube(s) and liners] entirely in form of body of revolution, usually about major axis of engine.

**annular gear** Ring gear or annulus, gearwheel in which teeth project inwards from outer periphery. In annulus gear there is no centre, teeth being carried on open ring (which in turboprop/turbofan reduction gears may be resiliently mounted and torque-reacted by torque-signalling system). When shaft-mounted, teeth usually on one side only of flat or conical disc.

**annular injector** Rocket (or possibly other engine) injector in which liquid fuel and/or oxidant is sprayed from narrow annular orifice. In bipropellant engine numerous such orifices spaced around chamber head, alternately for fuel and oxidant.

**annular radiator** Cooling radiator shaped as body of revolution to fit around axis of aircraft engine, esp. between propeller and piston engine having circular cowl.

**annular spring** Has form of ring distorted radially under load. Sometimes called ring spring, esp. when given tapered cross-section and used in multiple, in an intermeshing stack, to resist load along axis of symmetry.

**annular wing** Wing in form of body of revolution, designed to operate in translational flight with axis of symmetry almost horizontal.

**annulus drag** Most often refers to base drag of annular periphery around propulsive jet nozzle which incompletely fills base of vehicle, esp. ballistic rocket rising through atmosphere.

**annunciator** 1 In gyrocompass (remote compass), indicator flag visible through window of cockpit instrument; with a.c. supply on and gyro synchronized with compass detector, indication should hover between dot and cross, never settle on either.

2 In aircraft system, esp. on aircraft having flight deck

rather than cockpit, panel or captioned warnings often distributed on schematic diagram of system.

3 In a CDU, the alpha and numeric keys providing part of the operator interface.

4 Subsystem of autopilot for auto or manual switching between compass and directional gyro.

**ANO** Air Navigation Order, UK statutory instrument for enactment of ICAO policy defining laws, licensing and similar fundamental issues regarding aerial navigation (see *ANR*).

**anode** In electrical circuit (electrolytic cell, valve, CRT), positive pole, towards which electrons flow; that from which "current" conventionally depicted as emanating.

**anodic treatment** See next.

**anodising** Electrolytic (electrochemical) treatment for aluminium and alloys, magnesium and alloys and, rarely, other metals, coated with inert surface film consisting mainly of oxide(s) as protection against corrosion. Electrolyte usually weak sulphuric or chromic acid.

**ANOE** Automated nap of the Earth.

**anomalistic period** Time between successive passages of satellite through perigee.

**anomalistic year** Earth's orbital period round Sun, perihelion to perihelion: 365 d 6 h 13 m 53.2 s, increasing by about 0.26 s per century.

**anomalous dispersion** Local reversal in rule that medium transparent to EM radiation diffracts it with refractive index that falls as wavelength increases; discontinuities in absorption spectrum make index increase as wavelength increases.

**anomalous propagation** Of wave motions, esp. EM radiation of over 30 kHz frequency or sound, by route(s) grossly different from expected, usually because of atmospheric reflection and/or refraction, sharp humidity gradients and temperature inversion.

**anomaly** 1 Difference between mean of measured values of meteorological parameter at one place and mean of similar values at all other points on same parallel (in practice, mean of similar values at other stations near same parallel).

2 In general, deviation of observed geodesic parameter from norm or theoretical value.

3 Specif. local distortion of terrestrial magnetic field caused by local concentrations of magnetic material used in aerial geophysical surveys and ASW (see *MAD*).

**Anoms** Airport noise and operations monitoring system.

**ANORAA** Association Nationale des Officiers de Réserve de l'Armée de l'Air (F).

**Anova** Analysis of variance, especially in monitoring flight-crew performance under different adverse or stress conditions.

**anoxaemia** Hypoxaemia, deficiency in oxygen tension (loosely, concentration) of blood.

**anoxia** Absence of oxygen available for physiological use by the body (see *hypoxia*).

**ANP** 1 Aircraft nuclear propulsion; general subject and defunct DoD programme.

2 Air navigation plan (ICAO).

3 Actual [or achieved] navigation performance.

**ANPA** 1 Aircraft Nuisance Prevention Association (J).

2 Advanced notice of proposed amendment.

3 See APA (13).

**ANPAC** Association Nazionale Piloti Aviazione

## A-NPR, ANPRM

anti-freeze

Commerciale (Rome); other Italian associations include ANPAV (Assistenti di Volo), ANPCAT (Professionale Controlleri & Assistenti Traffico Aereo), ANPI (Paracadutisti d'Italia), ANPIC (Piloti Istruttori Civili), ANPiCo (Piloti Collaudatori), and ANPSAM (Piloti Servizi Aerei Minori; also *API*).

**A-NPR, ANPRM** Advance notice of proposed rule-making (FAA).

**ANR** 1 Air Navigation Regulation.

2 Active [or acoustic] noise reduction.

**ANRA** Association Nationale des Résistants de l'Air; résistant, a tough hard worker; [office F-75996 Paris] (F).

**ANRS** Automatic navigation relay station.

**ANRT** Association Nationale de la Recherche Technique (F).

**ANS** 1 Air Navigation School.

2 Airborne [or air, or area] navigation system.

3 Artificial neural system.

4 Ambient-noise sensor.

5 Answer.

**ANSA** Advisory group, air navigation services (G).

**Anser** Autonomous navigation sensing experimental research.

**ANSI** 1 American National Standards Institution, vital for software.

2 Air navigation services institute [CAA] (Finland).

**Ansir** Awareness of national security issues and responses (FBI, US).

**ANSP** Air navigation service provider.

**AN<sup>2</sup>** AN-squared, a fundamental gas-turbine parameter in which A is total cross-section area of the gas path through the rotor blades and N is ppm.

**ANSV** Agenzia Nazionale per la Sicurezza del Volo [accident investigation authority] (I).

**Ansyn** Analysis by synthesis.

**ANT** 1 Autonomous negotiation [or negotiating] team.

2 Air-navigation trainer (simulator).

3 Antrieb [powerplant] neuer Technologie (G).

**ant** Antenna.

**ANTAC** Association des Navigants Techniciens de l'Aviation Civile (Belg.).

**Antares** Antenna advanced inertial reference for enhanced sensors.

**ANTC** Advanced Networking Test Center (US).

**antenna** US term for aerial (2), portions of broadcasting EM system used for radiating or receiving radiation. Plural antennae, not antennae.

**antenna azimuth rate** Rotational speed, rpm or rad/s.

**anthophyllite** Crystalline mineral, essentially (Mg, Fe) Si O<sub>3</sub>.

**anti-aircraft, AA** Surface-based defence against aerial attack. Suggested historic word; better to introduce SA, surface-to-air, as prefix for guns as well as missiles, together with associated radars and other peripherals.

**anti-aircraft artillery, AAA** Guns and unguided-rocket projectors dedicated to surface-to-air use with calibre 12.7 mm (0.5 in) or greater.

**anti-air warfare, AAW** All operations intended to diminish or thwart hostile air power, eg air defence and interdiction against enemy airfields.

**anti-aliasing filter** Inserted in output of analog-to-digital converter to screen out multiples of the digital sampling frequency.

**anti-balance** Opposing, counteracting or reducing balance, esp. in dynamic system.

**anti-balance tab** Tab on control surface mechanically constrained to deflect in same sense as parent surface to increase surface hinge-moment (ie, to make it more difficult to move in airstream); opposite of servo tab.

**anti-ballistic missile, ABM** System designed to intercept and destroy hypersonic ballistic missiles, esp. RVs of ICBMs. Speed of such targets, smaller radar cross-section, possible numbers, use of ECM and decoys, nuclear blanketing of large volumes of sky, ability to change trajectory, enormous distances, and need for 100% interception, make ABM difficult.

**anti-blocking system** Prevents aircraft from making simultaneous or conflicting radio transmissions.

**anti-buffet** Describes measures adopted on atmospheric vehicles, esp. high-speed aircraft, to reduce or eliminate aerodynamic buffet. Almost always auxiliary or locally hinged surface moved out into airflow to reduce buffet which would otherwise be caused by configuration change, eg opening weapon-bay doors. Thus \* flap, panel, comb, rake, slot.

**anticer** Device or material intended to prevent ice from forming. See *anti-icing*.

**anticing** See *anti-icing*.

**anti-clutter** Any of many techniques intended to reduce clutter.

**anti-collision beacon** High-intensity [so-called strobe] flashing red light[s] carried by most aircraft, to be visible at great distance from any aspect.

**anti-coning** In most helicopters, and some other rotorcraft, \*\* device fitted to prevent main rotor blades from reaching excessive coning angle (being blown upwards, eg by high wind at zero or low rotor rpm on ground), from which they could fall and exceed root design stress when suddenly arrested. Usually fixed range of angular coning permissible between \*\* device and droop stop.

**anti-corrosion** Measures taken depend on environment (see *marinising*), and working stress and temperature of hardware; apart from choice of material and surface coating (Alclad, anodising, painting with epoxy-based paint, etc), special agents can be introduced to fuels, lubricants, seals, hydraulic fluids and interior of stored device (inhibiting).

**anti-cyclone, anticyclone** Atmospheric motion contrary to Earth's rotation. Large area of high pressure, generally with quiet, fine weather, with general circulation clockwise in N hemisphere and anticlockwise in S; divided into 'cold' and 'warm' each group being subdivided into 'permanent' and 'temporary'.

**anti-dazzle panel** 1 Rearwards extension around top of instrument panel or cockpit coaming to improve instrument visibility and at night prevent reflection of instruments from windscreen.

2 On aircraft with natural metal finish, areas of exterior painted with non-reflective black or dark blue to prevent bright reflections being visible to crew.

**anti-drag wire** Structural bracing filament, usually incorporated within wing, intended to resist forwards ('anti-drag') forces, usually from trailing edge at root to leading edge at tip.

**anti-freeze** Most important agent ethylene glycol (CH<sub>2</sub>OH.CH<sub>2</sub>OH), usually used as aqueous solution with minor additives. Neat 'glycol' (there are many) remains

**anti-friction bearing**

liquid over more than twice temperature range of water, and freezes not as solid ice but as slush.

**anti-friction bearing** Loose term applicable to bearing suffering only rolling friction (ball, needle, roller) but esp. signifying advanced geometry and high precision.

**anti-frosting** Measures taken to prevent frost (ice condensing from atmosphere and freezing as layer of fine crystals), esp. on windscreen; typically raise temperature by hot air or fine electrical resistance grids or conductive films.

**anti-g** Measures counteracting adverse effects of severe accelerations in vertical plane. See *g-suit*.

**anti-glare** Against optical glare, generally synonymous with anti-dazzle but esp. dull non-reflective painted panels on airframe and propeller blades.

**anti-gravity** Yet to be invented mechanism capable of nullifying local region in gravitational field.

**anti-g suit** See *g-suit*.

**anti-g valve** See *inverted flight valve*.

**anti-icing** Measures to prevent formation of ice on aircraft; required on small vital areas where ice should not be allowed to form even momentarily (see *icing, de-icing*).

**anti-icing correction** Applied to aircraft, esp. advanced aeroplane, performance with various forms of ice-protection operative. Esp necessary when engine air bleed exerts significant penalty in degraded take-off, climb-out, overshoot and en route terrain-clearance calculations. Required numerical values usually given in flight manual as percentage for each flight condition.

**anti-icing inhibitor** Fuel additive preventing freezing of water precipitated out of fuel at high altitude.

**anti-knock rating** Measure of resistance of piston engine fuel to detonation (1) (see *octane rating*).

**anti-lift** In direction opposite to lift forces, eg loads experienced by wing on hard landing with lift dumpers in use. Thus \*\* wire (landing wire), structural bracing filament, usually within wing, to resist downloads.

**anti-missile** Against missiles, specif system intended to intercept and destroy hostile missiles (which may or may not include guided devices, artillery shells, bullets, mortar bombs and other flying hardware). In large-scale defence against ICBM attack, anti-ballistic missile.

**anti-misting kerosene** Jet fuel chemically and physically tailored so that, on sudden release to atmosphere (from ruptured tanks in a crash), it spreads in the form of droplets too large to form an explosive mixture with air.

**antimony** Element, abb. Sb, existing in several allotropic forms, most stable being grey metal with brittle crystalline structure. Widely used in aerospace in small quantities: with tin and other metals in bearings and applications involving sliding friction, with lead in storage batteries, as acceptor impurity in semiconductors, in type metals and electronic cathodes.

**antinode** 1 Points on wave motion where displacement (amplitude) is maximum.

2 Locations in aircraft structure where flexure (due to vibration or aeroelastic excitation) is maximum.

3 Either of two points in satellite orbit where line in orbit plane perpendicular to line of nodes, and passing through focus, intersects orbit (thus, essentially, points in orbit midway between nodes).

**anti-oxidant** Fuel additive which prevents formation of oxides and, esp. peroxides during long storage.

**antipode** Point on Earth, or other body, as far as

possible from some other point or body; specif. point on Earth from which line through centre of Earth would pass through centre of Moon.

**antipodes** Regions on Earth diametrically opposite each other.

**anti-radiation missile** Missile designed to home on to hostile radars.

**anti-rolling** In rigid airship, measures intended to prevent rolling of any part relative to hull or envelope.

**anti-rumble panel** Small anti-buffet panel necessary on grounds of noise.

**anti-snaking strip** In early high-subsonic aircraft, strip of cord or metal attached to one side of rudder or elsewhere to prevent snaking (yawing oscillations).

**anti-solar point** Point on celestial sphere 180° from Sun; projection to infinity of line from Sun through observer.

**anti-sound** Sound generated to cancel out unwanted noise.

**anti-spin parachute** Streamed from extremity of aeroplane or glider to assist recovery from spin; most common location is extreme tail.

**antistatic** Measures taken to reduce static interference with radio communications, traditionally by trailed \*\* wire, released from \*\* cartridge, which serves as pathway for dissipation of charge built up on aircraft. See next.

**anti-static additive** Fuel additive which increases electrical conductivity and thus speeds up dissipation of static electricity built up during refuelling.

**anti-submarine warfare** See *ASW*.

**anti-surface improvement program** Combines sensors, datalinks and displays presenting integrated precision tactical picture.

**anti-surge measures** 1 To prevent aerodynamic surging in axial compressor, eg redesign further from surge line, use of variable stators, blow-off valves and interstage bleeds.

2 Valves and baffles in oil cooler to maintain steady oil flow.

**anti-torque drift** Inherent lateral drift of helicopter due to side-thrust of tail rotor; often countered by aligning main rotor so that tip-path plane is tilted to give cancelling lateral component.

**anti-torque pedals** Common name for foot pedals of helicopter.

**anti-torque rotor** Tail rotor of helicopter, or any other rotor imparting thrust (moment) neutralising that of main rotor.

**antitrade wind** Semi-permanent winds above surface trades, generally at height of at least 3,000 feet, especially in winter hemisphere, moving in opposite direction (ie westerly).

**anti-transmit/receive** Pulsed-radar circuit which isolates transmitter during periods of reception.

**antivibration loop** Closed-loop servo system designed to suppress structural or system vibration.

**Antle** Affordable near-term low emissions (EEFAE).

**ANTMS** Airport noise/track monitoring system.

**ANU** Aircraft nose-up.

**ANUA** Associazione Nazionale Ufficiali Aeronautica (I).

**Anvar** Agence Nationale de Valorisation de la Recherche [Paris F-75436] (F).

**anvil cloud** Cumulonimbus.

**Anvis** Aviator's night-vision system, see next.

## Anvis/Hud

- Anvis/Hud** Adds head-up display for safe NOE helicopter flight at night.
- ANVR** Association of travel agents (Neth.).
- ANW** Airborne networking waveform.
- ANZUK, Anzuk** Australia, New Zealand, UK, and SE Asia defence.
- ANZUS, Anzus** Australia, New Zealand and US (1951 defence pact).
- AO** 1 Administrative Operations, major US Federal budget heading.
- 2 Artillery observation.
  - 3 Aircraft operator.
  - 4 Anti-oxidant.
  - 5 Airplane, observation (USA 1956–62).
  - 6 Announcement of opportunity (NAS, NASA).
- AOA** 1 Aerodrome Owners' Association (UK 1934–, became next).
- 2 Airport Operators Association [London SW1H 9JJ] (UK).
  - 3 Angle of attack (units, thus “6 AOA”).
  - 4 Angle of arrival (ECM).
  - 5 Air Officer i/c Administration (RAF).
  - 6 Airborne optical adjunct (ABM).
  - 7 Amphibious operating [or operations] area (DoD).
  - 8 At or above (FAA).
  - 9 Abort once around, ie after one orbit.
  - 10 Analysis of alternatives.
- AOAC** Autonomous operation from aircraft carrier (UAV).
- AOB** 1 At or below.
- 2 Angle of bank.
  - 3 Automatic optical bench (for testing optically tracked missiles).
  - 4 Air Observer (Bombardment).
  - 5 Angle off boresight.
  - 6 Air order of battle.
  - 7 Air-dropped oceanic [or Arctic Ocean] buoy.
- AOC** 1 Air Officer Commanding.
- 2 Air Operator's Certificate (CAA UK).
  - 3 Autopilot omni-coupler.
  - 4 Aerodrome, or airport, obstruction, or obstacle, chart.
  - 5 Assumption of control message (ICAO).
  - 6 Adaptive optical camouflage.
  - 7 Association of Old Crows [electronic warfare, Alexandria, VA22314-1652] (US).
  - 8 Airline, Operations Center (US).
  - 9 Air Operations Command (Vietnam AF) and co-located Air Operations Centers (USAF).
  - 10 Airport [also Airline] Operational Commission (US).
  - 11 Air/oil cooler.
  - 12 Aeronautical operational control (Acars).
  - 13 All other configurations.
  - 14 Acceleration-onset cueing.
  - 15 Attitude and orbit control [S adds system].
  - 16 Airline, or aircraft, operational control, or communications.
  - 17 Air and space Operations Center (US Air Combat Command).
- AOCC** Airline Operation Control Center (US).
- AOCI** Airport Operators Council International, Inc (Int., office Washington DC).

## AOT

- AOCM** Airborne, or advanced, optical counter-measures.
- AOCP** Airborne operational computer program.
- AOCS** 1 Attitude and orbit control system.
- 2 Airline Operational Control Society, [office, Coraopolis, PA] (US).
- AOD** 1 Aft of datum (c.g.).
- 2 Airport Operations Director.
  - 3 Airport operational data [B adds base].
  - 4 Age of data [C adds clock, E adds ephemeris] (GPS).
  - 5 Area of display.
  - 6 Above Ordnance datum (Newlyn, see *sea level*).
  - 7 Audio on demand.
  - 8 Air operations directive (NATO).
- AODB** Airport operational data-base.
- AOE, AoE** Airport of entry.
- AOFR** Aluminium oxide fibre-reinforced.
- A of R** Area of responsibility.
- AOG** Aircraft on ground, code inserted in message (eg for spare parts) indicating aircraft unable to operate until remedial action taken.
- AOHE** Air/oil heat exchanger.
- AOI** 1 Arab Organization for Industrialization.
- 2 Area of interest.
  - 3 Airborne, or aircraft, overhead interoperability [O adds office, TF adds task force].
- AOK** “All OK” [Astronaut].
- AOM** 1 Annual operational maintenance.
- 2 Aircraft operating manual.
- AOO** Analysis of options.
- AO1** Automated observation without precipitation discriminator.
- AOP** 1 Airborne (or air) observation post.
- 2 All other persons (airline costings).
  - 3 Airline operational procedure.
  - 4 Aeronautical OSI profile.
  - 5 Advanced onboard processor.
  - 6 Amraam optimisation program.
- AOPA** Aircraft Owners & Pilots Association [formed 1939 as US organization with office Frederick, MD 21701; now global with offices in 36 states, UK office London SW1V 4QQ]; LA adds legislative action.
- AOPAA** Aircraft Owners & Pilots Association of Australia.
- AOPF** Active optical proximity fuze.
- AOPG** Aerodrome Operators' Group (UK).
- AOPT** Accurate [or advanced] optical position transducer.
- AOPTS** Air Operations Planning and Tasking System[s].
- AOR** 1 Atlantic [previously Azores] Oceanic Region, [suffix -E or -W].
- 2 Average operational reliability.
  - 3 Area of responsibility.
- AOS** 1 Acquisition of signal (telecommunications, telemetry).
- 2 Airborne optical sensor [A adds adjunct, P processor, T telemetry].
- AOSC** Asset-optimization service contract.
- AOSP** Advanced on-board signal processor.
- AOST** Astronaut operational skill training.
- AOSU** Airfield Operations Safety Unit.
- AOT** 1 All-operators Telex [issued by prime supplier].
- 2 Air Officer, Training (RAF).

- AOTD** Active optical target detector.
- AO2** Automated observation from unattended ASOS.
- AO2A** AO-augmented, from an attended ASOS.
- AOU** Area of uncertainty.
- A<sub>ov</sub>** Area of overlap [twin-rotor helicopter].
- AOW** All-operators wire [AOT is preferred].
- AOY** Angle of yaw.
- AP** 1 Armour-piercing [–DS adds discarding sabot, –E explosive, –F finned, –I incendiary, –T tracer; there are other suffixes].  
2 Ammonium perchlorate (solid rocket fuel).  
3 Air Publication (UK).  
4 Airport (ICAO, Acars).  
5 Autopilot.  
6 Aviation regiment (USSR).  
7 Allied publication (NATO).  
8 Advance[d] procurement.  
9 Airframe parachute [S adds system].
- 10 Action Panel** [materials R&D].
- 11 Array processor.**
- 12 Anti-personnel.**
- 13 Anomalous propagation.**
- 14 Approach** [apch preferred].
- 15 Assessment Phase** (UK).
- 16 Automotive** [i.e., automatic] picture [transmission].
- 17 Aeroklub-Polski** [Warsaw PL-00-071] (Poland).
- 18 Aluminised phosphor.**
- Ap** Approach light[s].
- A/P** 1 Autopilot.  
2 Airplane(s).  
3 Airport.  
4 Aim point.
- APA** 1 Airline Passengers Association (US).  
2 Airport (or airfield) pressure altitude.  
3 Allied Pilots' Association [Fort Worth, TX76155-2512] (US).  
4 Army Parachute Association (UK).  
5 Autopilot amplifier.  
6 Automatic plotting aid.  
7 Aerobatic practice area.  
8 Accidents to private aviation [now Saga].  
9 Altitude preselect/alert[er].
- 10 Aviation Policy Area.**
- 11 Aerodromes Protection Agency**, found necessary to fight closures (UK).  
12 Airline performance analyses.  
13 Associazione Pionieri dell' Aeronautica [previously ANPA, pilots with brevet before 2 Aug. 14; I-00192 Rome] (Italy).  
14 Airline Professionals Association [pilot union] (US).
- APAC** Association of Professional Aviation Consultants (UK).
- APACCS** Aerial-port command and control systems (USAF).
- Apacs** Atlas prompting and checking system.
- APADS** Advanced precision air-delivery system.
- APAG** Allied Policy Advisory Group (NATO).
- Apals** Autonomous precision-approach and landing system.
- AP/AM** Anti-personnel/anti-material (last word often spelt materiel).
- APAMA** Asia/Pacific Aviation Media Association.
- APAP** Approach-path alignment panels.
- Apapi** Abbreviated Papi.
- APAR** Active phased-array radar (Canada, G, Neth.).
- APATC** Allied publication air traffic control.
- Apatsi** Airport/air-traffic system interface.
- APAW** Air-portable avionic workshop (RAF).
- APB** 1 Auxiliary power-breaker.  
2 Aviation Policy Board (US Congress 1947–48).  
3 Automated passenger bridge.
- APC** 1 Association of Parascending Clubs.  
2 Approach power control (or compensator).  
3 Armament practice camp (RAF).  
4 Avionics planning conference.  
5 Aviation Press Club (Belg.).  
6 Area positive control.  
7 Aeronautical passenger communications.  
8 Aeronautical public correspondence [public telephone].  
9 Autopilot computer [also A/PC].  
10 Adaptive packet compression.
- APCA** Association Professionnelle de la Circulation Aérienne (F).
- APCB** Advanced plenum-chamber burning.
- APCC** Air Pollution Control Center (EPA, US).
- apch, apchg** Approach, approaching (FAA).
- APCI** The Aviation Postcard Club International [Old Coulsdon, CR5 1QB, UK] (Int.).
- APCO** Air Pollution Control Office (EPA, US).
- APCR** Armour-piercing, composite rigid.
- APCS** 1 Air Photo and Charting Service (USAF, Orlando AFB).  
2 Approach-power compensation system.
- APCTA** Associação Portuguesa dos Controladores de Tráfego Aéreo [office, Lisbon P-1800] (Portugal).
- APD** 1 JETDS code: piloted aircraft, radar, DF/reconnaissance/surveillance (usually SLAR).  
2 Aerial position, digital (usually 4,096 pulses per 360°).  
3 Avalanche photo-diode.  
4 Amplifying photo-diode.  
5 Airports Policy Divisions [1 to 3] (DETR UK).  
6 Air Procurement District.  
7 Air Passenger Duty (UK).
- APDMC, A/PDMC** Aircraft and products, or aircraft-propulsion, data-management computer.
- APDS** Air-picture display system; multi-radar C<sup>2</sup>.
- APDZ** Active parachute drop zone.
- APE** 1 Airline pallet extender.  
2 Airborne polar experiment, study of ozone depletion (R).
- APEC** Asia-Pacific Economic Co-operation.
- APEP** Armour-piercing, enhanced penetration.
- aperiodic** Of any dynamic and potentially oscillatory system, so heavily damped as to have no period; unable to accomplish one cycle of oscillation; thus \* magnetic compass, \* electric circuit.
- aperture** 1 Diameter of objective of optical instrument, either direct length or function of it; also angular \*, minor angle subtended at principal focus by extremes of objective diameter; numerical \*,  $n \sin u$ , where n is refractive index between lens and object and u is objective angular radius (half angular aperture); and relative \* (f-number) relating focal length to objective diameter.  
2 In radio or radar aerial, either greatest dimension; or, with undirectional aerial, greatest length across plane perpendicular to direction of maximum radiation, close to

**aperture card**

aerial, through which all radiation is intended to pass (ie all except diffuse stray radiation).

**aperture card** Standardised unit in microfilm filing, comprising frame of microfilm mounted in card border; stored, retrieved and projected automatically.

**aperture management** Design of radar cavities and apertures to eliminate multiple reflections.

**Apex** 1 Advanced project for European information exchange, linking all major EC airframe companies.

2 Advanced passenger, or purchased, excursion fare, one of many forms of air carrier fare and flight coupon.

3 Application Executive.

**apex** 1 Highest point in canopy of parachute in vertical descent.

2 In a plan view of a wing, the point where the projected leading edge cuts the aircraft centreline.

**APF** 1 Association des [female] Pilotes Françaises [F-75116 Paris] (F)..

2 Adhesive polymer film.

**APFA** Association of Professional Flight Attendants (US).

**APFC** Air-portable fuel container [or cell].

**APFD** Autopilot flight director.

**APFSDS** Armour-piercing fin-stabilized discarding sabot.

**APG** 1 JETDS code: piloted aircraft, radar, fire control.

2 Automatic program generator, requires only component and netlist input.

3 Aberdeen Proving Ground, MD (USA, but used by other US services).

4 Air Platforms Group (DSTL, UK).

5 Airplane General [mechanic category] (US).

**APGC** Air Proving Ground Command (USAF, defunct).

**APGM** Autonomous precision-guided missile [or munition].

**APGS** Auxiliary power generation system.

**APHAZ** Aircraft proximity hazard[s], panel investigating airproxes filed by controllers [as distinct from JAWG].

**aphelion** Point in solar orbit furthest from Sun.

**Aphids** Advanced panoramic helmet interface demo system.

**API** 1 Air-position indicator.

2 Armour-piercing incendiary.

3 American Petroleum Institute [office, Washington DC].

4 Associazione Piloti Italiane [women pilots; office, I-00198 Rome] (Italy).

5 Application program[ming] interface.

6 Air-photo interpreter.

7 Airframe/propulsion integration [also A/PI].

8 Aim-point initiative.

9 Ascent-phase intercept.

10 Application programming interface.

11 Application implementation.

12 Advance[d] passenger information.

**APICS** Automatic pressure indication and control system.

**APIHC** Armour-piercing incendiary hard core.

**apiquage** According to a 1935 authority “Rotation of an aircraft about its lateral axis in the sense which decreases its angle of incidence (there is no English equivalent).”

**APIRG** African region Planning and Implementation Regional planning Group (ICAO).

**APIRS** Aircraft piloting inertial reference system, or strapdown sensor.

**APIS** 1 Apogee/perigee injection system.

2 Automatic priority interrupt system, for large computer systems with multi-programming.

3 Aircraft parking information system [docking guidance].

4 Air passenger information system.

**APKWS** Advanced precision-kill weapon system (USA).

**APL** 1 Acceptance performance level.

2 Applied Physics Laboratory of JHU.

**APLA** Asociación de Pilotos de Lineas Aéreas (Arg.).

**aplanatic** Free from spherical aberration.

**APLS** 1 Automated ply laminating system.

2 Articulated patient loading system.

**APM** 1 Aluminium powder metallurgy.

2 Aircraft performance monitoring.

3 Aviation de Patrouille Maritime (F).

4 Assistant programme manager.

**APMS** Automatic performance-management system (also, in US, rendered as advanced power management system) or automated performance measurement system.

**APN** 1 JETDS code: piloted aircraft, radar, navaid.

2 Aircraft procurement, Navy (US).

3 Arinc packet network.

4 Aircraft pallet net.

**APNA** Association des Professionnels Navigants de l’Aviation [F-75015 Paris] (F).

**A.P.970** See *Av.P.970*

**apoapsis** Point in orbit furthest from primary; apocentre.

**apoastron** Furthest point in orbit round star.

**APOB, Ap Ob** Airplane observation [of weather].

**apocynthion** Point in lunar orbit furthest from Moon.

**APOD** Airport of debarkation.

**APOE** Air (or aerial) port of embarkation.

**apogalacticon** Furthest point in orbit round galaxy.

**apogee** Point in geocentric (Earth) orbit furthest from centre of Earth (in near-circular polar orbit equatorial bulge could result in satellite being closer to surface at equatorial apogee than at polar perigee).

**apogee motor** Apogee kick motor or kick motor, small rocket designed to impart predetermined (sometimes remotely controllable) velocity change (delta-V) to satellite or spacecraft to change orbit from an apogee position.

**Apollo Applications Program, AAP** Much altered and largely defunct NASA programme intended to make maximum and earliest post-Apollo use of Apollo technology. Major portion evolved into Skylab; other AAP being built in to various plans for future manned and unmanned spaceflight, include Shuttle missions.

**apolune** Apocynthion of spacecraft departed from Moon into lunar orbit.

**APOR** Automated purchase order rescheduling system.

**apostilb** Non-SI unit of luminance equal to  $1/\pi$  international candle (candela)  $\text{m}^{-2}$  or  $10^{-4}$  lambert (see *luminance*).

**Apota** Automatic-positioning telemetering antenna.

**APP** 1 Approach (DTI, UK).

2 Approach control office (ICAO).

3 Approach pattern.

## APPA

## approach surveillance radar

4 Association des Pilotes Privés (F).

5 Association of Priest Pilots (US).

6 Autopilot panel.

**APPA** 1 Associação de Pilotos e Proprietários de Aeronaves [ office, São Paulo] (Brazil).

2 Association des Pilotes Privés Avions (F).

**apparent precession** Apparent tilt of gyro due to rotation of Earth; vertical component = topple, horizontal = drift.

**apparent solar day** Length of Earth day determined by two successive meridian passages of apparent Sun; longer than sidereal day by time taken by Earth to turn additional increment to nullify distance travelled in solar orbit during this day. Basis of most human timescales, being divided into 24 h, hour being thus defined.

**apparent wander** Apparent precession.

**APPC** Advanced program-to-program communications.

**APP CON** Approach control (FAA).

**Apple** 1 American pilots participating in local education.

2 Aircraft precise-position location equipment.

**Appleton layer** F layer ( $F_1$  and  $F_2$ ) of ionosphere, most useful for reflection of EM radiation (see *F-layer*).

**Appleyard scale** Circular slide-rule.

**application-specific integrated circuit** Self-explanatory, an ASIC is designed specifically for one application, and expects to be made by the million in order to play its role in what may be a giant system. Of course, the same i.c. may later find other applications.

**appliqué** Adhesive in the form of thin foils or polymer-based film, usually on aircraft external surface.

**APPP, AP3** Airport Privatization Pilot Program (FAA from 1996).

**APPR** Approach.

**approach** BS.185: ‘To manoeuvre an aircraft into position relative to the landing area for flattening-out and alighting’. Now subdivided into various categories, each of which needs pages of explanation defining circumstances, clearances and procedure. Following are brief notes. VFR \* may be made with no radio at uncontrolled airport or airfield. Visual \* may be made in IFR by pilot in contact with runway either not following other traffic or else in visual contact with it, with ceiling at least 500 ft above minimum vectoring altitude and visibility at least three miles. Various types of instrument \* are admissible in IFR with radio TWR authorization: straight-in, circling, precision (with g/s and runway centreline guidance) and parallel (two parallel ILS runways, or, in military aviation, two parallel runways, each with PAR). In certain circumstances pilot may receive clearance for contact \*, even in IFR. ILS \* is most important IFR precision \*. If required and available, pilot can be ‘talked down’ in GCA or RCA, his only necessary equipment being primary instruments and operative R/T.

**approach area** Airspace over designated region of terminal area controlled by approach control unit (in some cases serving two or more airfields).

**approach beacon** 1 Historically, short-range track beacon (see *BABS*).

2 Today, beacon giving fix before or after approach gate (rare).

**approach control** BS.185: ‘A service established to provide ATC for those parts of an IFR flight when an aircraft is arriving at, or departing from, or operating in

the vicinity of, an aerodrome’. DTI (Air Pilot): ‘ATC service for arriving or departing IFR flights’. FAA adds ‘and, on occasion, VFR aircraft’.

**approach control radar** ACR, radar at approach control facility displaying PPI positions (and, in advanced models, height or alphanumeric data) of all aircraft within its range (which is not less than radius of furthest point in the controlled airspace).

**approach coupler** Electronic linkage between aircraft ILS receiver and autopilot and hence to AFCS; thus aircraft can make ‘hands off’ approach.

**approach fix** From or over which final approach (IFR) to airport is executed (FAA). On projected centreline 3–5 miles from threshold.

**approach glide** “A glide preliminary to alighting” (B.S., 1940).

**approach gate** Point on final-approach course 1 mile beyond approach fix (ie further from airport) or 5 miles from landing threshold, whichever is greater distance from threshold (FAA).

**approach indicator** Ambiguous: could mean ILS or other cockpit instrument or any of several visual systems on ground indicating angle of approach.

**approach lights** 1 In modern large airfields, any of several systems of lights extending along projected centreline of runway in use towards approaching aircraft to provide visual indication of runway location, distances, alignment, glide path slope, and, probably, transverse horizontal.

2 In smaller or older airfields, one or more lights (often green) at, or extending from, downwind end of landing area to show favourable direction of approach.

**approach noise** Measured on extended runway centreline 1 nm (one nautical mile = 6,080 ft = 1,853 m) from downwind end of runway, with aircraft at height of 370 ft (112.58 m). [See *Noise*.]

**approach operations** Flight operations within approach area, esp. those of aircraft arriving or departing, designated as IFR or VFR.

**approach plane** Approach surface, sloping plane below which no aircraft should penetrate; in UK \*\* to grass airfield extends at inclination of 1:30 in all directions from periphery of landing area.

**approach plate** Flight-planning document relevant to specific airfield, giving details of minimum heights, safe headings and weather minimums (UK = minima), and including horizontal map and often also vertical profile for approach to each instrument runway.

**approach power** That used on landing approach, often about 58 percent MTO.

**approach power compensator** Autothrottle, esp. on combat aircraft. The APCS [S adds system] was devised to hold constant AOA (3) during carrier landings.

**approach radar** See *PAR, GCA, SRE*.

**approach receiver** 1 ILS receiver.

2 Historically, radio receiver ‘capable of interpreting the special indications given by an approach beacon installation’.

**approach sequence** Order in which aircraft are placed while awaiting landing clearance and in subsequent approach. In busy TMA traffic drawn in blocks from alternate landing stacks.

**approach speed** Usually means IAS.

**approach surveillance radar** Approach control radar.

## approach with vertical guidance

**approach with vertical guidance** Navaid category at present in two classes: APV 1 provides vertical guidance within 20 m (65.6 ft), and includes GPS and WAAS; APV 2 refines this to 8 m (26 ft), and includes Egnos and Galileo (ICAO).

**appropriation** Act of Congress enabling a Federal agency to spend money for a specific purpose.

**approval** 1 Of manufacturer of aerospace hardware, approval by delegated national authority to design, manufacture, repair or modify such hardware, subject to specified conditions and inspection.

2 Of item of aerospace hardware, certificate issued by delegated national authority that item is correctly designed and manufactured and will thus be likely to perform within its design limits satisfactorily. In case of complete aircraft, C of A, or Type Certificate.

3 Of flight plan, signature by ATC officer or other responsible person that proposed plan does not conflict with pilot's qualifications, aircraft equipment, expected met conditions and expected air traffic, and that flight may proceed.

**approval flight** Required to authorise historic aircraft [usually military] to do one more year flying at airshows.

**approval note** Issued by importing country to cover aircraft with foreign C of A.

**Approved Life** The life of a past or functioning item [either total or between overhauls] authorised by the certifying authority.

**APPSS** Association of Police and Public Security Suppliers.

**APPT** Air-platform propulsion technology; R adds research.

**APQ** JETDS code: piloted aircraft, radar, combination of purposes.

**APQA** Association Québécoise des Transporteurs Aériens Inc. [office, Dorval, PQ; Canada].

**APR** 1 JETDS code: piloted aircraft, radar, passive detection.

2 Airman performance report.

3 Automatic [or auxiliary] power [or performance] reserve.

4 Air-photo reader.

5 Actual performance reserve.

6 Aerostat programmable radar.

**APRA** Air Power Association, previously the Air Public Relations Association [1947–, office Milton Keynes] (UK).

**APRL** 1 Aeronautical Telecommunications Network profile requirements list.

2 Aeroklub Polskiej Rzeczypospolitej Lusowej [aero club, Warsaw] (Poland).

**APRO** 1 Airline Public Relations Organization [office, Crawley] (UK).

2 Aerial Phenomena Research Organization [1952–] (Int.).

**APRA** Air Power Association, previously the Air Public Relations Association (UK, 1947–).

**APRL** ATN(1) profile requirement list.

**APRO** Airlines Public Relations Organization (UK).

**Aprodeas** Association pour la Promotion et le Développement d'actions de formation pour les Entreprises Aéronautiques et Spatiales (F).

**apron** 1 Large paved area of airfield for such purposes as: loading and unloading of aircraft; aircraft turnaround

operations; aircraft modification, maintenance or repair; any other approved purpose other than flight operations.

2 In engine cowling, any portion hinged down to act as walkway or servicing stand.

3 In ejection seat, lower forward face behind occupant's lower legs.

4 In vehicle fuelled with corrosive liquid, corrosion-resistant panel surrounding, and especially beneath, relevant supply hose coupling.

5 Fairing round front of main landing gear, forming underside of nacelle in flight.

**apron capacity** Nominated number of transport aircraft to be accommodated on particular apron area in designated positions.

**apron-drive bridge** Passenger loading bridge comprising telescopic sections pivoted to terminal, extended and positioned by steerable powered chassis supporting free end. See *bridge* and *next*.

**apron-drive unit** Self-propelled vehicular support for free end of passenger jetty (jetway), usually provided with two heavy-duty wheels steering through at least 180°.

**Aprt** Airport.

**APRX** Approximate[ly].

**APS** 1 Aircraft prepared for service; standard weighing condition, or condition at which weight is calculated: comprises aircraft in all respects ready to take off on mission of type for which it was designed, complete with all stores, equipment (such as passenger reading material), fuel, crew and all consumable items, but with no revenue load.

2 Appearance-potential spectroscopy.

3 JETDS code: piloted aircraft, radar, search and detection.

4 Adaptive-processor system, or sonar, or sonobuoy.

5 Armament practice station (UK).

6 Auxiliary power system.

7 Aerial Port Squadron (USAF).

8 Advanced planning and scheduling.

9 Airborne-platform subsystem.

10 Armament, or air-vehicle, planning system.

11 Advanced fighter-crew protection system.

12 AIS(1) processing system.

13 Airframe/propulsion/steering.

14 Air Pictorial Service, formed 1951, now AAS(6).

15 Airline Pilots Security Alliance (US, 2002–).

16 Aircraft/altitude/attitude position sensor.

17 Autopilot system [also A/PS].

18 Advanced polar system [satellite].

19 Advanced passenger screening.

**APSA** Airline Pilots' Security Alliance (gun lobby, US).

**APSE** Apse Ada programming support environment.

**APSG** After passing.

**APSI** Aircraft, or airframe, propulsion-system integration.

**apsides** Plural of apsis.

**apsis** Extreme point of orbit, apocentre (furthest) or pericentre (nearest).

**APSP** Advanced programmable signal-processor.

**APSS** Aviation Preservation Society of Scotland [1974–; East Fortune EH39 5LF] (UK).

**APST** Aircraft propulsion systems trainer.

**APT** 1 Automatically programmed [machine] tool.

2 Automatic picture transmission, datalink from satellite vidicon.

- 3** Automatic, or automated, powerplant test [U adds unit].  
**4** Advanced passive technology.  
**5** Airport.  
**6** Aircrew procedure[s] trainer.  
**Apt** Airport.  
**APTA** American Public Transportation Association.  
**APTS** *1* Automatic picture-transmission system.  
**2** Airport, port and terminal security.  
**APTT** Aircrew part-task trainer.  
**APTU** Aerodynamic and Propulsion unit.  
**AP-25** C of A (R).  
**APU** *1* Auxiliary power unit; */GCU* adds generator control unit.  
**2** Weapon release unit (R).  
**3** Automatic pull-up.  
**APUC** *1* APU controller.  
**2** Average program unit cost.  
**APV** *1* Autopiloted vehicle.  
**2** Accumulated project value.  
**3** Approved.  
**4** Approach with vertical guidance.  
**APVO** See *IA-PVO*.  
**APW** *1* Automatic pitch warning, required on aircraft [eg, SR-71] with possible low or negative pitch stability.  
**2** Aircraft, or airborne, proximity warning; I adds indicator, S system.  
**APXS** Alpha-proton, or particle, X-ray spectrometer.  
**AQAD** Aeronautical Quality-Assurance Directorate (MoD-PE, now Qinetiq, UK).  
**Aquabrasive 330** Sand/water mix for high-velocity stripping of markings or sealant from airfield paved surfaces.  
**AQAP** Allied quality-assurance publication (NATO).  
**AQB** Advanced quadrature band.  
**AQC** Aviator Qualification Course [or Certificate] (USA).  
**AQD** Operational airline quality determination programme.  
**AQF** Avionics qualification facility.  
**AQL** *1* Agreed quality level [material specifications, dimensional tolerance, etc].  
**2** Advanced quick look (Guardrail).  
**AQP** *1* Advanced qualification program [US commercial pilots].  
**2** Avionics qualification procedure.  
**A-QPSK** Aeronautical quadrature phase-shift keying.  
**AQR** Airline quality rating.  
**AQS** Advanced quality system.  
**AQ-SAP** Acquisition special-access program.  
**aquaplane** To run wheeled vehicle, esp. landing aircraft, over shallow standing water at so high a speed that weight is supported wholly by dynamic reaction of water; tyres, out of ground contact, unable to provide steering or braking. An empirical formula is  $V_a = 9\sqrt{p}$  where  $V_a$  is aquaplaning speed in knots and  $p$  is tyre pressure in lb/in<sup>2</sup>.  
**aqueous** Pertaining to water, thus \* solution.  
**Aqueous film-forming foam** Typically 3 to 6 per cent halon/Halotron/BCF or other firefighting agent and 97 to 94 per cent water.  
**Aquila** Code address of EQD.  
**AQZ** Area QNH zone.  
**AR** *1* Air [aerial, airborne] refuelling.  
**2** Air receive.  
**3** Aspect ratio.

- 4** Alternative route.  
**5** Army [or Air] Regulation.  
**6** or A/R, altitude reporting.  
**7** Air radar.  
**A/R** Approach/reverse (nozzle mode).  
**AR** Aspect ratio (US).  
**ARA** *1* Aircraft Research Association [Bedford MK41 7PF] (UK, 1953–).  
**2** Airborne-radar approach.  
**3** Airspace restricted area.  
**4** Airborne Research Australia.  
**5** Alternative reference area.  
**6** Air-refuelling area (RAF).  
**7** Advanced Ram analysis [M adds method].  
**8** Anti-radar attack (UAV).  
**9** Advisory radio area.  
**10** Atmospheric research aircraft (FAAM 3).  
**ARAC** Aviation Rulemaking Advisory Committee (FAA).  
**Arades** Automatic radar evaluation system and jammer test set.  
**Araldite** Trade name (Ciba) of two-component (resin + hardener) epoxy-based adhesive used in airframe structural bonding.  
**ARALL, Arall** Aramid/aluminium laminate(s).  
**aramid fibre** Man-made fibre of extraordinary tensile strength, so named because of its chemical and physical similarity to spider-web fibre; see *Kevlar*.  
**Aramis** *1* Area multiple intercept system (radar).  
**2** Advanced runway arrivals management to improve airport safety and efficiency (Euret).  
**AR&M** Availability, reliability and maintainability.  
**AR&TF** Aircraft Repair and Transportation Flight (RAF).  
**ARAS** Auto refuelling assembly system.  
**ARASP** Advanced radar airborne signal processor.  
**ARATCC** Air Route Air-Traffic-Control Center (FAA).  
**ARB** *1* Air Registration Board, then Airworthiness Requirements Board, now Airworthiness Review Board, part of EASA. (UK).  
**2** Air Research Bureau (BRA, ICAO).  
**3** Air Reserve, or Rescue, Base (USAf).  
**4** Arbitrary waveform generator.  
**arbitrary landing distance** See *ALD*.  
**arbitrated loop** A database topology which can link <128 nodes in a shared ring.  
**ARBS** *1* Angle/rate bombing system [or set].  
**2** Airline Representative Board Sweden.  
**3** Air, or advanced, refuelling boom system.  
**ARC** *1* Aeronautical Research Committee [1920–45], then Council [1945–79] (UK).  
**2** JETDS code: piloted aircraft, radio, communications.  
**3** Ames Research Center (NASA).  
**4** Area reprogramming capability (EW).  
**5** Arc, position of compass rose on EFIS.  
**6** Air Race Classic (US from 1977, for female pilots only).  
**7** Airport runway configuration.  
**8** Automatic radial centring (VOR).  
**9** See *Air Refuelling Control*.  
**arc** Ground track of aircraft flying constant DME distance from navaid.

**Arcads**

- Arcads** Armament control and delivery system.
- Arcal** Aircraft, or airborne, radio control of airfield lighting.
- Arcan** Aeronautical Radio of Canada.
- arc and plug** See *plug aileron*.
- ARCC** 1 Airworthiness, or airframe, Requirements Co-ordinating Committee (UK).
- 2 Aeronautical Rescue Co-ordination Centre (RAF Kinloss, UK).
- ARCH** Agricultural remotely controlled helicopter.
- Archie** Colloq., anti-aircraft gunfire, 1915–18 (allegedly from ‘Archie! Certainly not’, music-hall song; archaic).
- archway** Airport-gate detector requiring passenger to pass through sensitive magnetic field, usually alongside baggage screening; also called AMD or WTMD.
- ARCM** Anti-radiation countermeasures.
- Aremas** Automatic real-time cable monitoring and analysis system.
- arc-minute, arc-second** See *angular measure*.
- ARCO, Arco** Airborne remote control officer (RPVs).
- ARCP** 1 Air refuelling control point.
- 2 Aerodrome Reference Code Panel (ICAO).
- ARCS** 1 Acquisition radar and control system.
- 2 Aerial rocket control system.
- 3 Airline request communication, or computer, system.
- ARCSS** Autonomous rendezvous and capture sensor system.
- Arctic air mass** Major class of air mass most highly developed in winter over ice and snow, although surface temperature may be higher than that for Polar masses.
- Arctic minimum** Densest of standard model atmospheres assumed in aircraft performance calculation.
- Arctic smoke** Surface fog essentially caused by very cold air drifting across warmer water.
- ARCTS** Automated radar-controlled terminal system.
- ARD** 1 Anti-radar drone.
- 2 Atmospheric re-entry demonstrator.
- 3 ATC-related delay.
- 4 Advanced requirement[s] definition.
- ARDC** Air Research and Development Command (USAF, established 1 February 1950, became Systems Command 1 April 1961).
- ARDC model atmosphere** Devised by ARDC, published 1956 (see *model atmosphere*).
- Ardec** Armament Research Development and Engineering Center (USA).
- ARDF** Airborne radio direction-finding.
- Ardhan** Association pour la Recherche de Documentation sur l’Histoire de l’Aéronautique Navale (F).
- ARDS** Airborne radar demonstration system, links J-Stars, Astor, Orchidée.
- ARDU** Aircraft Research & Development Unit (RAAF).
- ARE** 1 Airborne radar extension (surveillance C-130).
- 2 Altitude-reporting equipment (towed target).
- 3 Admiralty Research Establishment.
- 4 Algebraic Riccati equation for LQR [1724].
- area** SI unit of plane area is square metre ( $m^2$ ); to convert from  $ft^2$  multiply by 0.092903; from hectares by  $10^4$ ; from sq yd by 0.836127.
- are** Non-SI unit of area =  $10^{-2}m^2$ .

**area, aerospace surfaces** See *gross wing* \*, *net wing* \*, *disc* \*, *equivalent flat-plate* \*, *control-surface* \*.

**area bombing** Bombing in which target occupies large area, such as built-up area of city, with aiming point loosely defined near centre (when expression was current, WW2, marked at night by TIs or TMs).

**area defence system** In general, anti-aircraft or AAW system capable of providing effective defence over large area (dispersed battlefleet, task force, ground battlefield or large tract of country containing several cities) rather than point target.

**area-denial munition** Explosive device, usually dispensing cluster bombs each with time-delay fuze, to deny area to enemy ground forces.

**area-increasing flap** Wing flap which in initial part of travel moves almost directly rearwards to increase wing chord, without significant angular movement.

**area loading** Mass divided by gross projected area W/S [lifting-body aircraft].

**area navigation, R-nav, RNAV** Navaid that permits aircraft operations on any desired course within coverage of station-referenced navigation signals or within limits of self-contained system capability (FAA); thus, does not constrain aircraft to preset pathways.

**area-navigation route** Established R-nav route, pre-defined route segment, arrival or departure route (including RNAV SIDs and STARs). Route, based on existing high-altitude or low-altitude VOR/DME coverage, which has been designated by Administrator and published (FAA).

**area ratio** 1 In rocket thrust chamber, usually ratio of idealised cross-section area at nozzle to minimum cross-section area at throat; also called expansion ratio. In general, chambers designed to expand products of combustion into atmosphere have \*\* 10:1 to 25:1; those for use in upper atmosphere may exceed 50:1; SSME for Space Shuttle has \*\* 157:1.

2 For a wing,  $S/b^2$ , area divided by span squared, reciprocal of aspect ratio.

**area rule** Formulated by Richard T. Whitcomb at NACA in 1953. For minimum transonic drag at zero lift aircraft should be so shaped that nose-to-tail plot of gross cross-section areas should approximate to that of ideal body for chosen flight Mach number. Thus, addition of wing should be compensated for by reduction in section of body (which gave some early area-ruled aircraft “wasp waists”, which are generally undesirable). Obviously, streamlines cannot be sharply deflected; it is not possible to have perfect area-ruling both with and without bulky external stores. In 1954–55 rules extended to Mach 2 by plotting cross-section area distributions on sloping axes approximately aligned with Mach angle.

**area sterilization** Seeding part of sky with chaff of such extent and density that radar operation is impossible.

**AREF, ARef** Air Refueling Squadron (USAF), also ARS.

**Arens** A remote control system in which push/pull commands are transmitted by a steel cable tightly surrounded by a guiding coil spring, the whole sliding in a tube.

**Arento** National telecommunications organisation (Egypt).

**ARES** 1 Adaptable radar-environment simulator.

2 Airborne radar emitter simulator.

## Aresa

## armature reaction

- 3 Aerial regional scale environmental survey.  
4 Advanced route evaluation system.  
5 Affordable responsive spacelift [Space Command] (USAF).
- Aresa** Association des Radio-Electroniciens de la Sécurité Aérienne (F).
- Aresti** International procedures devised by José \* for governing competitive aerobatics to set formula stipulating competing aircraft, set and free manoeuvres, [rendered graphically], judging and marking, now replaced by Aerobatic Catalogue.
- ARF** 1 Air Reserve Forces; suffix PDS adds personnel data systems (US).  
2 Airborne relay facility, or facilities.  
3 Air Reconnaissance Facility.  
4 Airlink risk factor.
- ARFA, Arfa** Allied Radio-Frequency Agency (NATO).
- Arfab** Allied radio frequency allocation board (NATO).
- ARFAC** Australian Royal Federation of Aero Clubs.
- ARFC** Aerospace Reconstruction Finance Corporation (US Government).
- ARFF** Airfield [or airport or aircraft] rescue and fire-fighting (vehicle).
- AR5** NBC hood and respirator (UK, RAF, RN).
- ARFOR** Area forecast (Int. Met. Figure Code, ICAO).
- ARG** 1 Amphibious Ready Group, with air assets (USMC).  
2 Aeronautics Research Group (EREA).  
3 Airfield Research Group [1977–; Thetford IP24 2AB] (UK).
- ARGMA** Army Rocket and Guided Missile Agency (USA, now Miradom).
- argon** Most widespread inert gas in atmosphere; typical sea-level about 0.934%. Used in some fluorescent lamps and filament bulbs and as constituent of breathing mixtures, but most important in steel and titanium production and to prevent oxidation in welding.
- Argos** National space-based navigation system (F).
- ARGS** Anti-range-gate stealing.
- argument** Angle or arc (astronomy). Thus \* of perigee, angular arc traversed from ascending node to perigee as seen by observer at near focus, measured in orbital plane in satellite's direction of travel.
- Argus** Advanced remote ground unattended sensor.
- ARH** 1 Active radar homing.  
2 Anti-radar homing.  
3 Anti-radiation homing.  
4 Armed reconnaissance helicopter.
- ARHMP** Accelerated radiation-hardened microelectronics production, or protection.
- ARI** 1 Aileron/rudder interconnect.  
2 Airborne, or aircraft, radio installation (UK).  
3 Airpower Research Institute (US).  
4 Aviation restructure initiative.  
5 Additional requirement[s] for import.  
6 Azimuth/range indicator.  
7 Aviation Research Institute (USA, not connected with 3).
- ARIA** Apollo (later Advanced) range instrumentation aircraft.
- ARIARDA, Ariarda** Army Research Institution Aviation R&D Activity (USA).
- ARIC** Airborne radio and intercom control.

- Aries, ARIES** 1 Airborne research integrated experimental system [flight instrumentation] (NASA Langley).  
2 Airborne recorder for IR and EO sensors.  
3 Aeronautical reporting and information-exchange system.  
4 Airborne reconnaissance integrated electronics suite.
- ARINC, Arinc** Aeronautical Radio Inc, with subsidiary Arinc Research. Non-profit research organisation responsible for aeronautical radio standards and widespread ground aids, esp. communications, across Pacific and in other regions. The authority publishes numerous specifications for avionics, notably:  
400 Basic design guidelines.  
404A Specifications for packaging.  
429 Initial standard digital data highway [latest version 42913]. See 600.  
500 baseline specifications for analog equipment.  
578 Standards for VOR.  
600 Standards of basic technologies and packaging.  
629 Standards for 2 Mbit/s databases.  
700 Specifications for digital equipment.  
708 Standards for weather radar.  
755 Standards for multimode receivers.
- Arinc communications and reporting system** VHF link between aircraft systems and ground-based computer, plus messages generated by menu-driven CDU.
- ARIP** Air refuelling initial point.
- ARIS** Anti-resonance isolation system.
- arithmetic unit** Heart of typical digital computer; portion of central processor where arithmetical and logic functions are performed; invariably contains accumulator(s), shift and sequencing circuitry and various registers.
- ARJA** Association Suisse Romande des Journalistes Aéro & Astronautique (Switz.).
- ARJS** Airborne radar jamming system.
- ARL** 1 Aeronautical Research Laboratories (Australia).  
2 Aerospace research laboratories (US, OAR).  
3 Air Resources Laboratory (NOAA).
- AR-L** Air [or airborne] reconnaissance-low.
- Arlat** Association of Registered and Licensed Aeronautical Technicians [Pretoria, South Africa].
- ARM** 1 Anti-radiation missile.  
2 Atmospheric radiation measurement (US Dept of Energy).  
3 Advanced radar mode[s].
- arm** 1 To prepare explosive or pyrotechnic device so that it will operate when triggered.  
2 Horizontal distance from aircraft or missile reference datum to c.g. of particular part of it.  
3 See *tail arm*.
- Armak** Aeronautical certification authority (R).
- armament** Carried on combat aircraft specifically to cause injury, by direct action, to hostile forces. Excludes radars, laser rangers (unless they cause optical injury by intent), illumination devices, detection or tracking devices, defoliating sprays, smokescreen generators and, unless filled with napalm, drop tanks.
- Armat** Anti-radar missile, Matra.
- armature reaction** In d.c. generator or alternator, distortion of main field by armature current, factor

## ARMC

fundamental to machine design, and speed/voltage regulation.

**ARMC** Area Regional Maintenance Center.

**ARM/CM** Anti-radiation missile countermeasures.

**ARMD** Anti-radiation missile, decoy.

**armed** System switched to function upon command; thus, eg, when pneumatic escape chute (slide) is \* it extends immediately passenger door is opened.

**armed decoy** Aerodynamic vehicle launched by penetrating bomber to generate additional target for hostile radars, send out its own countermeasures and, if it finds hostile aerial target, home on it and destroy it.

**armed reconnaissance** Mission flown with primary purpose of finding and attacking targets of opportunity.

**ARMET** Area forecast, upper winds and temperatures (ICAO).

**arming** Closing an electrical circuit [or in any other way] enabling a device or system to function when required. A typical system is a thrust reverser.

**arming vanes** One name for slipstream-driven windmill used in some aerial bombs, mines and other stores to unscrew safety device or in some other way arm device as it falls.

**ARMMAC** Active remote maintenance monitoring and control (ILS, VOR etc).

**armour** Typical materials used in airborne armour include thick light alloys, titanium alloys, boron carbide and several filament-reinforced composites.

**armourer** Trade for military ground crew specialising in armament.

**arm restraint** In some types of ejection seat, automatic straps or arms energised during firing sequence to hold occupant's arms securely against aerodynamic forces until he is released from seat.

**ARMS, Arms** 1 Aircraft reporting and monitoring system, combines DMU, FDIU, FDR and AIDS.

2 Airport remote monitoring system.

3 Aviation reconfigurable manned simulator.

4 Airborne reconnaissance and marine surveillance.

5 Aerospace relay mirror system.

**Armstrong line** Pressure equivalent to about 63,000 ft, 19,200 m, at which human blood boils.

**ARMTS** Advanced radar maintenance training set.

**army co-operation** Major elements were: reconnaissance [including photography], artillery observation, contact patrols, supply dropping and, occasionally, tactical co-operation (archaic),

**ARN** Active reduction of noise.

**Arnd** Around.

**ARNG, ArNG** 1 Army National Guard (USA).

2 Arrange.

**ARNO** Azimuth/range not operating.

**Arnold Engineering Development Center, AEDC** Large USAF installation in Tennessee charged with aerodynamic development, especially of air-breathing propulsion.

**ARO** 1 Air Traffic Services reporting office.

2 Aspheric reflective optics.

3 Airport reservation office, for arranging GA traffic slots.

4 Aerial refueling operator.

5 Aircraft Recovery Officer.

6 Army Research Office (US).

7 Airfield, or airport, reporting office.

## arresting gear, arrester gear

**AROD** 1 Aerodrome runway and obstruction data.

2 Airborne remotely operated device.

**AROG** Auto roll-out guidance (after blind Cat 3b landing).

**aromatic** Hydrocarbon petrol (gasoline) fuels containing, in addition to straight-chain paraffins (kerosenes), various linked or ring-form compounds such as toluenes, benzenes and xylenes. Some cause rapid degradation of natural or synthetic rubbers.

**AROS** African Regional Organization for Standardization.

**Arosys** Adaptive-rotor system.

**ARP** 1 Air report (written).

2 Aero-Rifle Platoon (infantry section of Air Cavalry).

3 Air raid precautions (UK, WW2).

4 Aerospace, or aeronautical, recommended practice (SAE).

5 Aerodrome reference point (ICAO).

6 Aluminium-reinforced polyimide.

7 Attack reference point (appears in practice to mean IP) (US).

8 Applied research programme.

9 Anti-runway penetrator.

10 Airworthiness review programme.

11 Antenna rotation period.

12 Aviation regulatory proposal (Australian).

13 Anti-rotation period (radar).

14 Air-data reference panel.

**ARPA, Arpa** Advanced Research Projects Agency, created 1958, became Darpa.

**ARPC** 1 Air Reserve Personnel Center (USAF, Denver, Colorado).

2 Ascending ring-plane crossover (Saturn).

**ARPDD** Automatic [or airborne] radar periscope detection and discrimination.

**ARPS** 1 USAF Aerospace Research Pilots' School, Edwards AFB, Calif.

2 Advanced radar processing subsystem (AEW).

**ARPT** Airport.

**ARPTT** Air-refueling part-task trainer (USAF).

**ARQ** Automatic error correction [repeat request].

**ARR** 1 Arrival message.

2 Airborne radio relay.

3 Air-refuelling receiver.

4 Air-traffic-control radar recording.

**array** Transmitting or receiving aerial (antenna) system made up of two or more (often 20 or more) normally identical aerials positioned to give enormously multiplied gain in desired direction.

**ARRC** Allied Command Europe Rapid-Reaction Corps [HQ, D-41179 Mönchengladbach] (NATO).

**ARRCOS** Arrival co-ordination system.

**arrested landing** Normal fixed-wing landing on aircraft carrier, engaging arrester cable.

**arrested-propeller system** In aircraft with free-turbine turboprop engines, system for bringing one or more propellers to rest and holding them stationary while gas generator continues to run. Should not cause turbine overheat condition; speeds up turn-round and sustains on-board power without causing danger to passengers or others near aircraft.

**arresting barrier** Runway barrier.

**arresting gear, arrester gear** Fixed to aeroplane landing

area to halt arriving aircraft within specified distance. Many systems qualified for use on aircraft carriers, rough battlefield airstrips (in this case, mainly by light STOL machines) and major military runways. In nearly all cases involves one or more transverse cables traversed by hook on arriving aircraft. Kinetic energy of aircraft dissipated by cable pulling pistons through hydraulic cylinders or rotary brakes, driving fan through step-up gears or towing heavy free chains.

**arresting hook, arrester hook** Strong hook hinged to some land-based and most carrier-based aeroplanes for engagement of arresting gear; usually released by pilot from flight position to free-fall or be hinged under power to Engage position.

**arresting unit** Energy-absorbing device on one, or usually both, ends of arrester wire.

**ARRGp** Aerospace Rescue and Recovery Group (USAF).

**arrival** 1 In flight planning, calculated time when destination should be reached (see *ETA*); may be determined by plotting straight line from last waypoint to overhead destination, but professional pilots refine this to take account of approach procedures.

2 Inbound unit of traffic (ie one aircraft approaching destination airfield).

3 Colloq., derogatory description of a particular landing.

**arrival runway** At major airfield, runway currently being used only by arrivals (2).

**arrival stall** Caused by attempting to line up on landing approach by rudder alone, without bank, causing inner wing to stall. Trying to recover by aileron aggravates situation.

**arrival time** Time at which inbound aircraft touches down (BS, FAA); airlines sometimes use different definitions, esp. time at which first door opened.

**ARRM** Affordable rapid-response missile [D adds demonstrator].

**ARROW** 1 Aircraft routing right of way (not spoken as word) (US).

2 Checklist for documents carried: Airworthiness, Registration, Radio license, Operational limitations, Weight/balance. Suffix-C adds Charts [outside local area].

**arrow engine** piston engine having three, or multiples of three, cylinders arranged with one (or one row) vertical and others equally inclined on either side. Also called broad-arrow or W (if inverted, M or inverted-arrow).

**arrow stability** Weathercock stability stemming from simple distribution of mass and side areas.

**arrow wing** 1 Markedly swept wing; in his Wright Brothers lecture in 1946 von Kármán used \*\* exclusively, and 'swept wing' did not become universal until 1948.

2 Modern meaning is wing with inboard section [with subtly curved profile] with LE sweep close to 80° and outer panels of more conventional form, eg sweep 30°–50°.

**ARRS** Aerospace Rescue & Recovery Service (USAF).

**ARRW** Aerospace Rescue & Recovery Wing (USAF).

**ARS** 1 Special air report (written).

2 Atmosphere revitalisation subsystem.

3 Auto-relight system.

4 Attack radar set.

5 Air Rescue Service (from 1996 ARRS).

6 American Rocket Society (became AIAA in 1962).

7 Attitude retention system (XV-15 FCS).

8 Automated retrieve system.

9 Aeroplane Repair Shop (RAF 1918–45).

10 Automated radar summary, charts issued hourly showing local echoes.

11 Active ranging system [airborne laser].

12 Air control centre. Recognised air picture production centre, Sensor fusion post [ACCS] (NATO).

13 Active radar seeker.

**ARSA** 1 Airport radar service area (in US reclassified 1993 as Class C airspace).

2 Apron, or advisable, radar service area.

3 Aeronautical Repair Station Association [office, Alexandria, VA22314-2903] (US).

**ARSAG, Arsag** Aerial Refueling Systems Advisory Group (US).

**Arsips** Aerial refuelling store integrated power system [RAT1].

**Arsis** Aircraft rotation, scheduling and information system.

**ARSR** Air-route surveillance radar, ARTCC radar to detect and display aircraft en route between TMAs.

**ART** 1 Actuator remote terminal.

2 Air Reserve Technician (Afres).

3 Airborne-radar technician.

4 Adaptive-resonance theory.

5 Auto reserve thrust.

**Artac** The Alliance of Independent Travel Agents (UK, office Malborne, Peterborough).

**Artads** Army tactical data system (USA).

**Artas, ARTAS** Air-traffic control radar tracker and server.

**ARTCC** Air-route traffic control center (FAA).

**ARTCS** Advanced radar traffic control system (FAA).

**ARTD** Applied research technology demonstrator.

**Artes** Advanced research in telecommunications (CNES, ESA).

**ARTF** 1 Alkali-removable temporary finish.

2 Aircraft Recovery and Transportation Flight (RAF and USAF).

**Arthur** Any AFCS (F, colloq.).

**ARTI, Arti** Advanced rotorcraft technology integration.

**article** Generalised term for one aircraft, especially one operated by the CIA.

**articulated blade** In rotorplane, rotor blade connected to hub through one or more hinges or pivots.

**articulated rod** In radial piston engine, any connecting rod pivoted to piston at one end and master rod at other.

**artificial ageing** Ageing of alloy at other than room temperature, esp. at elevated temperature.

**artificial feel** In aircraft control system, esp. AFCS, forces generated within system and fed to cockpit controls to oppose pilot demand. In fully powered system there would otherwise be no feedback and no "feel" of how hard any surface was working. Simulates ideal response while giving true picture of surface moments insofar as response curve of each surface and their harmonisation are concerned. System invariably strongly influenced by dynamic pressure  $q$ . Generates force for each surface according to optimised law [not necessarily same for all axes] and prevents pilot from damaging aircraft by primary control (but rarely takes into account rapid trimmer movements).

**artificial gravity** Simulated gravitational effects (but not field) in space environment. Obvious method involves rotation about axis, which introduces Coriolis forces.

**artificial horizon** 1 Primary cockpit flight instrument which, often in addition to other functions, indicates aircraft attitude with respect to horizon ahead.

2 Simulation of Earth horizon (planet's limb) for use as uniform and accurate sensing reference in near-Earth spaceflight (Orbital Scanner is programme generating data for this ideal).

**artificial satellite** Man-made satellite of planetary body.

**artillery observation** Assisting friendly artillery by reporting where shots are falling.

**Artima** Aircraft reliability through intelligent materials application (Acare).

**ARTIP, Artip** Advanced radar-technology insertion program (US).

**Artist** Advanced radar technology integrated systems testbed.

**art. obs.** Artillery observation (RFC, RAF, WW1).

**ARTS, Arts** 1 Automated, or automatic, radar terminal system (FAA, from 1966).

2 Aircraft-recovery transport system (after belly landing, etc.).

3 Automated remote tracking station.

4 All-round thermal surveillance.

5 All-purpose remote transport system (USAF).

6 Advanced radar target system (UK).

**ART/S** Aerial refuelling tank system.

**ARTT** Above real-time training.

**ARU** 1 Attitude retention unit (helicopter height-hold).

2 Auxiliary readout unit (ECM).

3 Aviation Research Unit, part of ARI (7).

4 Audio reproducer unit.

**ARV** Air recreational vehicle.

**ARW** 1 Air Refueling Wing (USAF).

2 Advanced radar warning: E adds equipment, S system.

**AS** 1 Aerospace Standard; major standards are 9001 and 9010 (SAE).

2 Air Station, HQ of unit[s] not directly equipped with aircraft (USAF).

3 Anti-submarine; less often, anti-ship (both also A/S).

4 Airlift Squadron (USAF).

5 Anti-skid (also A/S).

6 Air start, pneumatic service vehicle.

7 Altimeter setting.

8 Anti-spoofing.

9 Aerosystems [engineer branch] (RAF).

**As** 1 Structural aspect ratio.

2 Altostratus.

**As<sub>s</sub>** 1 Web average burning surface area of solid rocket.

2 Cross-section area of stringer.

**AS3, AS<sup>3</sup>** Aviation Services and Suppliers (US).

**ASA** 1 Anti-static additive [fuel].

2 American Standards Association.

3 Airline Suppliers Association [non-profit, monitors supply of parts to detect counterfeit items, 1996–] (US).

4 Army Security Agency (USA).

5 Advanced system architecture.

6 Air-services agreement, between operators and/or governments on particular routes.

7 Autoland status annunciator.

8 Aircraft, or airborne, separation assurance.

9 Airborne shared-aperture.

**ASAA** 1 Aviation Safety Authorities; SC adds Steering Committee.

11 Advertising Standards Authority (UK).

12 See SAA (12).

**ASAC** 1 American Society of Aviation Artists (founded 1986).

2 Acars system access approval

**ASAAC** Allied Standard[s] Avionics Architecture Council (NATO Europe).

**ASAC** 1 Asian Standards Advisory Committee.

2 Aviation Security Advisory Committee.

3 Airborne surveillance, airborne control, comprises autonomous radar, datalink, C<sup>2</sup>, navigation/guidance.

4 Australian Sport Aviation Confederation, Inc. [office, Deakin West, ACT 2600] (Australia).

5 Air, later (6–03) Aviation, Security Advisory Committee (TSA).

**ASaC** Airborne surveillance and control.

**AS/Ac** Air search/air cued.

**ASAG** Air Security Advisory Group (TSA).

**ASAI** Automated subsystem of aeronautical information, linked with FDR(1)/RDP(1).

**ASALM** Advanced strategic air-launched missile.

**AS&C** Airborne surveillance and control.

**ASAP** 1 Airborne shared-aperture program (fighter radar).

2 Australian Society for Aero-historical Preservation.

3 Advanced survival avionics program (USAF).

4 Aviation Security Action Plan, audits national standards for counter-terrorism (ICAO).

5 Aviation Safety Action Partnership, ot Program [Int.].

6 Aggressor space applications project.

7 Aerospace Safety Advisory Panel (NASA).

8 Association of Star Alliance Pilots.

9 American Society of Aerospace Pilots (Schaumburg IL).

10 Airline, or aviation, Safety Action Program (FAA).

**ASAR** Advanced synthetic-aperture radar.

**ASARG** Autonomous synthetic-aperture-radar guidance; P adds program.

**ASARS** 1 Advanced synthetic-aperture-radar system.

2 Airborne search and rescue system.

**ASAS** 1 All-source analysis system; RW adds remote workstation.

2 Airborne, or aircraft, separation assistance system [part of Mermoz effort] (Int.).

**ASAT** 1 Aviation situation-awareness trainer.

2 Advanced subsonic aerial target.

3 See next.

**A-sat** Anti-satellite.

**Asata** Asociación de Aviadores de Trabajos Aéreos (Spain).

**ASB** 1 Air Safety Board (UK, and US 1938–40).

2 American Standard Beam (structural sections).

3 Assembly section breakdown (airframe).

4 Alert service bulletin.

5 Airline Stabilization Board (US).

**asbestos** Fibrous silicate minerals once used for thermal insulation and as reinforcement in composites such as Durestos.

**ASBM** Air-to-surface ballistic missile, = ALBM.

**ASBS** Automated self-briefing system.

**ASC** 1 American Standard Channel (structural sections).  
 2 Aeronautical Systems Center (Wright-Patterson AFB).  
 3 Ascend, ascending (ICAO).  
 4 Aviation Statistics Center (Ottawa, Canada).  
 5 American Society for Cybernetics.  
 6 Aircraft-system controller.  
 7 Air Service Command (USAAF, defunct).  
 8 Air Support Command (RAF, defunct).  
 9 Aviation Safety Council (Taiwan).  
 10 Airborne strain counter.  
 11 Aerospace planning chart.  
 12 Airborne surveillance and control.  
 13 Airport Security Council [JFK International] (US).  
 14 Alternative simplified credit.

**Ascap** Automatic SSR-code assignment procedure.

**Ascas** Automated security-clearance approval system.

**ASCB** 1 Avionics synchronized control bus; commercial counterpart to MIL-1553B (Sperry).  
 2 Avionics, or aircraft, standard communications bus.

**ASCC** 1 Air Standards Coordinating Committee (US, UK, Canada, Australia, NZ).  
 2 Alternate Space Control Center, run by USN 1988–2005 (USAF).

**ASCCA, ASC<sup>2</sup>A** Air and Space Command and Control Agency (USAF).

**ASCE** American Society of Civil Engineers.

**ascending node** Point at which body crosses to north side of ecliptic.

**ascent** Rise of spacecraft from body other than Earth.

**ASCIET** All-Service Combined Identification Evaluation Team (US).

**ASCII** American standard code for information interchange, 7-bit plus 8th bit for parity in serial transmissions.

**ASCL** Advanced sonobuoy communications link.

**ASCM** 1 Anti-ship cruise missile.  
 2 Advanced spaceborne computer module.

**Ascon** Airport surveillance and control [system] (Alcatel).

**Ascot, ASCOT** 1 Airspace control and operations training [simulator].  
 2 Aerial-survey control tool.

**ASCP** Air-supply and cabin-pressure control[ler].

**ASCS** Aircraft-systems central system.

**ASCSII** Aerospace sensor component and subsystem investigation and innovation (USAF).

**ASCTU** Air-supply controller/test unit.

**ASCU** Armament station control unit.

**ASD** 1 Accelerate/stop distance.  
 2 Aeronautical Systems Division (AFSC, USAF).  
 3 Aerospace Systems Directorate (NASA, Ames).  
 4 Average Sortie Duration.  
 5 Aircraft, or airborne, or air, situation display.  
 6 AeroSpace and Defence Industries Association of Europe [formed 27 April 2004 by merger of Aecma, EDIG, Eurospace and SBAC, office Brussels B-1200] (Int.).

**ASDA, ASDa** 1 Accelerate/stop distance available.  
 2 Association Suisse de Droit Aérien (now ASDAS) (Switzerland).

**Asdar** Aircraft-to-satellite data relay.

**ASDAS** Association Suisse de Droit Aérien et Spatial (Switzerland).

**ASDC** 1 Alternative Space Defence Centre.  
 2 Armament signal data converter.

**ASDCS** Airspace surveillance display and control system (WSMR).

**ASDE** 1 Airport surface, or airfield surveillance, detection equipment (from 1952).  
 2 Air situation data exchange (NATO).

**ASDF** Air command and control Simulation and Demonstration Facility.

**ASDI** Aircraft situation display indicator.

**Asdic** Armed Services Documents Intelligence Center (US).

**asdic** Sonar, from “Anti-Submarine Detection Investigation Committee”; UK term originally (1925) applied to high-energy sound systems carried in surface vessels.

**ASDL** 1 Airborne self-defence laser.  
 2 Aeronautical satellite data-link.

**ASDR** 1 Avionic systems demonstrator rig.  
 2 Airport surface detection [ie, surveillance] radar.

**ASDS** Aircraft-sound description system.

**ASE** 1 Airport support equipment.  
 2 Amalgamated Society of Engineers (US).  
 3 Autostabilization equipment.  
 4 Allowable steering error (HUD).  
 5 Auto slat extension (DC-10).  
 6 Aircraft survivability, or self-protection, equipment.  
 7 Aero servo-elastic [mode].  
 8 Altitude setting, or altimetry-system, error.  
 9 Airplane, single-engine; see *ASEL, ASES*.

**Asean, ASEAN** Association of SE Asian Nations.

**Asecna** Agence Pour la Sécurité de la Navigation Aérienne (Africa & Malagasy) office Dakar, Senegal.

**ASEDP** Army Space Exploration Demonstration Program (USA).

**ASEE** American Society for Engineering Education [office, Washington, DC20036] (US).

**ASEG** All-Services Evaluation Group (USN).

**ASEL** 1 Airplane, single-engine, land.  
 2 A-weighted sound exposure level.

**Asema** Advanced special electronic mission aircraft (USAF).

**AS/EN.9100** Based on ISO.9001–2000, sets quality, safety and technology standards in air transport [1977–] (IAQG).

**ASEP** ACCS [Allied command and control system] surveillance exploratory prototype (NATO).

**ASES** Airplane, single-engine, sea.

**ASET** 1 Aircraft survivability equipment trainer (threat simulator).  
 2 Automatic scoring electronic target; A adds aircraft .

**Asetma** Asociación Sindical Española de Técnicos de Mantenimiento de Aeronaves [E-28042 Madrid] (Spain).

**ATES** Airborne seeker evaluation test system.

**ASF** 1 Air Safety Foundation.  
 2 Aviation Sans Frontières [humanitarian, non-profit; office Paris – Only] (Int., F).  
 3 Aircraft Servicing Flight (RAF).  
 4 Aeromedical staging facility/facilities.

**ASFA** Aviation Safety Foundation of Australia.

**ASFC** English translation “aero-sports federation of China” [office, 100061 Beijing] (China).

**AS4** Structural graphite/epoxy composite (Hercules).

**ASG** 1 Airborne system, gun (DoD hardware code).

**ASGC****ASNT**

2 Piloted aircraft, special/combination, fire control (JETDS).  
3 Air Safety Group [Bluntisham PE17 3LE] (UK).  
4 Arinc signal gateway.  
5 Acoustic-signal generator.  
6 Aviation Study Group [1992–, OX1 3JA] (UK).

**ASGC** Airborne-surveillance ground control.

**ASH** 1 Advanced, or assault, support helicopter (USA).  
2 Active seeker homing.

**ASHC** Assault Support Helicopter Company (USA).

**ashless dispersant** Lubricating-oil additive which stops the oil from ashing when overheated.

**ASHM** Aft-station HUD monitor.

**Ashrae** American Society of Heating, Refriegerating and Air-Conditioning Engineers.

**ASI** 1 Airspeed indicator.  
2 Air Staff Instruction (usually plural, ASIs).  
3 Aviation Safety Institute [office, Worthington, OH] (US).  
4 Agenzia Spaziale Italiana.  
5 Aviation Society of Ireland [1963–; office Dublin 15] (Ireland).  
6 Arinc standards interface.  
7 The Aeronautical Society of India.  
8 Augmented spark igniter.  
9 Air-system interrogator.  
10 Avionics system integration.  
11 Associazione Sindacale Intersind [I-00185 Rome] (Italy).  
12 Aircraft station interface.

**a-Si** Amorphous silicon, atoms arranged haphazardly, not in lattice.

**ASIA** Association Suisse de l'Industrie Aéronautique [CH-5400 Baden].

**ASIAS** Aviation Safety information analysis and sharing (FAA).

**ASIC** 1 Application-specific integrated circuit.  
2 Australian Securities and Investment Commission.

**ASICC** Australian Space Industry Chamber of Commerce [Sydney, NSW 2001] (Australia).

**ASID** American Society for Information Display.

**ASIF** Aviation security infrastructure fee (TSA).

**ASIG** 1 Airports Special-Interest Group (UK local-government association).  
2 Aircraft Service International Group.  
3 Air Safety Investigation Group.

**Asims** Advanced Sita message server.

**ASIP** 1 Aircraft structural-integrity program (USAF).  
2 Airborne signals intelligence payload.

**ASIR** Airspeed indicator reading.

**ASIS** 1 Air Safety Investigating System (Australia).  
2 Abort-sensing and implementation system.

**Asist, ASIST** Aircraft/ship integrated secure and traverse.

**ASIT** Adaptable surface-interface terminal.

**Asival** Assessment of the ATM(7) system configuration subject to validation (Euret).

**A6013** A weldable Si/Al alloy (Alcoa).

**A629** In the new century, this is the latest standard data bus. Not only is it 20 times faster than A429 (predecessor) at 2 Mbytes/s. but it can accommodate up to 131 terminals, each able to transmit to, and receive from, any of the other 130 (Arinc).

**ASJ** Automatic search jammer.

**ASK** 1 Automatic shift-keying.  
2 Available seat-km.

**ASL** 1 Above sea level (UK = AMSL).  
2 Authorised service life.  
3 Atmospheric Sciences Laboratory (WSMR).

**ASLA** Air Services Licensing Authority (NZ).

**ASLAE** Association of Singapore Licensed Aircraft Engineers [S-1232] (Singapore).

**ASLAET** Australian Society of Licensed Aircraft Engineers and Technologists [office, Mascot, NSW] (Australia).

**Aslar** Aircraft surge launch and recovery (USAF).

**ASLE** Advanced service-life extension.

**Aslib** Association of Special Libraries and Information Bureau [not plural]; (UK 1951–).

**ASLO** Accident-Site Liaison Officer.

**ASLP** Air-sol longue portée (long-range ASM) (F).

**ASLR** Air/surface, or air-to-surface, laser ranger.

**ASLS** 1 Air Surveillance Liaison Section.  
2 Aircraft structural life surveillance.

**ASLV** Augmented satellite launch vehicle (India).

**ASM** 1 Air-to-surface missile; NZ has used \* to mean anti-ship missile.  
2 Available, or aircraft, seat-miles (often a.s.m.).  
3 Advanced systems monitor (in cockpit).  
4 American Society for Metals.  
5 Autothrottle servo-motor.  
6 Apron-services management.  
7 Aircraft schematic[s] manual.  
8 AirSpace management.  
9 Air separation module.  
10 Aerial supervision module.  
11 Anonymous subscriber messaging.

**ASMA** 1 Aerospace Medical Association, often AsMA [office, Alexandria, VA22314-3579] (US).  
2 Air Staff management aid (UK).

**Asmac** Aero Space Museum Association of Calgary [Alberta T2E 8A5] (Canada).

**ASMD** 1 Anti-ship missile defense (USN).  
2 Air, space and missile defense (USN).

**ASME** The American Society of Mechanical Engineers (office New York).

**ASMET, Asmet** Accelerated simulated missile, or mission, endurance test.

**A-SMGCS** Airport, or airfield, or advanced, surface-movement guidance and control system.

**ASMI** Airfield surface movement indicator.

**ASMK** Advanced serpentine manoeuvrability kit.

**ASMO** Arab Standardization and Metrology Organization.

**ASMP** Air-sol moyenne portée (medium-range ASM); A adds amélioré = improved.

**ASMR** Advanced short/medium-range.

**ASMS** 1 Advanced strategic-missile system (previously Abres).  
2 Airport surface-management system.

**ASMT** Air-supply mission technology.

**ASMU** Avionics system management unit.

**ASN** Abstract syntax notation, protocol for message handling; can be followed by identity number.

**ASNA** Aviation Safety and Noise-abatement Act (US).

**ASNI** Ambient sea-noise indication.

**ASNT** American Society for Non-destructive Testing [office, Columbus, OH 43228-0518] (US).

**ASO** 1 Air-support operations, see *ASOC*.  
2 Acoustic-systems, or sensor, operator.

**ASOC** 1 Air-Support Operations Centre (RAF), Center (GTACS).  
2 Air Sovereignty Operations Centre.

**Asops** Airport-security operational process simulation.  
**ASOS** Automated surface observation, or observing, system; at uncontrolled airfields gives voice readout of useful data.

**ASP** 1 Armament status panel.  
2 Aircraft servicing platform [or pan].  
3 Automated small-batch production.  
4 Audio selector panel.  
5 Airbase survivability program (US).  
6 Adaptive, or advanced, or aircraft, or airborne, signal processing, or processor.  
7 Aircrew services package.  
8 Application service provider.  
9 Altimeter setting panel.  
10 Airborne surveillance platform.  
11 Airfield[s] systems planning (ICAO).  
12 Arrival sequencing program.  
13 Aircraft systems processor.  
14 Antenna scan[ning] period.  
15 AFS(1) planning.  
16 Airspace policy.  
17 Accelerated share purchase.

**ASPA** Asociación Sindical de Pilotos Aviadores (Mexico).

**Aspares** Air-surveillance and precision-approach radar control system (USMC).

**ASPC** See *CSPA*.

**ASPCU** Air supply/pressurization control unit.

**ASPE** Speed of sound in EDP.

**aspect change** Changing appearance or signature of reflective target as seen by radar, caused by attitude changes.

**aspect ratio** General measure of slenderness of aerofoil in plan. For constant-section rectangular surface, numerical ratio of span divided by chord, discounting effects due to presence of body or other parts of aircraft. For most wings \*\* A is defined as  $b^2/S$ , where b is span measured from tip to tip perpendicular to longitudinal axis (slew or VG wing as nearly as possible transverse) and S is gross area. Structural \*\* As generally defined as  $b^2 \sec^2 \Lambda$  or

$\frac{A}{\cos^2 \Lambda}$ , where  $\Lambda$  is  $\frac{1}{4}$ -chord sweep angle. Confusingly,  $A_s$  is now losing ground to  $R_A$ . Effective or

equivalent \*\* increased by fitting end-plates (eg horizontal tail surface on top of fin), but there is no universally applicable formula. Optimum \*\* usually means that giving minimum wing weight, but this is seldom the best overall. Generally, faster aircraft have lower \*\*, shorter field length demands higher \*\*. Sailplanes and man-powered aircraft need extremely high \*\*, from 20 to 40.

**Aspen** Aerospace planning and execution network (USAF).

**Asph** Asphalt.

**Aspire** 1 Advanced supersonic propulsion integration and research (NASA).  
2 Asia and South Pacific initiative to reduce emissions.

**Aspis** Advanced self-protection integrated suite.

**ASPJ** Advanced, or airborne, self-protection jamming, or jammer.

**ASPO** 1 Army Space Program Office (USA).  
2 Avionics Systems Project Officer (USAF).

3 Aviation Strategic Planning Organization (Australia).

**ASPP** Airfield [originally aeronautical fixed] Service Planning Panel (ICAO).

**ASPR** Armed Services Procurement Regulations (US).

**Aspro** Airborne associative [from "advanced signal"] processor.

**ASPS** 1 Airborne self-protection system.

2 Advanced self-protection suite.

**ASPSS** Aircraft self-protection security system.

**ASQC** American Society for Quality Control.

**ASQF** Assurance-specific qualification facility, alternative form of PACF for Satnavs (ICAO).

**ASRAAM, Araam** Advanced short-range AAM.

**ASR** 1 Air/sea rescue [see *ASR apparatus*].  
2 Aerodrome, airfield, airport, or approach, surveillance radar.

3 Air Staff Requirement (UK).

4 Altimeter setting region.

5 Automatic send/receive.

6 Acceleration, or accelerating, slip reduction.

7 Air Safety Report, of hazardous event.

8 Alternate system[s] review (USAF).

**Asrad** Advanced short-range air defence.

**ASR apparatus** Term for that dropped to survivor(s), including 3 canisters containing dinghy, food, radio etc.

**ASRC** Alabama Space and Rocket Center, Huntsville.

**ASRgn** Altimeter setting region.

**ASRM** Advanced solid rocket motor (NASA).

**Asroc** Anti-submarine rocket.

**ASRP** Aviation Safety Reporting Program (FAA/NASA, from 1976).

**ASRS** 1 Aviation safety [&] reporting system (NASA, 1975–).  
2 or **AS/RS** Automatic storage/retrieval system.

**ASRT** 1 Air support radar team.

2 Autonomous scout rotorcraft testbed (DoD).

**ASRTE** Avion station relais de transmissions exceptionnelles, also redered Astarte (F).

**ASRWSP** Airport surveillance radar with weather systems processor.

**ASS** 1 Attitude-sensing system.

2 Airlock support subsystem.

3 Air Signallers' School (RAF).

4 Anti-shelter submunition.

5 Aviation support ship.

6 Atmospheric sounding system.

**ASSA** 1 Aeronautical Society of South Africa, more usually in Afrikaans: LKV.

2 Aviation system of systems architecture (US).

**ASSAD, Assad** Union of aviation-engine producers (R, CIS).

**assault aircraft** Aeroplanes and/or helicopters which convey assault troops to their objective and provide for their resupply.

**assembly** 1 Completed subsystem, portion of airframe or other part of larger whole which itself is assembled from smaller pieces.

2 Process of putting together parts of functioning item of equipment, engine, subsystem, portion of airframe or other aerospace hardware (other than complete aircraft,

## assembly drawing

buildings, docks, large launch complexes and similar major structures, for which preferred term is *erection*).

**assembly drawing** Engineering drawing giving no information on manufacture but necessary for correct assembly; shows geometric relationships, assembly sequence, necessary tooling (jigging), fits and tolerances, and operations required during assembly.

**assembly line** Essentially linear arrangement of work stations in manufacturing plant for assembly or erection of finished product or major component (eg wing). Modern aircraft produced in such small numbers optimum erection-shop layout often not linear. High-rate production (eg car engines or radio sets) parts travel on belt or overhead conveyor from station to station (see *transfer machines*).

**ASSET** Aero-Space Structure Environmental Test; USAF research programme.

**Asset** Airborne sensor system for evaluation and test (Northrop).

**asset** Item or group of items from a nation's military inventory, especially those serving front-line function.

**ASSG** Acoustic-sensor signal generator.

**assigned amount** In emissions legislation, the maximum permitted.

**Assist** Affordable space systems intelligent synthesis technology (USAF/NASA).

**assisted takeoff, ATO** Aerodyne takeoff with linear acceleration augmented by accelerator, by self-propelled trolley, by rockets attached to aircraft or by other means not forming part of normal flight propulsion. Criterion is use of external force; mere downward slope, giving component of weight in takeoff direction, does not qualify.

**ASSM** Anti-ship supersonic missile.

**associated (VOR, Tacan)** VOR and Tacan/DME facilities either co-located or situated as closely as possible; subject to maximum aerial (antenna) separation of 100 ft in TMAs when used for approach or other purposes requiring maximum accuracy, or 2,000 ft elsewhere.

**associative processor** Digital computer processor operating wholly as ancillary to another, usually larger, installation. Normally has no parent computer. Future ATC computer installations may use powerful large-memory sequential machine to resolve conflicts and exercise overall control, supplemented by \*\* working in parallel seeking potential conflicts.

**ASSR** 1 Airport surface-surveillance radar.

2 Approach-control secondary surveillance radar.

3 Air-security screening records (TSA).

**ASSRP** Air and Space Scientific Research Program (AFRL).

**AS<sup>3</sup>, ASSS** 1 Active-search sonobuoy system.

2 Airport surface-surveillance system.

**ASST** 1 Anti-ship surveillance and tracking, or targeting.

2 Advanced supersonic transport.

**ASSTC** Aerospace Simulation and Systems-Test Center.

**assured destruction** Concept of measurable inevitable damage inflicted on enemy heartlands for purposes of deterrence and arms limitation.

**ASSV** Alternate-source select[or] valve.

**ASSW** 1 Anti-surface-ship warfare.

2 Associated with (met. report).

## Astra, ASTRA

**AST** 1 Advanced supersonic transport (or technology).  
2 Advanced simulation technology.

3 Atmospheric surveillance technology.

4 Air Staff Target (UK).

5 Accelerated service test.

6 Airborne surveillance testbed.

7 Avionics system trainer.

8 Atlantic Standard Time.

9 Applied signal technology.

10 Air surveillance terminal.

**ASTA** 1 American Society of Travel Agents [office, NY City].

2 Airport surface-traffic automation [S adds system] (FAA).

3 Aircrew synthetic-training aid[s].

**astable** Not having a stable state.

**Astamids** Airborne standoff minefield-detection system (passive IR).

**AST&L** American Society of Transportation and Logistics [Lock Haven, PA 17745-1419] (US).

**Astar** Airborne search/track, or target, attack radar.

**Astarte** Avion station relais de transmissions exceptionnelles (F).

**astatic** Without specific orientation or direction.

**ASTC** Aviation Security Training Centre [B-1931 Zaventem] (Int.).

**ASTE** 1 Association pour le Développement des Sciences et Techniques de l'Environnement (F).

2 Advanced strategic/tactical expendables [mainly IR sources].

**Astec** 1 Automation system[s] for terminal and en-route control.

2 Advanced small turbine-engine core.

3 Advanced strategic/tactical expendable[s] (IR decoy).

**Aster** Advanced spaceborne thermal emission and reflection radiometer.

**Asterix** All-purpose structure Eurocontrol radar info. exchange.

**asteroid** Minor planet, esp. fragments (mostly much less than 50 miles across) orbiting between Mars and Jupiter; thus, small body, such as artificial satellite, in solar orbit.

**ASTF** 1 Aeropropulsion Systems Test Facility (at AEDC, commissioned September 1985).

2 Airspace system task force.

**ASTI** Airport surface-traffic indicator.

**Astia** Armed Services Technical Information Agency (US).

**ASTM** American Society for Testing & Materials. [West Conshohocken, PA19428] (US).

**ASTO** Arab Satellite Telecommunications Organization (Int.).

**ASTOL** Alternate (alternative is meant) STOL.

**Astor** Airborne stand-off radar.

**ASTOS, Astos** The Association of Specialist Technical Organisations [SMEs] for Space [office, Amersham HP6 6DZ] (UK).

**Astovl, ASTOVL** Advanced Stol.

**ASTP** 1 Apollo-Soyuz Test Project (US, USSR).

2 Advanced Space Transportation Program (NASA).

**ASTR** Attack store; usually (and very confusingly) means which type of AAM is selected, not air/ground weapon.

**Astra, ASTRA** 1 Applications of Space Technology to Requirements of Civil Aviation (ICAO panel); 1986

## Astral

renamed Application of Space Techniques Relating To Aviation, later still Space replaced by Satellite.

2 Air staff training programme.

3 Association in Scotland to Research into Astronautics [office, Anderson, Glasgow G3] (UK).

4 Advanced stability training and research aircraft [previously systems training aircraft] (ETPS).

5 Attitude steering turn-rate azimuth.

6 Alternative abb. for Aviation Strategic Planning Organization (Australia).

**Astral** Air-surveillance and targeting radar L-band.

**Astras** Airport surface-traffic awareness system (ICAO), confusion with ASTA[2].

**Astrea** Autonomous systems technology related airborne evaluation and assessment [UAV] (UK).

**Astrid** Airborne system for target recognition, identification and designation.

**astrionics** Space electronics.

**Astro** 1 Air support to regular operations (police helicopters).

2 Autonomous space transport robotic operations, or -and robotic orbiter (Darpa).

**astrobiology** Science of possible life on planets other than Earth, or elsewhere in space (note, in R means 'space medicine').

**astrocompass** Non-magnetic instrument, gives direction of true North relative to celestial body which must emit light and be of known direction (see *astronavigation*).

**astrodome** Optically transparent dome in roof of large aircraft 1935–50 through which navigator could take astro fixes using sextant.

**astro fix** Fix obtained by sighting two or more stars of known direction using sextant or astrocompass.

**astrogation** Navigation in space, suggest colloq.

**astro-inertial** Navigation by means of inertial system updated or corrected by astro fixes.

**astronaut** One who navigates in space; ie who travels in space. Specif. [capital A], one selected for space flight by NASA.

**astronautics** Science of study, design, construction and operation of spacecraft.

**astronavigation** 1 Navigation of aircraft or spacecraft by measuring declination, right ascension and/or other angular positions of stars and other celestial bodies whose location on celestial sphere is known.

2 Navigation of spacecraft by any means (usage ambiguous).

**astronics** Astrionics.

**astronomical twilight** Period between day and night when Sun's centre between  $12^\circ$  and  $18^\circ$  below sea-level horizon (see *civil twilight*, *nautical twilight*).

**Astronomical Unit, AU, A.U.** Unit of linear distance based on mean distance between Earth and Sun; accepted value was  $149,598,500$  km, but IAU definition is now  $1.496 \times 10^{11}$  m.

**astronomy** Science of celestial bodies other than Earth. Not included in this definition are celestial phenomena, such as polarisation of stellar light and other measures concerned more with radiation than with 'bodies'. Thus, subdivision radar \*, X-ray \*, IR \*, UV \* etc.

**astrophysics** Physics of observable universe, esp. states of matter and energy generation and transfer.

**astroseismology** Study of earthquakes on bodies other than Earth.

## asymptote

**astro-tracker** Automatic sextant capable of searching celestial sphere for particular luminous body, identifying it and determining orientation in terms useful for navigation, and of repeating sequence with same and at least one other celestial body. Corrects and updates INS in long-range aircraft.

**ASTS** 1 Association Suisse pour les Techniques Spatiales (Switz).

2 Advanced screening technology systems.

**ASU** 1 Aeromedical staging unit.

2 Altitude (or, confusingly, attitude) sensing unit.

3 Approval for service use.

4 Aircraft storage unit (UK).

5 Aircraft starting unit.

6 Acoustic simulation unit.

7 Avionics switching unit.

8 Anti-surface.

9 Analyser sub-unit.

**Asupt** Advanced simulator for undergraduate pilot training.

**ASUW, ASuW** Anti-surface [or anti-surface-unit] warfare aircraft category (USN).

**ASV** 1 Air-to-surface vessel. WW2 airborne search radar. Incorrectly rendered as anti-surface vessel. See *ASVW*.

2 Aerial swimming vehicle.

**ASVEH** Air-surveillance vehicle.

**ASVR** Aircraft-systems verification [now changed to validation] rig.

**ASVS** Airborne separation video system.

**ASVW** Anti-surface vessel warfare, today's term.

**ASW** 1 Anti-submarine warfare [AC adds analysis center, AS area system, DS data system, SOW stand-off weapon and T trainer].

2 Aft-swept wing.

3 Confusingly, also used in US for anti-ship warfare, and in UK (WW2) for air/sea warfare.

4 Acquisition scan window (UAV).

**ASWA** Aeronautical Society of Western Australia Inc. [Perth South].

**ASWAC** Airborne surveillance, warning and control [S adds system] (India).

**ASWDU** Air/Sea Warfare Development Unit (RAF/RN).

**ASWE** Admiralty Surface Weapons Establishment (Portsmouth, UK).

**ASWOC** ASW [1] operations centre.

**ASWT** Air-to-surface weapons technology.

**ASXV** Air-launched expendable sound velocimeter.

**asymmetric flight** Flight by aerodyne in sustained grossly asymmetric condition of lift, weight, thrust or drag, esp. flight by multi-engined aircraft in which at least one engine at substantial distance from axis of symmetry is inoperative.

**asymmetric loading** Flight by aircraft, esp. aerodyne, in which c.g. is located at substantial distance from vertical line through centre of lift with aircraft in level attitude and trimmed for normal horizontal flight (eg strike aircraft unable to release one of two heavy stores carried on outer-wing pylons).

**asymmetric warfare** Conflict between a high-tech nation and a primitive one.

**asymptote** Limiting position of tangent to curve, where

**asynchronous**

lines meet at infinity. Thus, asymptotic, where slope of plotted curve becomes parallel to either x or y axis.

**asynchronous** Not synchronised, not in frequency or phase.

**asynchronous computer** Electronic computer, usually digital, in which operations do not proceed according to timing clock but are signalled to start by completion of preceding operation.

**ASZ** Air surface zone (NATO, USAF).

**AT** 1 Advanced trainer (USAAF category, 1924–48).

2 Anti-tank.

3 Autogenic training.

4 Autothrottle [also A/T].

5 Air transmit.

6 Armament trainer (F-22).

7 Air transport (role of tanker).

8 All traffic.

9 Advanced targeting.

**AT<sup>3</sup>** See *ATT*.

**ATA** 1 Air Transport Auxiliary, UK ferry organization 1940–45; also the Association, 1946– [office, Chipping Sodbury BS17 6XG].

2 Air Transport Association of America [scheduled carriers, office, Washington DC20004-1707] (US).

3 Actual time of arrival.

4 Advanced tactical aircraft.

5 Air Transport Association (UK).

6 Automatic target-acquisition.

7 Aero Testing Alliance (F, G, Neth.).

8 Aviation Training Association [office, High Wycombe, HP13 6LS] (UK).

9 Airport traffic area.

10 Airline-tariff analysis.

11 Advanced testbed[s] for avionics.

12 Aerial tactics area.

13 Air Traffic Alliance [Airbus, EADS, Thales, 2003–] (Int.).

**ata** Atmosphere[s] pressure; 1 ata [atm in UK] = 101.325 kPa = 14.6959 lb/in<sup>2</sup>.

**ATAAC** Anti-torpedo air-launched countermeasure[s].

**ATAAS** Advanced terminal area approach spacing.

**ATAB** Air Transport Allocations Board, joint agency in theatre of operations which assigns priorities to loads.

**ATAC** 1 Air Transport Association of Canada [office, Ottawa].

2 Applied-technology advanced computer (airborne EW).

3 Air-transportable acoustic communication[s], expandable buoy.

**ATACC** Advanced tactical air command center (USMC).

**ATACMS** Army tactical missile system[s] (USA).

**Ataco** Air Tactical Control Officer.

**ATAF** 1 Allied Tactical Air Force (NATO).

2 Association Internationale des Transporteurs Aériens [acronym from previous title; F-75008 Paris] (F).

**ATAFCS** Airborne target acquisition and fire-control system.

**ATAG** Air Transport Action Group, coalition pressing for better infrastructure [CH-1215 Geneva 15] (Int.).

**Atags** Advanced-technology anti-g suit (USAF).

**ATAL, Atal** 1 Automatic test application language.

2 Appareillage de TV sur aéronef léger (F).

**ATALS** Army Transportation and Logistics School (USA).

**ATAM** Air-to-air Mistral.

**ATAOS** Autonomous tactical attack and observation system.

**ATAP** Advanced tactical-, or target-, attack penetrator.

**ATAR** 1 Air-to-air recognition (device).

2 Air-to-air recovery.

3 Advanced threat-alert and response; CE adds critical experiment (USAF).

4 Association des Transporteurs Aériens Régionaux (F).

**Atares** Air-transport and air-refuelling exchange of services (European Air Group).

**atars** 1 Automatic traffic-advisory and resolution service (UK).

2 Advanced tactical air-reconnaissance system.

3 Aircrew training and rehearsal support (USAF).

**ATAS, Atas** 1 Air Traffic Advisory Service, provides separation between known aircraft in IFR on certain routes (UK DTI).

2 Advanced target-acquisition sensor.

3 Air-to-air Stinger.

4 Automated talking advisory system (FAA).

5 Advanced tactical airborne system.

**ATATS** Automatic target-acquisition and tracking-system.

**Ataws** Advanced tactical air-warfare system.

**ATB** 1 Advanced-technology bomber.

2 Air-Transport Bureau (ICAO).

3 Aerospace Technology Board.

4 Automated ticket and boarding pass.

5 Advanced-technology blade (HP turbine).

6 Air turn back [mission abandoned while en route].

**ATBM** Anti-tactical, or anti-theater, ballistic missile.

**ATC** 1 Air traffic control; C adds centre.

2 Air Training Corps (replaced ADCC in 1941; HQ Air Cadets, RAF College, NG34 8HB] (UK).

3 Air Training Command (USAF, from 15 April 1946).

4 Air Transport Command, formed from Air Ferrying Command 1 July 1942, became MATS.

5 Approved Type Certificate, first issued (by DoC) in 1927.

6 Advanced-technology component (DoD).

7 Aerospace Technical Council (AIAA).

8 Air transport conference (travel agencies).

9 Automatic [usually EW] threat-countering.

10 After top centre.

11 Acoustic-torpedo countermeasures.

12 Automatic tuning control.

13 Astronomy Technology Centre (Edinburgh, UK).

14 Airport traffic control (US DoC 1938).

15 Auxiliary, or ancillary, terrestrial component. [= CGC].

**ATCA** 1 Air Traffic Control Association of America [1955–, office Arlington, VA22201] (US).

2 Air Traffic Conference of America.

3 Allied Tactical Communications Agency (NATO, Brussels).

4 ATC Assistant (UK).

5 Advanced tanker/cargo aircraft (USAF).

**ATCAC** ATC Advisory Committee (US Congress).

**Atcap** 1 ATC Automation Panel (ICAO).

**2** Army Telecommunications Automation Program (USA).

**Atcare** ATC analysis and recording environment.

**Atcas** *1* ATC administration system.  
 2 ATC automation system.

**ATCC** ATC centre/center (UK/US).

**ATC clearance** Authorization by ATC for purpose of preventing collision between known aircraft for aircraft to proceed under specified conditions in controlled airspace (FAA).

**ATCCC, ATC3** ATC Command Center (FAA).

**ATCCTS** *1* ATC communications training system.  
 2 ATC control-tower simulator.

**ATCE** Air training centre of excellence.

**ATCEU** ATC Evaluation Unit (Hurn, UK).

**ATCGS** ATC ground segment [of satellite link].

**ATCI** ATC investigation of airprox.

**ATCMFT** ATC multifunction trainer.

**Atco, ATCO** *1* ATC officer.  
 2 Air-taxi and commercial operator.

**Atcom** Aviation and Troop Command (USA).

**ATCOMS, Atcoms** ATC operations, or and operational, management system[s].

**ATCPA** Air Taxi & Commercial Pilots Association (office, Washington DC).

**ATCPS** ATC procedures simulator.

**ATCPT** ATC procedural trainer.

**ATCR** *1* Air Training Command Regulation[s] (USAF).  
 2 ATC room[s].

**ATCRBS** ATC radar-beacon system (FAA).

**ATCRS** ATC radar simulator.

**ATCRU** ATC radar unit (UK).

**ATCS** *1* ATC Service (UK), or simulator.  
 2 Active thermal-control system, or subsystem.  
 3 Automated tower control system.

**ATCSCC** ATC System (originally Services) Command Center (FAA, Herndon, VA).

**ATCSS** ATC signalling system (air/ground datalink tested 1958 as alternative to voice).

**ATCT** ATC (14) tower; S adds simulator.

**ATD** *1* Actual time of departure.  
 2 Airline-, or aviation-, transmitted disease.  
 3 [translated] Aviation technical division (USSR, R).  
 4 Automatic threat detection; S adds system.  
 5 Applied Technology Directorate (USA).  
 6 Along-track distance.  
 7 Advanced-technology demonstrator.

**ATDA** Augmented target docking adaptor.

**ATDC** Automatic, or assisted, target detection and classification.

**ATDI** Aviation Training and Development Institute (IATA).

**ATDL** Advanced, or Army, tactical, or air-transport, datalink (USA).

**ATDMA** Advanced time-division multiple access.

**ATDRR** Autonomous airborne tactical data radio relay.

**ATDS** *1* Airborne tactical data system.  
 2 Air-turbine drive system.

**ATDU** Air Torpedo Development Unit (RAF Gosport 1940–46) later Helston, now defunct.

**ATE** *1* Automatic test equipment.  
 2 Aircraft test and evaluation (UK).

**3** Actual time en-route.

**4** Advanced technology and engineering (also AT&E).

**5** Air traffic engineer [inspects and maintains navaids].

**ATEC** *1* Aviation Technician Education Council (US).  
 2 Automatic test-equipment complex.

**3** Air[craft] Test & Evaluation Centre [Boscombe Down, previously A&AEE] (QinetiQ).

**Atecm, ATECMA** Agrupación Técnica Española de Constructores de Material Aeroespacial [E-280015 Madrid] (Spain).

**Ategg, ATEGG** Advanced turbine engine gas-generator.

**Atems, ATEMS** Advanced threat-emitter simulator.

**Atepsa** Asociación Técnicos y Empleados de Protección e Seguridad a la Aeronavegación (Argentina).

**ATER** *1* Advanced triple ejector rack.  
 2 Air Test and Evaluation Review [MoD] (UK).

**ATES** Aircraft Test and Evaluation Sector (QinetiQ/DRA, Boscombe Down).

**ATESS** *1* Aerospace and telecommunications engineering support services.  
 2 Advanced tactics and engagement simulation subsystem.

**ATF** *1* Advanced tactical fighter.  
 2 Aviation turbine fuel.  
 3 Actual time of fall.  
 4 Amphibious task force.  
 5 Adaptive terrain-following.  
 6 Altitude test facility.  
 7 Air traffic flow.  
 8 Aerodrome, or airport, traffic frequency.  
 9 Air-transport force.  
 10 Anechoic test facility.

**Atfero** Atlantic Ferry Organisation (UK, 1940–42).

**Atflir, Atfir, ATFLIR, ATFIR** Advanced targeting forward-looking IR.

**ATFM** Air traffic flow management; U adds unit.

**ATFPS** Air traffic flow planning system.

**ATFS** Authentic tactical flight simulator, or simulation.

**ATG** *1* Amphibious task group.  
 2 Air-traffic generator.  
 3 Adversary Tactics Group (USAF).

**ATGS** Air Tactical Group Supervisor, an experienced firefighter who provides aerial C<sup>2</sup> and also feeds information to the IC(8).

**ATGW** Anti-tank guided weapon.

**ATH** *1* Autonomous terminal homing.  
 2 Air-transportable hospital.  
 3 Automatic target handoff.

**Athlete** All-terrain hex-legged extraterrestrial explorer (NASA).

**atodyd** Aero-thermodynamic duct. The essential features are that it is open at both ends and has an internal profile such that flow velocity inside is lower than the free-stream velocity, thus facilitating burning of fuel, or in some other way adding energy. The term is generally taken to be synonymous with *ramjet*.

**Athos** Airport tower harmonised controller system (Euret).

**A/THR** Autothrottle mode.

**ATHS** Airborne, or automatic, target handover, or handoff, system.

**ATI** *1* Air, or airline, transport instrument [standard panel sizes].

## ATIC

- 2 Anti-trust immunity [DoT] (US).  
3 Air Technical Intelligence (USAAF, USAF).
- ATIC** Avionics Test and Integration Complex (Edwards AFB).
- ATIF** 1 Aeronautical telecommunications network trials infrastructure (ICAO).
- 2 All-source track and identification fusion.
- ATIG** Air Technical Intelligence Group, of FEAF (1945–6).
- Atigs** Advanced tactical inertial guidance system.
- ATILO** Air technical-intelligence liaison officer.
- ATIMS** Airborne target-information management system.
- ATIMU** Advanced tactical inertial-measurement unit.
- ATIR** Air-traffic incident report.
- ATIRCM** Advanced threat, or theatre, IR countermeasures.
- ATIS** 1 Automatic, or automated, terminal information service (ICAO, FAA); continuous broadcast of recorded non-control information in selected high-activity terminal areas (to improve controller effectiveness, and relieve congestion by automating repetitive transmission of routine information).
- 2 Airfield-terminal information system.
- 3 Air-traffic information service, or server, or system.
- ATISD** Air Training Information Systems Division (Randolph AFB).
- ATITA** Air Transport Industry Training Association (UK).
- ATITB** Aviation and Travel Industry Training Board (NZ).
- ATK** Aviation turbine kerosene; F adds fuel.
- ATKHB** Attack Helicopter Battalion (USA).
- ATk** 1 Available tonne-kilometres.
- 2 Anti-tank.
- ATL** 1 Airborne, or advanced, tactical laser.
- 2 Auto-trim loop.
- 3 Acquisition, technology and logistics (DoD).
- 4 Automatic tape layer, or tapelaying.
- ATLA** Air Transport Licensing Authority (Hong Kong, formerly).
- Atlantic** Airborne targeting low-altitude navigation thermal imaging and cueing.
- Atlas** 1 Abbreviated test language for avionics systems.
- 2 Advanced tactical low arresting system (overrun barrier).
- 3 Advanced tactical light arresting system (Aerazur cable/drum).
- 4 Advanced-technology ladar system.
- 5 Airborne topography and land-use assessment system.
- 6 Azimuth target-intelligence and acquisition system (Israel).
- 7 Antenna-testing laboratory automated system (NAS Patuxent).
- 8 Aircraft total lightning advisory system.
- Atlass** Advanced technology low-altitude surveillance system.
- ATLB** Air Transport Licensing Board (UK).
- Atlis** Automatic tracking laser illumination system.
- ATLND** Automatic takeoff and landing (UAV).
- ATM** 1 Air-turbine motor.
- 2 Air transport movement, or management.

## atmospheric electric field

- 3 Air tasking [previously base] message, request for a particular combat mission to be flown (RAF).
- 4 Anti-tactical missile.
- 5 Anti-tank missile, or mine, or munition.
- 6 Asynchronous transfer, or transmission, mode.
- 7 Airspace, or air, [and] traffic management [C adds centre, MG management group].
- 8 Aileron trim motor.
- 9 Air-targeting mode.
- atm** Atmospheres pressure (UK usage, see *ata*).
- ATMA** 1 Association Technique Maritime et Aéronautique (F).
- 2 Active tuned mass absorber.
- Atmac** Air Traffic Management Advisory Committee (RTCA).
- ATMDC** Air Traffic Management Development Centre [Christchurch BT23 6DF] (UK).
- ATMG** Arms Transfer Management Group (US DoD).
- Atmos** Ammunition, toxic material open space.
- atmosphere** 1 Gaseous envelope surrounding Earth, subdivided into layers (see *atmospheric regions, model atmosphere*). For composition see *Air*.
- 2 Gaseous or vaporous envelope surrounding other planets and celestial bodies.
- 3 Theoretical model atmosphere providing standard basis for performance and other calculation.
- 4 Any of group of units of pressure all approximately equal to pressure of atmosphere on Earth at sea level. Most important is Standard \* (abb. ata on European continent, atm in UK) equal to  $101,325 \text{ Nm}^{-2} = 101,325 \text{ Pa} = 101.325 \text{ kPa} = 1,013.25 \text{ mb} = 1.01325 \text{ bars or hectopièze} = 14.6959 \text{ lbf in}^{-2} = 761.848 \text{ mm (29.994 in)} \text{ Hg at } 16.6^\circ\text{C}$ . Second is Metric \* (also ata) equal to 0.98642 Standard \* and defined as 0.981117 bars (981.117 mb, ie acceleration due to 1 g) or 14.223 lbf in<sup>-2</sup>. Third is Technical \* (at), usually identical with Metric. Fourth is bar (b), 1000 mb = 750.07 mm Hg = 14.5038 lbf in<sup>-2</sup> (see *pressure*).
- atmospheric absorption** Absorption of EM radiation due to ionisation in atmosphere. Apparent loss of signal or beam power may be much greater, as result of diffraction and dispersion by vapour and particulate matter.
- atmospheric boundary layer** Generally defined as Earth's surface up to 5,000 ft or 1.5 km.
- atmospheric braking** Use of air drag, esp. of upper atmosphere on re-entering spacecraft or RV, converting very high kinetic energy into heat.
- atmospheric circulation** Gross quasi-permanent wind system of Earth, based on bands between parallels of latitude.
- atmospheric constituents** See *air*.
- atmospheric diffraction** Of importance chiefly with sound waves, which can be substantially changed in direction and intensity distribution by changes in air velocity and density. Effect with most EM radiation is small.
- atmospheric duct** Almost horizontal layer or channel in troposphere apparently defined by values of refractive index within which EM radiation, esp. in microwave region, is propagated with abnormal efficiency over abnormally great distances.
- atmospheric electric field** Intensity of electrostatic field of Earth varies enormously, but on fine day may be about  $100 \text{ V m}^{-1}$  at SL falling to around  $5 \text{ V m}^{-1}$  at 10 km height.

## atmospheric entry

Air/Earth current continuously degrades \*\*\*, believed that thunderstorms reinforce it.

**atmospheric entry** Re-entry, or entry of extraterrestrial bodies such as meteors.

**atmospheric filtering** Use of upper zones of ionosphere and mesophere to filter out ICBM decoys from true warheads, it being supposed that latter will have higher density, better thermal protection and increasingly divergent trajectories, while decoys decelerate more violently, fall behind and burn up.

**atmospheric pressure** See *atmosphere* (4), *atmospheric regions*.

**atmospheric refraction** Bending of EM radiation as it passes through different layers of atmosphere, esp. obliquely. Affects radio and radar, esp. when directionally beamed; visibly manifest in air over, say, hot roadway in sunshine when objects seen through this air 'shimmer'; in astronavigation \*\* makes apparent altitude of celestial bodies falsely great.

**atmospheric regions** Layers of Earth's atmosphere differ in different model atmospheres; following notes are based on ISA. Lowest layer, troposphere, extends from SL to about 8 km (26,000 ft) at poles, to 11 km (36,090 ft) in temperate latitudes, and to 16 km (52,000 ft) over tropics. Throughout this region ISA characteristics of temperature, pressure and relative density are precisely plotted. Assumed lapse rate is  $6.5^{\circ}\text{C km}^{-1}$  and at tropopause, taken in ISA to be 11 km (36,090 ft), temperature is  $-56.5^{\circ}\text{C}$ . From tropopause stratosphere extends at almost constant temperature but falling pressure to 30 km, stratopause, above which is mesosphere. Here there is reversed lapse rate, temperature reaching peak of about  $10^{\circ}\text{C}$  at 47.35–52.43 km, thereafter falling again to minimum of  $180.65^{\circ}\text{K}$  at mesopause (79.994–90.000 km). Above this is ionosphere, extending to at least 1,000 km, where temperature again rises through  $0^{\circ}\text{C}$  ( $273^{\circ}\text{K}$ ) at about 112 km and continues to over  $1,000^{\circ}\text{C}$  at 150 km and to peak of about  $1,781^{\circ}\text{C}$  at 700 km. Between 100–150 km lies E (Kennelly-Heaviside) layer; at 200–400 km is F (Appleton) layer, which at night is single band but by day divides into F1 and F2, F2 climbing to 400–500 km on summer day. E and F layers are reflective to suitable EM radiation striking at acute angle. Above ionosphere is open-topped exosphere, from which atmospheric molecules can escape to space and where mean free path varies with direction, being greatest vertically upward. Other \*\* are based upon composition, electrical properties and other variables.

**atmospheric tides** Produced by gravitational attraction of Sun and Moon. Latter exerts small influence, equal to equatorial pressure difference of 0.06 mb, but solar \*\* has 12 h harmonic component (apparently partly thermal) of 1.5 mb in tropics and 0.5 in mid-latitudes.

**atmospheric turbulence** See *gust*, *CAT*.

**ATMRP** Air traffic management research program[me].

**ATMS** 1 Air-traffic management system[s].

2 Advanced-technology microwave sounder.

**ATN** 1 Aeronautical telecommunications network.

2 Air-traffic network.

**Atnavics** Air-traffic navigation integration and co-ordination system (USA).

**ATNM** Air-traffic network management.

**ATNP** ATN(1) panel.

**ATNS** Air-traffic [and] navigation services.

**ATO** 1 Air task, or tasking, order.

2 Assisted takeoff.

3 Abandoned takeoff.

4 Abort to orbit, ie cannot avoid making a complete orbit.

5 Airborne tactical officer.

6 Auto [reporting of] time over[head].

7 Authorization, or authority, to offer.

8 Air Traffic Organization (FAA, November 2003–).

**ATOA** Air Taxi Operators Association (UK).

**Atoc(s)** Allied tactical operations centre(s) (NATO).

**A to F** Authority to fly.

**ATOL** 1 Air travel organiser's (or operator's) licence (UK, a major function is to protect passenger after bankruptcy of carrier).

2 See ATOLS.

**Atol** Advanced trainer on localizer.

**Atoll** Assembly/test oriented launch language.

**ATOLS** Automatic takeoff and landing system (UAV).

**ATOM** Aileron trim offset monitor.

**atom bomb** Colloq., fission bomb; very loosely, any NW (see *nuclear weapon*).

**atomic materialization** Growth of thin-film coating by bombardment with ions and clusters [IR stealth].

**atomic number** Symbol Z, number of protons in atomic nucleus or number of units of positive electronic charge it bears.

**atomic weight** Mass of atom of element in units each 1/12th that of atom of carbon 12 (refined to 12.01115 on 1961 table). Numerical value for each element is same as atomic mass.

**atomising** Continuous conversion of solid or liquid, esp. high-pressure jet of liquid, into spray of fine particles. Also called atomisation.

**ATOP** 1 Airline training orientation program (US).

2 Advanced Technology [or Technologies] and Oceanic Procedures (FAA), Lockheed Martin.

**Atops** Advanced transport operating systems (NASA).

**ATOS** 1 Automated technical-orders system.

2 Air Transportation Oversight System (FAA).

**ATP** 1 At time, place.

2 Actual track pointer.

3 Authority, or authorization, to proceed.

4 Aviation technical regiment (USSR).

5 Application transaction program (SNA).

6 Airborne [USAF, Advanced] targeting pod.

7 Air-transport pilot [ALTP is preferred].

8 Advanced tow placement, manufacturing process for precise composite structure.

9 Air-turbine pump.

10 Allied technical publication.

11 Attack plot.

12 Acceptance-test procedure.

13 Aeronautics Test Program (NASA).

**ATPAC** Air-Traffic Procedures Advisory Committee (US).

**ATPCS** Automatic takeoff power control system.

**ATPI** Air Travel Price Index (BTS).

**ATPL** Airline [or air] transport pilot's licence; ALTP licence; /H adds endorsement for helicopters [required to be PIC of civil aircraft  $\geq 20,000$  kg MTOW].

**ATR** Air, or airline, transport radio, Arinc system of standardizing dimensions of airborne electronics boxes,

## Atran

## attention-getter

thus ATR,  $\frac{1}{2}$ ATR,  $\frac{1}{4}$ ATR etc; broadly defined by Arinc 404, has also been said to mean air-transport[able] rack[sing].

2 Air Transport Rating.

3 Automatic, or aided, target recognition.

4 Airport terminal resources.

5 Air-traffic requirements.

6 Anti-transmit receive.

7 Analog tape recorder.

8 Advanced tactical radar.

9 Armed turn[a]round.

10 Attained turn-rate.

11 Advanced threat resolution, a baggage-screen workstation.

12 Automated time-recording.

**Atran** Automatic terrain recognition and navigation, cruise-missile guidance, Goodyear from 1949.

**ATRB** Advanced Technology Review Board.

**ATRC** 1 Air transport, or traffic, regulation center (US).

2 See next.

**ATRC/C** Automatic, or aided, target recognition and classification.

**ATRD** Active towed radar decoy.

**Atrel** Air-transportable reconnaissance exploitation laboratory (RAF).

**ATRH** Advanced tandem-rotor helicopter.

**Atrif** Air Transportation Research International Forum [office, Sterling, VA20164] (Int.).

**ATRJ** Advanced threat radar jammer.

**ATRP** Air-Transport Regulation Panel (ICAO).

**ATS** 1 Air Traffic Services, thus \* route (ICAO).

2 Applications technology satellite, wide research programme.

3 Suomen Avaruustutkimusseura Ry (Finnish astronomical society).

4 Automatic throttle system.

5 Armament training station (UK, WW2).

6 Aircrew training system (USAF).

7 Automatic test system (or station) for LRU check away from aircraft.

8 Aviation training ship (RN).

9 Air-turbine starter.

10 Acoustic tracking system.

11 Accelerator test stand [U adds upgrade].

12 Agile target system.

13 Auxiliary Territorial Service (UK WW2, became WRAC).

14 Advanced tracking system (radar extractor/tracker).

15 Automated trajectory server.

16 Airborne telephony server.

**ATSA** 1 Aviation and Transportation Security Act (US, 19 November 2001).

2 Airline and travel services architecture.

3 Air-Traffic Services Agency (Bulgaria).

4 Air traffic service assistant.

**ATSAB** Air Transportation Systems Advisory Board [proposed] (FAA).

**Atsaw, ATSAW** Airborne traffic situational awareness.

**ATSB** 1 Air Transportation Stabilization Board (FAA).

2 Australian Transport Safety Board [at Canberra, ACT].

**ATSC** 1 Air Technical Service Command (USAAF).

2 Air Traffic Services Cell, or communication (FAA/DoD).

**AT/SC** Autothrottle/speed control.

**ATSCC** Air Traffic Service Command Center.

**ATSD** Air-traffic situation display.

**ATSG** Acoustic test signal generator.

**ATSGF** ATS(1) geographic filter.

**ATSM** ATS(1) message [P adds processor].

**Atsocas** Air-traffic services outside controlled airspace.

**Atsora** Air traffic service[s] outside regulated airspace. Comprises RAS, RIS, FIS and non-radar procedural services.

**Atsos, ATSOS** Air Traffic Safety Oversight Service [monitors AT08] (FAA, 2004-).

**ATSS** Air Transport Security School (UK, RAF).

**ATSSD** Air Traffic Services Standards Department (CAA, UK).

**ATSU** Air-traffic services unit.

**ATSy** Air Transport Security Section (RAF).

**ATT** 1 Automatic attitude hold (AFCS).

2 Advanced tactical [or theater] transport.

3 Advanced theater threat.

4 Automatic target tracking.

**ATT** Tail-on-tail aerodynamic influence coefficient.

**attach** To place temporarily in a military unit.

**attached shockwave** Caused by supersonic body having leading edge or nose sufficiently sharp or pointed not to cause shock to detach and move ahead of it. Critical values of M at which shock will just remain attached; eg for cone of  $30^\circ$  included angle shock will detach below 1.46; for  $30^\circ$  wedge M is 2.55 because wedge exerts larger obstructing effect on airflow. In most supersonic aircraft aim is to keep most shocks attached, especially at engine inlets.

**attack aircraft** Combat aircraft, usually aeroplane but sometimes helicopter, designed for attacking surface targets of tactical nature; missions include CAS (3) and interdiction.

**attack, angle of** Angle  $\alpha$  between wing chord or other reference axis and local undisturbed airflow direction. There are several ways of measuring this crucial parameter. One is absolute angle of attack. Another is \*\*\* for infinite aspect ratio, which assumes two-dimensional flow. Effective \*\*\* varies greatly with aspect ratio; modern wings of low aspect ratio have no stall in conventional sense even at  $\alpha = 40^\circ$ . Some authorities in UK cause confusion by using 'angle of incidence', which already has clear meaning unconnected with angle of incident airflow.

**attack avionics** Navigation and weapon-aiming systems, often integrated into single 'fit' for particular attack-aircraft type.

**ATTC** 1 Automatic takeoff thrust control.

2 Aviation Technical Test Center (USA, Ft Rucker).

3 Aircraft Tactics Training Center (USAF).

**attention-getter** Prominently positioned caption in cockpit, or esp. flight deck, triggered by onboard malfunction or hazardous situation (eg potential mid-air collision) immediately to flash bright amber or red. Less strident caption, warning light or other visual and/or aural circuit also triggered, enabling crew to identify cause and, if possible, take remedial action. Where CWS is fitted first task is to trigger \*\* while routing appropriate signal to captioned warning panel or other more detailed information.

**attenuation** Loss of signal strength of EM radiation, esp. broadcast through atmosphere, due to geometric spread of energy through volume increasing as cube of distance, loss of energy to Earth, water vapour, air and possibly ionised E and F layers.

**attenuation factor** Ratio of incident dose or dose rate to that passing through radiation shield.

**ATTG** Automated tactical target graphic[s].

**AT<sup>3</sup>**, AT3, AT- **three** See ATTT.

**Attinello flap** Blown flap.

**ATTITB** Air Transport and Travel Industry Training Board (UK).

**attitude** Most, if not all, aircraft \* described by relating to outside reference system three major axes OX/OY/OZ (see *axes*); \* of flight relates these mutually perpendicular co-ordinates to relative wind; \* with respect to ground relates axes to local horizontal.

**attitude control system, ACS** Control system to alter or maintain desired flight attitude, esp. in satellite or space-craft to accomplish this purpose in Earth orbit or other space trajectory. Typical \*\*\* uses sensing system, referred to Earth's limb, star or other 'fixed' point or line, and imparts extremely small turning moments to structure by means of gas jets or small rocket motors. In some cases passive \*\*\* used (PACS), or vehicle stabilized by spin about an axis, with portions despun if necessary.

**attitude gyro** Loosely, gyro instrument designed to indicate attitude of vehicle. Specif., instrument similar to artificial horizon but with 360° freedom in roll and preferably 360° freedom in pitch. Also applicable to conventional horizon with restricted indications of movement in aircraft not intended for aerobatics.

**attitude jet** 1 Reaction jet imparting control moments to aircraft at low airspeed (see *RCS*).  
2 Sometimes applied to small thrusters or attitude motors used for same purpose on spacecraft.

**attitude motor** Small rocket motor used to control attitude of space vehicle (see *thruster, reaction control engine*).

**attitude reference symbol** Usually an inverted T giving heading and pitch attitude in HUD symbology.

**ATTLA** Air transportability test-loading agency (US).

**ATTMA** Advanced technology [or tactical, or theater] transport mission analysis.

**ATTN** Attention.

**atto** Prefix,  $\times 10^{-18}$ , symbol a; thus, 1 am (attometre) = 0.0000000000000001 m.

**attributes** Inherent characteristics of a finished part that determine its capability.

**attrition** Wastage of hardware in operational service, esp. of combat or other military aircraft.

**attrition buy** Additional increment of production run ordered to make good anticipated attrition over active life of system.

**attrition rate** Usually means average [actual or predicted] loss per year.

**attrition ratio** Many meanings, none of which compare losses with those of enemy.

**ATTS** Air-transportable towed system.

**ATTT** Advanced tactical targeting technology.

**ATTU** 1 Atlantic to the Urals (NATO).

2 Advanced Tactics and Training Unit (RAF Valley).

**ATU** 1 Antenna, or automatic, tuning unit.

2 Aerial [or aircraft] target unit.

**ATUA** Air Transport User's Association (UK).

**ATUC** Air Transport Users' Council [London WC2B 6TE] (UK).

**Atugs** Armed tactical unattended ground sensor.

**ATV** 1 Associazione Tecnici di Volo Aviazione Civile (I).

2 Automated transfer vehicle, also called space tug.

3 Atmospheric test vehicle.

4 Aircrew training vessel (UK MoD).

**ATVA** Active tuned vibration attenuator, or absorber.

**AT-Vasi** Abbreviated T-Vasi, ten light units on one side of runway in single 4-unit wing bar plus 6-unit bisecting longitudinal line.

**ATVC** Ascent thrust-vector control.

**ATVP** Aerospace technology validation programme (UK).

**ATVS** Advanced TV seeker.

**ATW** Advanced tactical workstation.

**ATW** Wing-on-tail aerodynamic influence coefficient.

**ATWGS** Advanced tactical weapon guidance system.

**A2I2** Accelerated-accuracy improvement initiative (Navstar/GPS).

**ATWS** Active tail-warning system.

**ATZ** Aerodrome traffic zone.

**AU, a.u.** Astronomical Unit[s].

**AU** 1 Air University (Maxwell AFB, USAF, founded 15 March 1946).

2 Utility aircraft (USA, USAF, 1956–62).

**AUAP** Andrews University Air Park [Berrien Springs, MI 49104-0001] (US).

**AUC** See ATUC.

**audio box, audio control** Governs voice communication and broadcast throughout aircraft and by telephone to ground crew.

**audio frequency** Frequency within range normally heard as sound. Limits vary widely with individuals but normally accepted 15 Hz to 20 kHz, upper limit being depressed with advancing age.

**audio integration unit** Interlinks 'classic' cockpit with TCAS, EGPWS and other newer audio systems.

**audiometer** Instrument for measuring subject's ability to hear speeches and tones at different frequencies.

**audio oscillator** Multi-valve (tube) or multi-transistor stage in superheterodyne receiver serving as local oscillator and amplifier (detector).

**audio panel** Cockpit panel controlling all communications systems.

**audio speed signal** Aural indication of vehicle speed, either on board or at ground station; usually has pitch proportional to sensed velocity, indication being qualitative only (see *aural high-speed warning*).

**audio warning** Loud warning by horn, buzzer, bell or voice tape in headphones or cockpit loudspeaker indicating potential danger. Examples: incorrect speed (usually sensed airspeed) for regime, configuration or other flight condition; potentially dangerous excursion of angle of attack; ground proximity; incorrect configuration (gear up, wings at maximum sweep, etc).

**Audist** Agence Universitaire de Documentation et d'Information Scientifiques et Techniques (F).

**audit** Comprehensive detailed examination of airframe structure of aircraft in line service, esp. after fatigue problems encountered on type.

**AUEW** Amalgamated Union of Engineering Workers (UK).

**AUF** 1 Airborne use of force (USCG).

2 Australian Ultralight Federation [Canberra ACT].

**AUFP** Average unit flyaway price.

**auger in** To crash, esp., to fly into ground.

**augmentation** 1 Boosting propulsive thrust by auxiliary device, esp. by afterburning in both core and bypass flows of turbofan.

2 Percentage of thrust added by (1).

3 Increasing inadequate natural flight stability of aerodyne by on-board system driving control surfaces (rarely, ad hoc auxiliary surfaces).

4 Enhancing target signature of radar, optical, IR or other radiation by means of corner reflectors, Luneberg lenses or other \* devices.

5 Enhancement of fluid flow by ejector effect, esp. of lift airflow in powered-lift aircraft.

**augmentation choke** Pilot-controlled modulating valve in blowing system of CCW for roll control.

**augmentation ratio** Ratio of total fluid flow to mass flow of primary ejector flow of hot gas in ejector-lift system.

**augmented deflector (or deflected) exhaust nozzle** Nozzle of V/STOL jet engine downstream of augmentor and capable of deflecting flow through at least 90°C.

**augmented turbojet, turbofan** Engine equipped with afterburning (reheat) to augment thrust, esp. at transonic or supersonic flight speed. Turbofan augmentation may be in hot and/or cold flows, latter offering greater density of free oxygen.

**augmentor** Afterburner for turbofan, with burning in hot and cold flows; US often augmenter.

**augmentor ejector** Main lifting system in *ejector lift*.

**augmentor wing** General term for STOL aeroplane wing in which engine thrust is directly applied to augment circulation and thus lift. Countless variations, but most fundamental division is into external and internal blowing. Former typically uses engine bleed air (rarely, total efflux) discharged at sonic speed through one or more narrow slits ahead of large double or triple-slotted flaps which, because of blowing, can be depressed to unusually sharp angle. Second method uses either engine bleed air or total efflux to blow through flap system itself (or propulsion engines are distributed across main flap, in some schemes there being as many as 48 small engines). Internal blowing makes flow separation impossible and gives large downwards component of thrust, but is difficult to apply and may severely compromise aircraft in cruise (see *jet flap*, *blown flap*, *externally blown flap*, *upper-surface blowing*).

**AULD** Aircraft unit-load device.

**AUM** 1 Air-to-underwater missile (USA DoD weapon category).

2 All-up mass.

**AUP** 1 Advanced unitary penetrator.

2 Avionics upgrade program.

3 Airspace use plan.

4 Active unmanned vehicle phenomenology (AFRL).

**AUR** 1 All-up round.

2 Airplane [aircraft, aeroplane] upset recovery.

**AURA** 1 Advanced UHF radar.

2 Autonomous unmanned reconnaissance aircraft.

**aural acquisition** Acquisition of target by IR seeker head as confirmed by pilot's headset.

**aural high-speed warning** System triggered by sensed flight speed, usually presented as EAS, significantly above

allowable maximum. In transport aircraft typically triggered 10 kt above  $V_{mo}$  and 0.01 Mach above  $M_{mo}$ . Not usually made to do more than warn crew.

**aural null** Condition of silence between large regions where sound is heard, eg in early radio DF system, in some types of beacon passage ('cone of silence') and several ground-test procedures.

**Aurora** Automatic recovery of remotely-piloted aircraft.

**aurora** Luminescence in upper atmosphere, esp. in high latitudes, associated with radiation and/or particles travelling along Earth's magnetic field and at least partly coming from Sun. Exact mechanism not yet elucidated, but 12 classes identified, based on appearance and structure.

**AUS** Airspace Utilisation Section, part of ATC service (CAA DAP).

**AUSA** Association of the US Army [office, Arlington, VA22201] (US).

**Ausac** Australian Aviation Council [umbrella organization for aerospace industry].

**AUSI** Architecture user of system integration.

**Ausire** Anglicization of 'all-union scientific research institute of radio equipment' (R).

**Austaces** Australian automatic command and control system.

**austenitic steel** Ferrous alloys with high proportions of alloying elements and with microstructure transformed by heat treatment to consist mainly of solid solution of austenite (iron carbide in iron, face-centred). Used to make highly stressed aerospace parts, such as turbine discs.

**AuTC** Autothrottle control.

**AUTEC** Atlantic Undersea Test and Evaluation Center (USN with UK help, in British territory).

**AUTH, Auth** Authorized, or authority.

**authority** 1 Organisation empowered to pronounce hardware properly designed, constructed and maintained, and to issue appropriate certificates.

2 Extent to which functioning system is permitted to control itself and associated systems. Greater \* demands greater inherent or acquired reliability, typical means of acquiring reliability being to increase redundancy and provide alternative control channels or in some other way provide for failure-survival.

**Authorization** Act of Congress establishing a Federal agency or procedure (US).

**authorised medical examiner** Doctor approved by national licensing authority to issue/renew/refuse aircrew medical certificates.

**Auto-Acas** Automatic air-collision avoidance system.

**Autob** Automatic observation and reporting of weather.

**Autocarp, Auto-CARP** Automatic computed air release point.

**autoclave** Pressure chamber which can be heated; oven which can be pressurized. Large \* can accept major structural parts of aircraft for adhesive bonding operations.

**auto coarse pitch** System used on a few multi-piston engine aircraft to minimise drag after engine failure.

**Autodin** Automatic digital network (USAF).

**autodyne oscillator** Multi-electrode valve or transistor stage of superheterodyne receiver serving as both local oscillator and amplifier or detector (demodulator).

**autofeathering** System for automatically and swiftly

## autoflare

feathering propeller when engine fails to drive it; usually triggered by NTS.

**autoflare** Flare [1] commanded by autopilot.

**autogenic training** Psycho-physiological technique carried out by subject according to prescription by qualified therapist, to reduce stress.

**Autogiro** Registered name of Juan de la Cierva autogyros, 1924–45.

**autogyro** Rotorplane in which propulsion is effected by horizontal-thrust system, eg propeller, and lift by rotor free to spin under action of air flowing through disc from below to above (ie, autorotating). Some can achieve VTOL by driving rotor in vertical phases of flight, but true \* is STOL.

**auto-hover** Automatic hover, usually at low altitude, by helicopter or other VTOL aircraft, using radio altimeter and AFCS.

**auto-igniting propellant** Hypergolic.

**auto-ignition** 1 Of gas turbine engine, auxiliary system which senses angle of attack or other aerodynamic parameter and switches on igniter circuits before engine is fed grossly disturbed airflow which would otherwise pose combustion-extinguishing hazard. In some aircraft flight in rough air with full flap, or flight at high AOA, can cause intermittent or total flame-extinction, and there are other flight conditions (eg violent manoeuvre) when turbulent flow across intake triggers \*, indicated by cockpit lights.

2 Specific meaning, ignition of premix fuel/air because of high compression (OPR 45+).

3 Of combustible material, spontaneous combustion.

**auto-ignition temperature** At which auto-igniting materials spontaneously combust in air; design factor in some rocket engines and gas generators.

**autokinesis** Sensation of movement of a distant light that is stared at.

**Autoklean** Patented (UK) lubricating-oil filters based on compressed stack of strainer discs and spacers.

**Autoland** 1 Loosely, AFCS capable of landing aeroplane hands-off and qualified to do so in total absence of pilot visual cues.

2 Specific systems developed in UK by Smiths Industries and GEC-Marconi-Elliott.

**Autolycus** ASW detection system operating by sensing minute atmospheric concentrations of material likely to have come from diesel submarine running submerged (UK).

**Automap** Trade name for map and/or track guide projection system, esp. for single-seat combat aircraft.

**Automated Radar Terminal System** Shows terminal controller basic information on all collaborating traffic. \* I largely overtaken by \* II, and by III which tracks/predicts secondary-radar targets. \* IIIA adds primary targets. All forms now modular and programmable. (FAA).

**automated trajectory server** A ground system which relies on its software to manage flight-path requests from pilots and controllers. (FAA/NASA).

**automatic boost control, ABC** On piston engine servo system which senses induction pressure and so governs boost system that permissible limits of boost pressure cannot be exceeded. These were among first airborne closed-loop feedback systems.

**automatic coarse pitch** See *Automatic pitch coarsening*.

**automatic dependent surveillance** Global system to

## automatic power reserve

compensate for lack of radar coverage over oceans and remote areas, involving automatic regular polling of navaids of each aircraft so that ATC can always monitor its position and ensure safe separation. Satellites appear to be essential for implementation.

**automatic-direction finder** See *ADF*.

**automatic drag-limiting system** Propeller subsystem which, via a torquemeter signal, increases [coarsens] pitch whenever a negative, or predetermined low positive, torque is experienced by the drive shaft, thus preventing excessive drag following engine failure.

**automatic extension gear** Landing gear which extends by itself, typically by sensing airspeed and engine rpm, should pilot omit to select DOWN.

**automatic feathering** Autofeathering.

**automatic flagman** Electronic installation in ag aircraft to provide precise track guidance on each run in conjunction with ground beacons.

**automatic flyback vehicle** Unmanned shuttle between Earth and spacecraft.

**automatic frequency control** 1 Radio receiver which self-compensates for small variations in received signal or local oscillator.

2 By different method, self-governing of a time base.

**automatic gain control** See *AGC*.

**automatic landing** Safe, precisely repeatable landing of advanced aeroplane, helicopter or other aerodyne in visibility so restricted that external visual cues are of no assistance to pilot. Basis of present systems is high-precision ILS, approach coupler, triplexed or quad AFCS, autothrottle, autoflare and ground guidance after touchdown.

**automatic manoeuvre device system** Automatically schedules high-lift devices, especially on variable-sweep aircraft; usually governed by AOA.

**automatic manual reversion** Fully powered flight-control system may be so designed that no ordinary pilot could control aircraft manually; if not, \*\*\* on one, two or three axes allows pilot to drive surfaces giving control in those axes after malfunction of powered system can no longer be accommodated by failure-survival.

**automatic mixture control** In piston engine, subsystem which automatically adjusts flow rate of fuel to counteract changes in air density, or which controls intake airflow by restricting carburettor air-intake duct by amount inversely proportional to altitude until wide open at height usually around 15,000 ft.

**automatic observer** Self-controlled group of sensors for recovering parameters during flight test.

**automatic parachute** 1 Parachute pulled from its pack by static line [usual meaning].

2 Parachute opened by barometric device at preset pressure altitude[s].

**automatic pilot** See *autopilot*.

**automatic pitch-coarsening** Facility built into propeller control system causing it to increase pitch automatically, normally from fine-pitch setting to typical cruise angle, when called for by operating regime. This is normally another name for a CSU, and quite distinct from auto coarse pitch.

**automatic power reserve** Special increased-thrust rating available on commercial turbofan engines only in emergency, and triggered automatically by loss of power in other engine in same aircraft.

## automatic pull-up

**automatic pull-up** Preprogrammed steep climb by (1) aircraft in TFR flight following failure of one pitch channel, or (2) aerial target at start of parachute recovery.

**automatic RDF** See *ADF*.

**Automatic Recall** In a time of extreme tension, this would have come into effect if an attacking bomber carrying NW reached the Go-No-Go Line without having received the PRM (USAF, RAF, 1960–90).

**automatic reverse pitch** Facility built into propeller control system causing it to reduce pitch automatically past fine-pitch stop through zero to reverse (braking) position, upon receipt of signal from microswitch triggered when main gears compress shock struts on landing. Very rare for reverse pitch to be obtainable without deliberate selection by pilot, though with \*\*\* pilot may select in air, leaving auto system to send operative signal.

**automatic riveter** Machine for drilling holes through parts to be joined, inserting rivet and closing (heading) it.

**automatic roll-out guidance, AROG** Steering guidance after automatic landing in blind conditions (ideally extended from runway turnoff to terminal parking).

**automatic search jammer** ECM intercept receiver and jamming transmitter which searches for and jams all signals having particular signatures or characteristics.

**automatic selective feathering** 1 Airborne subsystem which, in the event of engine failure in multi-engined aircraft (invariably aeroplane), decides which engine has failed and takes appropriate action to shut down and feather propeller.

2 Similar system which, when pilot presses single feathering button, routes signal automatically to failed engine and propeller.

**automatic slat** Leading-edge slat pulled open automatically at high angle of attack by aerodynamic load upon it. All slats were originally of this type.

**automatic synchronization** In multi-engined aircraft (invariably aeroplane), subsystem which electrically locks rpm governors of all engines to common speed.

**automatic terminal information service** See *ATIS*.

**automatic threat counteracting** Ability of EW system to detect, identify, locate and respond to each hostile emission without human intervention.

**automatic touchdown release** Device incorporated in sling system for external cargo carried below helicopter or other VTOL aircraft which releases load as soon as sling tension is released.

**automatic tracking** Although this could have meaning in system constraining aircraft to follow preset tracks over Earth's surface, universal meaning is property of directionally aimed system to follow moving target through sensing feedback signal from it. Applications found in (1) air-superiority fighter, in which essential to lock-on and track aerial target automatically, by means of radar, IR, optics or other system; and (2) ground tracking station, which may need to follow satellite, aircraft, drone target or other moving body in order to sustain command system, interception system, data-transmission system or other directionally beamed link.

**automatic VHF D/F** Ground D/F system in which, instead of requiring manual turning of aerial array to find null position, signal from aircraft causes aerial to rotate automatically to this position, direction being at once

## autorotation

displayed as radial line on CRT of the equipment. Also called CRT D/F, CRT/DF.

**automatic voice advice** In terminal ATC, computer-generated voice message broadcast to two or more aircraft warning of potential conflict. Intended primarily for VFR traffic and for all traffic not under immediate control, and intended to relieve controller of function that appears to be safely automated.

**automatic voice alerting device** Uses digitized human voice to warn of impending or hazardous situation, warnings being arranged in order of priority.

**autonomous** 1 Of aircraft or other vehicle, not needing GSE.

2 Of an SSR, not co-located.

3 Of airborne equipment, not needing external sensors; not linked to other aircraft systems (though possibly under pilot control), eg \* reconnaissance pod.

**autonomous formation flight** Saving up to 20% fuel by copying geese and using accurate GPS to place at least one wingtip in tip vortex of preceding aircraft (NASA/Boeing/UCLA).

**autonomous landing guidance** Based upon sensors or other devices in the aircraft.

**autonomous logistics information system** Monitors all significant functioning parts of an organism, predicts expected life and gives advance warning of failure.

**autonomous vehicle** Vehicle, especially unmanned aircraft, which completes mission without external help.

**autopilot** Airborne electronic system which automatically stabilizes aircraft about its three axes (sometimes, in light aircraft, only two, rudder not being served), restores original flight path following any upset, and, in modern \*, preset by pilot or remote radio control to cause aircraft to follow any desired trajectory. In advanced aircraft \* is integral portion of AFCS and can be set by dial, push-button or other control to capture and hold any chosen airspeed, Mach, flight level or heading. In advanced combat aircraft \* receives signals from sensing and weapon-aiming systems enabling it to fly aircraft along correct trajectories to fire guns or other ordnance at aerial target or lay down unguided bombs on surface target.

**autopilot-disconnect** Advanced autopilots are automatically disconnected by control overloads generated within aircraft and by certain other disturbances likely to reflect wish of pilot, eg triggering of stall-protection stick-pusher.

**autopilot flight-director computer** This governs the AFD system, which controls the trajectory of the aircraft in the horizontal plane. It outputs to the FBW control system.

**Autoplan** Portable EDP which digitises navigation plan and combines output with other CPGS data to provide attack-aircraft pilot with complete nav/ECM/weapon-aiming information.

**auto power reserve** See *automatic \*\**.

**autopsy** Searching examination of crashed aircraft to discover cause, esp. to detect fatigue failure.

**autorotation** 1 Loosely, condition in which airflow past aircraft causes whole aircraft or significant part of it to rotate. Propeller in this context is not significant, though windmilling propeller is autorotating.

2 In helicopter, descent with power off, air flowing in reverse direction upwards through lifting rotor(s), causing it to continue to rotate at approximately cruise rpm. Pilot preserves usual control functions through pedals, cyclic

## auto-separation

## avalanche

and collective, but cannot grossly alter steep ‘glide path’. Rate of descent may exceed design ROD for landing gear, but is reduced just before ground impact by sudden increase in collective pitch; this increases lift, trading stored rotor kinetic energy for increased aerodynamic reaction by blades, and should result in gentle touchdown.

**3** In aeroplane, descent in stalled condition, with general direction of airflow coming from well beyond stalling angle of attack but in grossly asymmetric condition (see *spin*).

**4** In aeroplane, descent in unstalled condition under conditions apparently not greatly different from straight and level but with stabilized spiral flight path (see *spiral dive, spiral stability*). Distinct case of \* which purist might argue is incorrect usage.

**5** In helicopter flying training, range of manoeuvres designed to increase confidence and remove fear of power failure; all power-off descents, but differ in whether they are NPR (no power recovery) or terminated at height well above ground by restoring at least partial power. In latter case \* terminated either by run-on-landing (running \*), run-on climb-out or moderate-flare climb-out.

**auto-separation** Automatic (often barometric) release of occupant from ejection seat.

**Autosevocom** Automatic secure-voice communications (DoD).

**autostabilizer** Loose term for autopilot, esp.. with authority on pitch axis only.

**Autosyn** Trade name for remote-indicating system in which angular position of indicator needle precisely follows rotary sensing device moved by fluid level, mechanical displacement or other parameter which must be remotely measured. Sensor and indicator are essentially synchronous electric motors.

**autosynchronization** Automatic synchronisation.

**autothrottle** Power control system for main propulsion engines linked electro-mechanically to AFCS and automatic-landing system so that thrust is varied automatically to keep aircraft on glide path and taken off at right point in autoflare; in general \* will also call for reverse thrust at full power in conjunction with automatic track guidance (roll-out guidance), though this may be left to discretion of pilot.

**autotracking** Signal processing technique that enables a target to be automatically acquired and tracked by means of its own image, which can be received at any operating wavelength (usually microwave or optical).

**autotrim** Aircraft trim system automatically adjusted by autopilot or other stabilising system to alter or maintain aircraft attitude according to pilot demand or changed distribution of weight or aerodynamic load. Usually governs pitch only, the autopilot commanding the elevator and the autotrim the tailplane (stabilizer).

**Autovon** Automatic voice network (USAF Communications Service).

**AU2GN** French designation of R.R.58 alloy.

**AUVS** Association for Unmanned Vehicle Systems [I adds International] (Washington, DC US).

**AUW, a.u.w.** All-up weight; actual aggregate weight of particular laden aircraft at moment of weighing. For generalized equivalent, more precise term should be used (MRW, MTOW, etc), but AUW has advantage of being not explicit and thus can be used to mean ‘total weight of aircraft, whatever that happens to be’. Should never be

used to mean MRW or MTOW. If latter are not known, preferred term meaning ‘maximum allowable weight’ is gross weight.

**AUWE** Admiralty Underwater Warfare Establishment (UK).

**AUWG** Airspace Users Working Group.

**AUX** Auxiliary.

**auxiliary bus** Secondary electrical bus serving one or more devices and often maintained at voltage different from that of main bus.

**auxiliary fin** Generally, small additional fixed fin carried, not necessarily to enhance directional stability, well outboard on tailplane.

**auxiliary fluid ignition** In rocket engine, use of limited supply of hypergolic fluid(s) to initiate combustion of main propellants.

**auxiliary inlet, auxiliary intake** Extra inlet to [invariably gas-turbine] engine to admit extra air when needed [normally only on takeoff]. Also called supplementary air inlet and, most commonly, suction-relief door.

**auxiliary parachute** Pilot parachute.

**auxiliary power unit, APU** Airborne power-generation system other than propulsion or lift engines, carried to generate power for airborne system (electronics, hydraulics, air-conditioning, avionics, pressurization, main-engine starting, etc). In general, term restricted to plant deriving energy from on-board source and supplying constant-speed shaft power plus air bleed. This would exclude a RAT or primitive windmill-driven generator. Some \*\*\* can provide propulsive thrust in emergency (see *MEPU*).

**auxiliary rigging lines** Branching from main parachute rigging lines to distribute load more evenly around canopy.

**auxiliary rotor** In a classical helicopter [one main rotor], the rotor provided to counter drive torque and control fuselage azimuth. This is preferably called the tail rotor.

**auxiliary tank** Fuel tank additional to main supply, esp. that can readily be removed from aircraft (see *reserve tank, external tank, drop tank*).

**AV** **1** Air vehicle.

**2** Audio-visual.

**3** Aft vectoring (nozzle mode).

**AVA** **1** Automatic voice advice.

**2** Applied vector analysis.

**3** Aeropark Volunteers Association [Derby DE24 0ED] (UK).

**AVAD** Automatic voice alert[ing] device.

**AVADS** Autotrack Vulcan air-defense system (USA).

**aval, Aval** Available.

**availability** **1** Symbol A, proportion of time aircraft is serviceable and ready for use, expressed as decimal fraction over period or as number of hours per day or days per month. Also expressed as  $\frac{\text{uptime}}{\text{uptime} + \text{downtime}}$ .

**2** Period which must elapse between purchase of aircraft, usually second-hand, and handover to customer.

**avalanche** **1** Any of several processes involving ions or electrons in which collisions generate fresh ions or electrons which in turn go on to have their own collisions. In \* tube electrons or other charged particles are accelerated in electric field to generate additional charged particles through collisions with neutral gas atoms or molecules. In semiconductor devices \* effect occurs when potential in

excess of critical voltage is applied across p-n junction, enormously multiplying liberation of charge carriers.

**2 Aerobatic manoeuvre** devised by Ranald Porteous involving rapid rotation about all axes in combined stall turn and flick roll.

**AVAQ** Association des Villes Aéroportuaires du Québec [office, Montreal].

**AVAS** Air-vehicle avionics suite.

**Avasi** Abbreviated Vasi.

**AvBatt, AVBATT** Aviation Battalion (USA).

**AvBM** Aviation business machine, PC + com. terminal.

**AVC** 1 Automatic volume control (see AGC).

2 Automatic variable camber.

3 Active visual camouflage.

4 Attitude/velocity/control subsystem.

5 Avionics ventialtion computer.

6 Active vibration control.

**Avcat** Originally Aviation Carrier [ship] Turbine, kerosene tailored to raise flashpoint above 60°C, freeze ≤ 48°C; US = JP-5, NATO = F43 (F44 with FS11 additive), see *kerosene*.

**Avcatt** Aviation combined-arms tactical trainer; -A adds aviation reconfigurable manned simulator (USA).

**AvCIR** Aviation crash injury research (CGASC).

**AVCR** Airborne video-cassette recorder.

**AVCS** Advanced vidicon camera system (carried by satellites).

**AVD** 1 Air Vehicles Directorate (AFRL).

2 Atmospheric-vehicle detection.

**AVDA** Asociación Venezolana de los Deportes Aereos [air sport], (Venezuela).

**Avdas** Airborne-vehicle data-acquisition system.

**Avdel** Trade-name for large range of rivets/fasteners (Textron).

**A-VDV** Aviation of airborne forces (USSR).

**AVE** 1 Airfield visitor enthusiast (PFA).

2 Airborne-vehicle equipment.

3 Aéronef de validation expérimentale (UCAV, F).

**AVEN, Aven** Axi-symmetric vectoring engine, or exhaust, nozzle.

**Aveppa** Asociación Venezolana de Pilotos Privados y Propietarios de Aeronaves (Venezuela).

**average flyaway unit cost** Recurring manufacturing cost, all GFE costs, avionics, production support services and cost of tooling, manufacturing and pre-delivery maintenance.

**average procurement cost** Average flyaway unit cost plus GSE, training and technical aids, spares support and data, handbooks, technical representatives and logistic support.

**AVD** 1 Air Vehicles Directorate (AFRL).

2 Atmospheric-vehicle detection.

**AVET** Adaptive versatile engine technology.

**AVG** 1 Average (ICAO).

2 American Volunteer Group (China, WW2).

3 Aircraft escort vessel (later ACV, then CVE).

**Avgard** Additive to JP-1 and other jet fuels to produce anti-misting kerosene (ICI trade name).

**Avgas** Aviation gasoline, range of piston engine petrols today being narrowed to 100LL (blue, max. 2.4 ml/Imp gal TEL) and 115 (purple, max. 5.52 ml/Imp gal TEL).

**AVGS** Advanced video guidance sensor (MSFC).

**AVHRR** Advanced very-high resolution radiometer.

**AVI** Air-vehicle integration; D adds design.

**Aviaregister** List of all civil aircraft (R, CIS).

**aviation** Operation of aerodynamics (but only a pedant would insist on “aerostation” for aerostat).

**aviation medicine** Study of all effects of aviation on the human body.

**Aviation Policy Area** Proposed rules for residential and commercial density in environs of airports with 2,300+ ft runway (US).

**Aviation Security Advisory Committee** Headed by V-P Al Gore, convened 1996 to improve security on US commercial flights, made numerous recommendations to combat terrorism, all rejected by US carriers.

**aviator** Operator of an aerodyne, esp. pilot. As term archaic, difficult to define; nearest modern equivalent is aircrew member.

**aviatrix** Female aviator.

**Aviatrust** Original (1923) central aviation industry management organisation (USSR).

**Aviavnito** Aviation department of Vnito, all-union amateur scientific/technical research organisation (USSR).

**AVIC** Aviation Industries of China [created 26 June 1993, in 1999 divided into AVIC I (54 enterprises and 30 research institutes) and AVIC II (79 and three), [office, Beijing 100009] (China)].

**Avics, AVICS** Air-vehicle interface and control system.

**Avid** Air-vehicle integration design.

**aviette** Man-powered aircraft.

**avigation** Aerial navigation (suggest undesirable word). Hence also *avigator*.

**Avim** Aviation intermediate-level maintenance (USAF).

**Avimid** Thermoplastic (strictly ‘pseudo’-) polymer composite, marketed as K-III fabric and tape (Du Pont).

**avionics** Aeronautical (not aviation) electronics, not necessarily by definition restricted to aerodynamics. Term implies equipment intended for use in air; purely ground-based equipment could be argued to be outside category.

**Aviox** Registered name for high-solidity polyurethane surface coatings.

**AVIP** Avionics integrity program (USAF).

**AVIRIS, Aviris** Airborne visible and IR imaging spectrometer.

**Avlan** Avionics local-area network.

**AVLC** Aviation VHF link control.

**AVLF** Airborne very low frequency.

**AVM** 1 Airborne, or airframe, vibration monitor.

2 Air Vice-Marshal.

**A-VMF** Naval air force (USSR, R).

**AVN** Aviation system standards (FAA).

**AVNDTA** Aviation development test activity (USA).

**AVNF** Air-vehicle near field.

**AVNIR, Avnir** Advanced visible and near-IR radiation.

**AVNL** Automatic video noise limiter, or limiting.

**AVO** Avoid verbal orders.

**AVOD** Audio/video on demand.

**Avogadro number** The number of molecules of a substance in one *mole* (2).

**avoid curve** Plot of TAS/height below which a helicopter may not survive total engine failure.

**Avoil** Aviation [lubricating] oil.

**AVOL** Aerodynamic visual, or aerodrome visibility, operational level.

## Avometer

## AWP

- Avometer** Pioneer hand-held tester for electrical systems.
- Avoss** Aircraft vortex spacing system, to permit reduced landing intervals.
- Avpac** Aviation packet communication.
- AVPH** Air-vehicle prognostics and health.
- Avpin** Aviation-specification isopropyl nitrate.
- Avplex** Avionics planning and execution.
- Av.P.970** Aviation Publication 970, *Manual of Design Requirements for Aircraft*, now called DAR.1 (UK).
- Avpol** Aviation-specification petrol/oil/lubricant.
- AVR** *1* Active vibration reduction.  
2 Additional validation requirement[s].
- AVRA** Automatic visual-range assessor.
- Avradar** Aeronautical, or aviation, R&D activity (USA).
- AVRS** Airborne video-recording system.
- AVS** *1* Advanced vertical strike.  
2 Advanced vision, or visionics, system.  
3 Air-vehicle specification.
- Avsat** Aviation satcom service.
- Avsec, AVSEC** Aviation Security Panel (ICAO).
- AvSP** Aviation safety project (NASA).
- AVSS** *1* Analog voice switching system.  
2 See *Avoss*.
- AVT** *1* Automatic video tracker.  
2 Augmented, or advanced, vectored thrust.  
3 Analog voice terminal.
- Avtag** Aviation turbine-engine gasoline, see *fuel*.
- Avtoc** Aviation tactical-operations center, if A2C<sup>2</sup>C unavailable (USA).
- Avtops** Aviation tactical-operations center (USA, USAF).
- AVTR** Airborne video-tape recorder.
- Avtur** Aviation turbine-engine fuel, see *fuel*.
- AVUM** *1* Aviation unit-level maintenance (USA).  
2 Air-vehicle unit maintenance.
- AVVI** Altitude and vertical-velocity indicator.
- AW** *1* All-weather (usually not literally true).  
2 Airway; often A/W, but AWY is preferred.  
3 Automatic [gun] weapon.  
4 Confusingly, airborne early warning.  
5 Airlift Wing (USAF).  
6 Airworthiness.
- A<sub>w</sub>, Aw** Aircraft total wetted area.
- AWA** Aviation/Space Writers Association [office, Chester, NJ (US/Int.)].
- Awacs, AWACS** Airborne warning and control system.
- AWADC** Advanced wideband analog-to-digital converter; T adds technology.
- Awads** All-, or adverse-, weather aerial delivery system.
- AWAM** Association of Women in Aviation Maintenance (US).
- Awans** Aviation weather and notice-to-airmen system (FAA, from 1976).
- Awards** *1* Aircraft wide-angle reflective display system.  
2 All-weather airborne reconnaissance drone sensor.
- Aware** Advanced warning of active-radar emission[s].
- Awas** Automated weather advisory system.
- AWB** *1* Airway bill, air waybill.  
2 Above-water battlespace.
- AWBA, Awba** Automated wing-box assembly.
- AWC** *1* Accumulated water condensate.  
2 Air Warfare Centre (RAF Waddington; see AWFC).
- 3** Aviation Weather Center (NOAA).
- 4** Air Wing Commander (USN).
- AWCCV** Advanced-weapon-carriage configured vehicle.
- AWCLS** All-weather carrier landing system.
- AW/CN** Awaiting collection (RAF).
- AWCS** Automatic, or airborne-, weapons control system.
- AWD** *1* Airworthiness Division (CAA, UK).  
2 Air-warfare destroyer (ship).
- Awdats** Automatic-weapon, or air-warfare, data-transmission system.
- Awdrey** Atomic-weapon detection, recognition and estimation of yield.
- AWDS** *1* All-weather delivery, or distribution, system.  
2 Automated weather [forecast] distribution system
- AWE** *1* All-up weight, equipped; generally = OWE.  
2 AWE Hunting Brae, previously Atomic Weapons Establishment [Aldermaston, RG7 4PR] (UK).  
3 Aircraft/weapon/electronic (AFMSS module).  
4 Advanced weapons elevator (CV).
- AWES** Atomic-weapons effects simulator; AWESS = signature simulator.
- AWFC** Air Warfare Center (USAF).
- AWFCS** All-weather flight-control system.
- AWG** *1* JETDS Code: piloted aircraft, armament, fire-control.  
2 Airlines Working Group (CAA, UK).  
3 Arbitrary waveform generator.  
4 Aural-warning generator.  
5 American Wire Gauge.
- AWH** All-weather helicopter.
- AWI** *1* Aircraft weight indicator, on-board system also often indicating c.g. position, usually by sensing deflections of landing-gear shock struts.  
2 All-weather intercept.  
3 Air weapons instructor.  
4 Airframe/weapons integration.
- Aviator** Aircraft wing with advanced-technology operation (Airbus).
- AWICS** Airborne wireless intercom system.
- AWIGWG** Aircraft wire and inert-generator working group.
- AWIM** Airport weather information manager.
- AWIN, Awin** Aviation weather information [S adds system] (NASA/Boeing).
- Awips** Advanced weather interactive processing system (FAA).
- AWIS** Automatic weather information system.
- AWL** Above water level.
- AWLS** All-weather landing system.
- AWM** *1* Average working man (in defining aircrew sleep patterns).  
2 Aircraft wiring manual.  
3 Audio warning mixer.
- AWMDS** Automatic wing-sweep and manoeuvre devices system.
- AWNIS** Allied worldwide naval information system.
- AWO** All-weather operations.
- AWOP** All-weather Operations Panel (ICAO).
- AWOS** Automated, or airport, weather-observing, or automatic weather-observation, system.
- AWP** Aerial work platform.

## AWPA

## azimuth control

**AWPA** Australian Women Pilots' Association [office, Crafers, SA].

**AWPG** Advanced weather products generator.

**AWR** Airborne weather radar.

**AWRA** Augmentor-wing research aircraft.

**AWRE** Atomic Weapons Research Establishment [Aldermaston, now AWE] (UK).

**AWRS** 1 Airborne weather reconnaissance system (USAF).

2 Automatic weather reporting system.

**AWS** 1 Air Weather Service (USAF, formerly part of MAC, now an FOA, Scott AFB).

2 Audible (or advanced) warning system.

3 Automatic wing sweep.

4 Air ward system.

5 Area weather system.

6 Aircraft Warning Service (USA/USN, 1942 – 46).

**Awsacs, AWSACS** All-weather stand-off aircraft (or attack) control system (USN).

**AWSAS** All-weather stand-off attack system.

**AWSO** Aviation-warfare systems operator.

**AWT** 1 Airborne wideband terminal.

2 Atmospheric wind tunnel.

**AWT** Tail-on-wing aerodynamic influence coefficient.

**AWTA** Advise what time available.

**AWTSS** All-weather tactical strike system.

**AWW** All-, or alert, weather watch.

**Aww** Wing-on-wing aerodynamic influence coefficient.

**AWX** All-weather interceptor.

**AWY, awy** Airway (ICAO, FAA).

**AX** 1 Avionics, avionics control (USAF).

2 Int. classes of hot-air balloons, from AX3 [20,000 cu ft, 566 m<sup>3</sup>] to AX9 [140,000 cu ft, 3,935 m<sup>3</sup>].

**AXAF** Advanced X-ray astrophysics facility.

**AXBt** Air- [or aircraft-] launched bathythermograph.

**axes** Aircraft attitude is described in terms of three sets of \*. First set are reference \*, also called *body* \*, three mutually perpendicular directions originating at c.g. (point O and defined as longitudinal (roll) axis OX, measured positive forwards from O and negative to rear; transverse (pitch) axis OY, measured positive to right and negative to left; and vertical (yaw) axis OZ, measured positive downwards and negative upwards. Position of O defined at design stage in what is considered most likely location for real c.g. in practice. Second, single, \* is wind \*: direction of relative wind, drawn through O, has angle determined by flight velocity, angle of attack and angle of sideslip. Third \* are those known as inertia \* and are imaginary lines about which aircraft would actually rotate in manoeuvres. These need not be same as reference \*, although OY and OZ inertia axes are usual closely co-incident unless aircraft is asymmetrically loaded. Principal inertia \*, however, may often depart substantially from geometrically drawn fore-and-aft axis OX (see inertia coupling). Purists distinguish between stability axes for aircraft (a special set of body axes) and those for tunnel testing.

**AX-5** Space suit for post-1989 Shuttle operations (NASA).

**axial cable** 1 In non-rigid airship, main longitudinal member linking supporting cables, in framework carrying crew and engines.

2 In rigid airship, essentially straight cable sometimes linking extreme nose and tail of hull and central fittings of radial or diametral wires.

**axial compressor** Compressor for air or other fluid with drum-shaped rotor carrying one or more rows of radial blades in form of small aerofoils (airfoils) arranged to rotate around central axis, with row of stationary stator blades (vanes) between each moving row. Compressed fluid moves through alternate fixed and moving blading in essentially axial direction, parallel to axis of rotation, temperature and pressure increased at each stage.

**axial cone** In rigid airship, fabric cone at front and rear of each gas cell providing flexible gas-tight connection between cell and axial cable.

**axial cord** In parachute, central rigging line joining apex to eyes formed at lower extremities of rigging lines.

**axial deck** In ship carrying or serving as operating platform for aircraft, flight deck aligned fore and aft.

**axial engine** Usually, piston engine in which axes of cylinders are parallel to crankshaft and/or main output shaft. Also, loosely, axial-flow engine.

**axial firing** Fixed to fire directly ahead (usually on helicopters).

**axial-flow engine** Gas-turbine engine having predominantly axial compressor, esp. one in which airflow is essentially axial throughout (ie, not reverse-flow).

**axial focusing** In supersonic wind tunnel, focusing of shockwaves reflected from tunnel wall on to principal axis. Usually condition to be avoided, typically by minimising such reflections or so shaping working section that they are dispersed in different planes.

**axial velocity ratio** In an axial-flow engine, ratio of axial flow velocity Va to turbine rotor blade velocity U, Va/U. Also called flow coefficient.

**axis of rotation** In rotorplane, apparent axis about which main lifting rotor rotates: line passing through centre of tip-path circle and perpendicular to tip-path plane. May be widely divergent from mechanical axis on which hub is mounted, especially in articulated rotor.

**axis of symmetry** Usually aeronautical \*\*\* determined by geometrical form, but in some cases dictated by mass distribution.

**Ay** 1 Direct sideforce, changing heading without bank or sideslip.

2 Any lateral acceleration.

**AYY** A half-width cargo container for upper deck of a narrow-body aircraft.

**Az** Generalised symbol, azimuth.

**Az-El, Azel, Az/El** Radar presentation giving separate pictures of azimuth (PPI display, or chosen sector) and elevation (such as side view of glide path).

**azication** Azimuth indication.

**azimuth** 1 Horizontal bearing or direction; thus \* angle.

2 Rotation about vertical axis (yaw is preferred term where motion is that of whole aircraft).

3 Bearing of celestial body measured clockwise from true North, often called \* angle and qualified true, compass, grid, magnetic or reference, depending on measure used.

**azimuth aerial** Ground radar aerial rotating about vertical axis, or sending out phased-array emission rotating about such axis, intended to measure target azimuth angles.

**azimuth compiler** Portion of SSR system, often optional or absent, which provides accurate azimuth information more accurately than the normal plot extractor.

**azimuth control** In rotorplane, cyclic pitch.

**azimuth error****Azusa**

**azimuth error** Radar bearing error due to horizontal refraction.

**azimuth marker** Scale used on PPI display to indicate bearing, including electronically generated references when display is offset from central position.

**azimuth stabilized** PPI display which does not rotate, despite changes in heading of vehicle.

**AZM** Azimuth.

**az-ran, azran** General term for target tracking or navigational fixing by means of azimuth and range; more commonly called  $R\theta$  or rho-theta.

**AZRN** Azimuth range.

**Azusa** C-band tracking system operating on short baseline and giving continuous signals of two direction cosines plus slant range (and thus giving 3-D fix and instantaneous velocity). From Azusa, Calif.

# B

- B** 1 Pitching moment of inertia.  
 2 Blue (ICAO).  
 3 Base (of semiconductor device).  
 4 Aircraft category, bomber (USAS, USAAC, USAAF, USAF 1924→, USN 1941–43 and 1962→; UK role prefix).  
 5 Total aircraft noise rating (Belgium, Netherlands).  
 6 Boron.  
 7 Magnetic flux density, or induction.  
 8 Prefix for nuclear bombs (US).  
 9 Degrees Baumé.  
 10 Beginning [precipitation].  
 11 Hourly cost.  
 12 Airspace near airport up to 1,000 ft AGL (FAA).  
 13 Beacon.  
 14 Rotorcraft category: cannot maintain flight after failure of one engine.  
 15 Receiver bandwidth.  
 16 Sport-parachuting certificate: 25 jumps, 10 landing ≤50m of target.  
 17 Byte[s].  
 18 Susceptance.  
 19 Luminance [B for brightness].  
 20 Bar, or bi-directional [airfield lighting].  
 21 Helicopter-rotor tip-loss factor.  
 22 Aircraft category, airship (FAI).  
 23 Often used for leftward side force [Z-axis component].
- b** 1 Wing span.  
 2 Bars (unit allowed within SI).  
 3 Barns (unit allowed within SI).  
 4 Engine bleed mass flow.  
 5 Number of blades in helicopter main motor.  
 6 Bit[s].  
 7 Propeller axial slipstream factor.  
 8 Pitch of stringers or other panel stiffeners.
- BAR** Induced-drag factor.
- B<sub>1</sub>, B<sub>2</sub>** 1 Graduation ratings from CFS.  
 2 Used together with b<sub>2</sub> as coefficients defining density of turbulence in gust calculations.
- b<sub>1</sub>** Control-surface hinge moment.
- b<sub>2</sub>** Rate of change of surface hinge moment dCH/dε.
- B2B** Business to business.
- B2C** Business to consumer.
- B<sub>3</sub>H<sub>6</sub>** Diborane rocket propellant, usually combined with OF<sub>2</sub>.
- B4** Aviation petrol (G, WW2).
- B-category** Aircraft used as non-flying trainer.
- B-class** 1 Military and civil prototype or experimental aircraft, not certificated but flown by manufacturer under special rules and with SBAC numerical registration (UK).  
 2 Terminal or control area near large airport (ICAO 1990, and US 1993).
- B-code** In flight plan, have DME and transponder with 64-code without encoding altitude.
- B-display** CRT or other display in which horizontal axis is bearing and vertical axis is range.
- B-licence** Commercial pilot's licence (not ALTP).
- B-line** 90° to the runway.

- B-power supply** Plate circuit that generates electron current in CRT or other electron tube.
- B-rating** Twin-engine pilot rating.
- B-slope** B-display.
- B-station** In Loran, transmitter in each pair whose signals are emitted more than half a repetition period after next succeeding signal and less than half an r.p. before next preceding signal of other (A station).
- B-Stoff** Hydrazine hydrate (G).
- B-vehicles** Non-flying vehicles in RAF service.
- BA** 1 Braking action (ICAO).  
 2 Budget authority.  
 3 Base Aérienne (air base, F).  
 4 Breathing apparatus.  
 5 Formerly the British Association for the Advancement of Science [office, London SW7 5HE] UK.
- B-A gauge** Bayard-Alpert ionisation gauge.
- b.a.** Buffer amplifier.
- BAA** 1 The British Airports Authority (1964–86) is today known as BAA plc, not written in full [130 Wilton Road, London SW1V 1LQ] (UK).  
 2 Broad-area announcement.  
 3 Broad Agency Announcement (Darpa).  
 4 Bombardiers' Alumni Association (US).  
 5 See BAeA.
- BAAC** 1 British Association of Aviation Consultants (office, London SW1V 1EJ) (UK).  
 2 British Aviation Archaeological Council, concerned with aircraft relics and documents, not with studying archaeological sites from the air; [office Oulton Broad, Suffolk NR32 3NH] (UK).
- BAAEMS** British Association of Airport Equipment Manufacturers and Services [office, High Wycombe, Bucks].
- BAAHS** Bay Area Airline Historical Society (San Francisco region).
- BAAI** Balloon and Airship Association of Ireland.
- BAAS** Broad-area aerial surveillance.
- Babbitt** (incorrectly, babbit) Family of soft tin-based alloys used to make liners for plain bearings.
- babble** Incoherent cross-talk in voice communications system.
- Babinet point** One of three points of zero polarisation of diffuse sky radiation.
- BABOV** Bureau Aanleg Beheer en Onderhoud van Vliegvelden (airfield plans and maint.) (Neth.).
- Babs, BABS** Beam-approach beacon system. Outmoded secondary radar system which provided fixed-wing aircraft with lateral guidance and distance information during landing approach.
- BAC** 1 Blood alcohol content.  
 2 Bureau of Air Commerce [1926–38, became CAA] (US).  
 3 Beryllium aliminium composite.
- BACA** 1 Baltic Air Charter Association [successor to Air Brokers Assoc., office London EC3A 8BH] (UK).  
 2 British Air Charter Association [1946, became BIATA 1951] (UK).
- BACE** Basic automatic checkout equipment (USN).

## BACEA

**BACEA** British Airport Construction and Equipment Association.

**Bacimo** Battlespace atmospheric and cloud impacts on military operations (USAF).

**back** 1 Of drag curve, aeroplane flight below VIMD, in which reduction in speed results in increased drag.

2 Of propeller or rotor blade, surface corresponding to upper surface of wing.

3 Rear cockpit of tandem two-seat aircraft, especially combat type (hence GIB).

**back beam** In any beam system, especially ILS localizer, reciprocal beam on other side of transmitter.

**back bearing** Direction observed from aircraft holding steady course of fixed object over which it has recently passed; reciprocal of track.

**backboard** 1 Multilayer circuit board.

2 Specially narrow stretcher (litter) for carrying injured passengers along aisles.

**back burner** To be on \* = not urgent, temporarily shelved.

**back contamination** Contamination of Earth by organisms introduced by spacecraft and crews returning from missions.

**back course** Course flown along back beam, on extended centreline of runway away from airfield.

**backdrive** Where controlled device drives control input, eg thrust levers in Autothrottle mode, or when active motor [e.g. for tailplane] drives failed unit.

**backed-off** Jet engine slid out of fuselage on rails for maintenance, ready to be at once re-installed.

**backfire** Premature ignition of charge in piston engine cylinder such that flame travels through still-open inlet valve(s) and along induction manifold.

**backfit** Retrofit (US usage).

**background** Ambient (usually supposed steady-state) level of intensity of a physical phenomenon against which particular signal is measured. If signal amplitude never exceeds that of background, it cannot be detected. Thus: \* clutter (radar), \* count (radiation), \* luminance, \* noise (this has two meanings: noise in electronic circuit, and ambient level of aural noise at airport or elsewhere). See *microwave* \*.

**background check** Post - 9/11 investigation of personnel (US Dept. of Justice).

**backing** 1 General effort by hardware manufacturer to support his products after they reach customer.

2 Change in direction of prevailing wind in counter-clockwise direction viewed from above; thus, from S to SE.

**backing up** Rearwards taxiing of freight aircraft to loading dock, using reverse thrust.

**backlash** In any mechanism, lost motion due to loose fitting or wear.

**backlobe** Radiation lobe from an antenna in the reverse direction to the main beam.

**backlog** In manufacturing programme, items sold but not yet delivered

**backout** Any reversal of countdown, usually due to technical hold or fault condition.

**backpack** 1 Personal parachute pack worn on back (usually thin enough for wearer to sit comfortably).

2 Any life-support system worn on back of user.

**backpacker** Passenger in cheapest seat(s).

**backplane** Standard STD or STE bus mounting board on which computer boards and other modules are

## BAD

attached by multiple push-in connectors. Most \* accommodate 10 boards and have 20 edge connectors.

**backplate** Fixed disc behind single-sided centrifugal compressor.

**back porch** In electronic display, esp. TV, brief (eg 6  $\mu$ ) interval of suppressed video signal at end of each line scan.

**back-pressure** 1 Pressure in closed fluid system opposing main flow.

2 Ambient pressure on nozzle of rocket or other jet engine or any other discharge from fluid system.

**backscatter** 1 Backward scatter.

2 Signal received by backward scattering.

**back-shop** In manufacturing plant, first shop to close on rundown of programme.

**backside** Moon face turned away from Earth.

**backstagger** Backward stagger.

**backswept** Swept.

**backswing** Linking manoeuvre between tailslide from zero airspeed with fuselage vertical and start of [upright or inverted] down-45 line.

**backtell** Transfer of information from higher to lower echelon.

**backtrack** 1 In aircraft operation, to turn through about 180° and follow same track in reverse direction (as allowance must be made for wind, not same as turn on reciprocal).

2 Having landed on runway in use, to turn through 180° and proceed along runway in reverse direction.

**back-up** 1 Complete programme, hardware item or human crew funded as insurance against failure of another.

2 Type of hardware item which could, even with degraded system performance, replace new design whose technical success is in doubt.

3 System funded to augment one already in operation (thus, BUIC).

4 Information printed on reverse of map or other sheet to supplement marginal information.

**backward compatibility** The ability of a new or modified system to operate in old [precursor] system.

**backward extrusion** Extrusion by die so shaped that material being worked flows through or around it in reverse direction to that of die.

**backward scatter** Electromagnetic energy (eg, radio, radar or laser) scattered by atmosphere back towards transmitter. In some cases whole hemisphere facing towards transmitter is of interest; in radar, attention usually confined to small amount of energy scattered at very close to 180° and detected by receiver.

**backward stagger** Stagger such that the upper wing of a biplane is mounted further back than the lower.

**backward tilt** Tilt such that blade tips are to rear of plane of rotation through centroids of blade roots.

**backward wave** In a TWT, any wave whose group velocity is opposite to direction of electron travel.

**backwash** Slipstream.

**BACM** Bootstrap air-cycle machine.

**BACN** Battlefield airborne communications node.

**Bacon cell** Hydrogen/oxygen fuel cell.

**BAC (1/1)** Open signal modulation used by Galileo navsats (EU).

**BACS** Bleed-air control system.

**BAD** 1 Boom-avoidance distance; thus \* (A) is boom-

## BADD

## ballistic camera

avoidance distance measured along track on arrival and  
\* (D) is same on departure.

2 Bomber Division (R).

3 Biological agent defeat.

4 Behind-armour damage.

**BADD** Battlefield awareness and data dissemination.

**BADGE, Badge** Base air-defence ground environment (Japan).

**BADL** Bulk acoustic delay line.

**BAeA** British Aerobatic Association [White Waltham SL6 3NJ] (UK).

**BAeF** British Aerophilatelic Federation [Enfield EN3 5NX] (UK).

**BAF** 1 Bleed-air failure.

2 Incorrectly, Belgian Air Force.

**BAFF** British air forces in France (1939–40).

**baffle** 1 Loosely, any device intended to disturb and impede fluid flow.

2 Shaped plates fixed around and between cylinders of air-cooled piston engine to improve cooling.

3 Surface, usually in form of a ring, plate or grating, arranged inside liquid container to minimise sloshing.

4 In two-stroke piston engine, deflector incorporated in crown of piston.

5 Partial obstruction inside pitot tube to minimise ingress of liquid or solid matter.

**BAFO** 1 British Air Forces of Occupation.

2 Best and final offer.

**BAG** British Airports Group [SBAC, London SW1H 9EU] (UK).

**bag** See *body bag*.

**baggage** Checked-in possessions of a passenger, normal limits  $\leq 900 \times 700 \times 400$  mm (36×28×15 in),  $\geq 350 \times 230 \times 150$  mm (14×9×6 in),  $\leq 34$  kg (75 lb), no trailing cord or loose binding nor sharp projections.

**bag tank** Liquid container, especially fuel tank, constructed of flexible material not forming part of airframe.

**BAH** Belgian Aircraft Homebuilders [office, B-1000 Brussels] (Belgium).

**BAI** 1 Battlefield air interdiction.

2 Board of Auditors, International (NATO).

**BAIG** British Aviation Insurance Group.

**bail** To loan aircraft or other possession, freely but under contract, to facilitate accomplishment of specific objective; in particular, loan by owner government of military hardware to industrial contractor engaged in particular development programme for that government.

**Bailie beam** Extra-precise Lorenz beam for Babs.

**bail out** To abandon dangerously unserviceable aircraft, esp. in midair, by parachute. Not yet used in connection with spacecraft.

**bailout bottle** Emergency personal oxygen supply, usually high-pressure gox, attached to aircrew harness or ejection seat.

**Bairstow number** Mach number.

**bakes** Back-course (ILS).

**Bakelite** Trade name for a phenol-formaldehyde resin plastic.

**bake out** In high-vacuum technology, heating to promote degassing.

**Baker-Nunn** Large optical camera used for tracking objects in space.

**BAL** 1 Office of air force training (Switzerland).

2 Bombe à guidage laser (F).

**balance** 1 State of equilibrium attained by aircraft or spacecraft.

2 Mechanism for supporting object under test in wind-tunnel and for measuring forces and moments experienced by it due to gas flow.

3 Mass or aerodynamic surface intended to reduce hinge moment of control surface.

**balance area** In aerodynamically balanced control surface, projected area ahead of hinge axis.

**balance beam** Large SLAR antenna arranged axially above fuselage on centreline with mass disposed fore and aft of c.g.

**balance circuit** In a WCS, subsystem which prevents, or warns of impending lateral asymmetry due to unbalanced weapon load.

**balanced approach** Optimum approach path referred to ground, taking in such factors as noise, ATC routing, cutbacks, land-use planning and preferential-runway rules.

**balanced field length** 1 Hypothetical length of runway for which  $TOD_a = EMD_a$  (and sometimes, in addition,  $TORA$ ).

2 Under CAR.4b, unfactored TOD to 50 ft following failure of one engine at  $V_1 = EMD$  to and from  $V_1$ , on dry surface.

**balanced modulator** Modulator whose output comprises sidebands without carrier.

**balanced signature** One which achieves optimal matching of IRS and RCS.

**balanced support** Logistic supply based on predicted consumption of each item.

**balanced surface** Control surface whose hinge moment is wholly or partially self-balanced (usually by means of mass or area ahead of hinge axis or by tabs).

**balance rod** Mass distributed along or within leading edge of helicopter rotor blade.

**balance station zero** Imaginary reference plane perpendicular to longitudinal axis of aircraft and at or ahead of nose, used in determinations of mass distribution and longitudinal balance.

**balance tab** Tab hinged to, and forming part of, trailing edge of control surface, and so linked to airframe that it is deflected in opposition to main surface, and thus reduces hinge moment. Action is thus similar to that of servo tab.

**bale out** See *bail out*.

**ball** 1 Small spheroid, or other laterally symmetric shape, in lateral glass tube of ball-type slip indicator.

2 Arbitrary unit of slip, equal to one ball-width.

**ball ammunition** Bullets of solid metal, containing no explosive, pyrotechnic or AP core.

**ballast** 1 In aerodynamics, mass carried to simulate payload, and permit c.g. position to be varied (usually in flight).

2 In aerostats, mass carried for discharge during flight to change vertical velocity or adjust trim.

**ballast carrier** In transport aircraft, holder for metal ballast weights with locking plungers mating with floor rails.

**ball bearing** Any shaft bearing in which inner race is supported and located by hardened spheres.

**ball inclinometer** Ball turn-and-slip.

**ballistic camera** Photographic camera which, by means

**ballistic capsule]**

of multiple exposures on same plate or frame of film, records trajectory of body moving relative to it.

**ballistic capsule** Capsule enclosing environment suitable for human crew or other payload and moving in \* trajectory.

**ballistic flight** Ballistic trajectory; arguably, not flight.

**ballistic galvanometer** Undamped galvanometer which, when an electrostatic charge is switched through it, causes large initial swing, taken to be proportional to quantity of electricity passing.

**ballistic missile** Wingless rocket weapon which, after burnout or cutoff, follows \* trajectory.

**ballistic parachute canopy spreader** Device for accelerating deployment of drag canopy in certain types of ejection seat.

**ballistic range** Research facility for investigation of behaviour of projectiles or of bodies moving through gaseous media at extremely high Mach numbers; usually comprises calibrated range along which test bodies can be fired, sometimes into gas travelling at high speed in opposite direction.

**ballistic recovery system** Large parachute deployed [sometimes fired by rocket] from above c.g. of [usually small] G A aircraft.

**ballistic re-entry** Non-lifting re-entry.

**ballistic trajectory** Trajectory of wingless body, formerly propelled but now subject only to gravitational forces and, if in atmosphere, aerodynamic drag.

**ballistic tunnel** High-Mach tunnel into which free projectiles are fired in opposition to gas flow (see \* range).

**ballistic vehicle** Vehicle, other than missile, describing a \* trajectory. Term usually not applied to spacecraft but to vehicles used in proximity of Earth and at least mainly within atmosphere.

**Ballistic Wind[s]** Research into variation of wind with altitude (USAF).

**ballistic wind** Theoretical constant wind having same overall effect on a \* projectile as varying winds actually encountered.

**ballizing** Forcing a hard oversized ball through a hole with a small fatigue crack, to bring crack region into compression.

**ball lightning** Rare natural phenomenon, materialising during electrical storms, having appearance of luminous balls which often appear to spin, eject sparks, travel slowly and eventually disappear (sometimes with explosion).

**ball mat** Standard squares or rectangles of tough flooring containing pattern of protruding freely-rotating balls facilitating omnidirectional movement of containers or pallets.

**ballonet** Flexible gastight compartment inside envelope of airship (rarely, balloon) which can be inflated by air to any desired volume to compensate for variation in volume of lifting gas and so maintain superpressure and alter trim.

**ballonet ceiling** Maximum altitude from which pressure aerostat with empty ballonet(s) can return to sea level without loss of superpressure.

**balloon sonde, ballonsonde** The original French term for a sounding balloon. See *registering balloon*.

**balloon** Aerostat without propulsion system.

**balloon barrage** Protective screen of balloons moored by steel cables around target likely to be attacked by enemy aircraft.

**band-elimination filter**

**balloon bed** Area of ground prepared for mooring of inoperative captive balloon.

**balloon fabric** Range of fabrics of mercerised cotton meeting specifications for covering lightplanes and, impregnated with rubber, aerostats.

**ballooning** Colloq., sudden unwanted gain in height of aeroplane on landing approach due to lowering flaps, GCA instruction or, most commonly, flare at excessive airspeed.

**balloon master** Person in charge of launch of free-flight balloons, including liaison with ATC.

**balloon reflector** In electronic warfare, confusion reflector supported by balloon(s).

**balloon tank** Tank for containing liquid or gas constructed of metal so thin that it must be pressurized for stability. Such tanks have formed airframe of large ICBMs.

**balloon tyre [tire]** Not defined but generally taken to mean tyre of larger than normal section (profile) and less than normal pressure.

**ball screwjack** Screwjack in which friction is reduced by system of recirculating bearing balls interposed between fixed and rotating members.

**balls-out** Maximum possible power (colloq.).

**ball turn-and-slip** Flight instrument whose means of indicating slip is a ball free to move within liquid-filled curved tube having its centre lower than its ends.

**ball turret** Ventral gun turret on certain large aircraft of 1942–45 – notably B-17, B-24 – having part-spherical shape.

**ballute** Balloon-parachute; any system of inflatable aerodynamic braking used for upper-atmosphere retardation of sounding rockets or slowing of spacecraft descending into planetary atmospheres.

**BALO** Brigade Air Liaison Officer.

**Balpa, BALPA** The British Air Line Pilots' Association; 1937-, trade union [office Harlington UB3 5BG] (UK).

**balsa** Wood of extremely low density (s.g. about 0.13), originally grown in W. Indies and Central America.

**Balt, BALT** Barometric altitude.

**Balnet** Monitors airspace over Estonia, Latvia, Lithuania.

**BAM** 1 Bundesanstalt für Material Prüfung (G).

2 Bird avoidance module.

**Bambi basket** Deployed under helicopter, esp. for recovery [esp. from water] of exhausted or injured.

**BAMS** 1 Brassboard airborne multispectral sensor.

2 Broad-area maritime surveillance (USN).

**BAMTRI** Beijing Aeronautical Manufacturing Technology Research Institute.

**BAN** Beacon alphanumerics (part of FAA ARCTS).

**banana case** The curved casing of an accessory gearbox wrapped around the compressor or fan case of a gas-turbine engine.

**band** 1 Designated portion of EM spectrum, usually bounded by frequencies used for radio communication.

2 A (usually small) portion of EM spectrum containing frequencies of absorption or emission spectra.

3 Strip of stronger material built into non-rigid aerostat envelope to distribute stress from mooring line, car or other load.

4 Group of tracks on magnetic disc or drum.

**band-elimination filter** Filter that eliminates one band of EM frequencies, upper and lower limits both being finite.

**B&GS** Bombing and gunnery school.

**bandit** Air contact (5) known to be hostile.

**band of error** Band of position.

**band of position** Band of terrestrial position, usually extending equally on each side of position line, within which, for given level of probability, true position is considered to lie.

**B&P** Bid and proposal.

**bandpass** Width, expressed in Hz, of band bounded by lower and upper frequencies giving specified fraction (usually one-half) of maximum output of amplifier.

**bandpass filter** EM wave filter designed to reduce or eliminate all radiation falling outside specified band of frequencies.

**B&S** Brown and Sharpe.

**bandwidth** 1 Number of Hz between limits of frequency band.

2 Number of Hz separating closest lower and upper frequency limits beyond which power spectrum of time-variant quantity is everywhere less than specified fraction of its value at reference frequency between limits.

3 Range of frequencies between which aerial performs to specified standard.

4 In EDP and information theory, capacity of channel.

5 Band of position, usually expressed in nm on each side of PL (1) or track.

**bang** Sound caused by passage of discontinuous pressure wave in atmosphere (*sonic bang*).

**bang-bang** Any dynamic system, especially one exercising control function, which continually oscillates between two extreme 'hard-over' positions. Also called flicker control.

**bang out** To eject (colloq.).

**bang valley** Land or sea area under track where supersonic flight is permitted (colloq.).

**banjo** Structural member having form of banjo, with open ring joined to linear portion (on either or both sides) projecting radially in same plane. Typically used to link spar booms on each side of jet engine or jetpipe aperture.

**bank** 1 Attitude of aerodyne which, after partial roll, is flown with wings or rotor not laterally level. Held during any properly executed turn.

2 To roll aerodyne into banked position.

3 Linear group of cylinders in piston engine.

4 Pool of trained aircrew, esp. pilots, for whom no jobs are immediately available.

**bank and turn indicator** Turn and slip indicator.

**banner cloud** Cloud plume extending downwind of mountain peak, often present on otherwise cloudless day.

**banner** 1 Large fabric strip towed behind aircraft, usually bearing advertising statement readable from both sides.

2 Fabric sleeve placed over propeller blade, usually saying FOR SALE.

**banner sleeve** Tow target in form of long tube inflated by slipstream, usually called sleeve target.

**banner target** Air-to-air or ground-to-air firing target in form of towed strip of flexible fabric like elongated flag.

**banter** Critical comment on a pilot's performance by his peers who are watching.

**BAO** Battlefield air operations, Afsoc field kit.

**BAOR** British Army of the Rhine.

**BAP** 1 Bomber aviation regiment (USSR).

2 Bank-angle projection.

3 Be a pilot (US GA initiative).

4 Bombe anti-personnel (F).

**BAPA** British Aeromedical Practitioners Association.

**BAPC** 1 British Aircraft Preservation Council [1967-, office Manchester M3 4FB] (UK).

2 British Association of Parascending Clubs.

**Bapta** Bearing and power-transfer assemblies (comsat).

**BAQ** Base allowance for quarters (US armed services).

**BAR** 1 See \* UK.

2 Broad Area Review.

**bar** 1 Unit of pressure, allowed within SI and standard in meteorology and many other sciences. Equal to  $10^5 \text{ Nm}^{-2} = 14.5037 \text{ lb/in}^2$ . In units contrary to SI,  $10^6 \text{ dynes cm}^{-2}$  or  $750.08 \text{ mm}$ ;  $29.53 \text{ in of Hg}$ . One bar (1,000 mb) is Normal Atmospheric Pressure.

2 Metal [usually gold] bar(s) across ribbon of medal to show decoration has been awarded twice (thrice); in written form, each bar appears as a star \*.

**baralyme** Trade name for mixture of barium and calcium hydroxides used to absorb CO<sub>2</sub>.

**Barb** Boosted anti-radar bomb (S Africa).

**barbecue manoeuvre** Deliberate intermittent half-rolls performed by spacecraft to equalise solar heating on both sides.

**barber chair** Chair capable of gross variation in inclination.

**barber-pole instrument** Indicator using rotating spirals, such as PVD (2).

**barbette** Defensive gun position on large aircraft projecting laterally and providing field of fire to beam.

**BARC** Bhaba Atomic Research Centre [NW warheads] (India).

**Barcap** Barrier combat air patrol between naval strike force and expected aerial threat.

**Barcis** British airports rapid control and indication system.

**bar code** Geometric patterns, no two alike, printed on document (eg flight coupon) and read by light pen connected to computer storing data (eg stolen ticket numbers).

**bare base** Airfield comprising runways, taxiways and supply of potable water.

**bare engine** Generally means engine without fuel/oil/water or any auxiliary devices such as APU, cabin compressor or vectored nozzle(s).

**barf bag** Sick bag.

**Barif** Bureau of Airlines Representatives in Finland.

**Barig** Board of Airlines Representatives in Germany.

**barn** 1 Unit of area for measuring nuclear cross-sections. Equal to  $10^{-28} \text{ m}^2$  or  $10^{-22} \text{ mm}^2$ . Symbol b.

2 Non-hardened hangar for single aircraft, eg SR-71.

**barnstormer** Formerly, itinerant freelance pilot who would operate from succession of unprepared temporary airfields giving displays and joyrides.

**baro** Barometric.

**baro-corrected** Pressure altitude corrected to local atmosphere.

**barogram** Hard-copy record made by barograph.

**barograph** Barometer giving continuous hard-copy record.

**barometer** Instrument for measuring local atmospheric pressure.

**barometric altimeter** Pressure altimeter.

**barometric altitude** Pressure height.

## barometric element

**barometric element** Transmitting barometer carried in radiosonde payload, variation in aneroid capsules causing shift in frequency of carrier wave.

**barometric fuze** Fuze set to trigger at preset pressure height.

**barometric pressure** Local atmospheric pressure.

**barometric pressure control** Automatic regulation of fuel flow in proportion to local atmospheric pressure.

**barometric pressure gradient** Change in barometric pressure over given distance along line perpendicular to isobars.

**barometric tendency** Change in barometric pressure within specified time, usually the preceding three hours.

**barometric wave** Any short-period meteorological wave in atmosphere.

**barosphere** Atmosphere below critical level of escape.

**barostat** Device for maintaining constant atmospheric pressure in enclosed volume.

**barostatic relief valve** Automatic regulation of fuel flow by spilling back surplus through relief valve sensitive to atmospheric pressure.

**barothermograph** Instrument for simultaneously recording local temperature and pressure.

**barotrauma** Bodily injury due to gross or sudden change in atmospheric pressure.

**barotropy** Bulk fluid condition in which surfaces of constant density and constant pressure are coincident.

**barrage** AA artillery fire aimed not at specific targets but to fill designated rectilinear box of sky.

**barrage balloon** Captive balloon forming part of balloon barrage.

**barrage jamming** High-power electronic jamming over broadest possible spread of frequencies.

**barrel** 1 Of piston engine cylinder, body of cylinder without head or liner.

2 Of rocket engine, thrust chamber of nozzle, esp. of engine having multiple chambers.

3 Any portion of airframe of near-circular section, even if tapering; thus Canadair made the CF-18 nose \*.

4 Highly dangerous area with strong defences against attacking aircraft.

5 Non-SI unit of volume, = 42 US gal – 0.15899m<sup>3</sup>.

**barrel engine** piston engine having cylinders with axes disposed parallel to engine longitudinal axis and output shaft.

**barrelling** 1 Various methods of using rotating drum filled with abrasive [usually powder] to remove burrs and other surface imperfections from workpiece.

2 Colloq., to make fast low pass over ground location; to barrel in.

**barrel roll** Manoeuvre in which aerodyne is flown through 360° roll while trajectory follows horizontal spiral such that occupants are always under positive acceleration in vertical plane relative to aircraft.

**barrel section** 1 Portion of transport aircraft fuselage added in stretching. Alternatively called plug section (but see barrel (3)).

2 Parallel length of control rod.

**barrel wing** Wing in form of duct open at both ends and with longitudinal section of aerofoil shape.

**barrette** Array of closely spaced ground lights that appear to form a solid bar of light.

**barricade** Barrier (USN).

**barrier** Net mounted on carrier (1) deck or airfield

## base leg

runway to arrest with minimal damage aircraft otherwise likely to overrun. Normally lying flat, can be raised quickly when required.

**barrier crash** Incident involving high-speed entry to \* with or without damage. Usually applied to carrier operations.

**barrier pattern** Geometrical pattern of sonobuoys so disposed as to bar escape of submerged submarine in particular direction.

**barring** Slowly turning gas-turbine engine by hand.

**bar stock** Standard form of metal raw material: solid rolled or extruded with round, square or hexagonal (rarely, other) section.

**Barstur, BARSTUR** Barking Sands Tactical Underwater Range (USN, Kauai, Hawaii).

**BAR UK** Board of Airline Representatives in the UK [office, London].

**barycentre** Centre of mass of system of masses, such as Earth/Moon system (barycentre of which is inside Earth).

**barye** Unit of pressure in CGS system. Equal to 10 Nm<sup>-2</sup> = 1 dyne cm<sup>-2</sup> or 1.4503 × 10<sup>-3</sup> lb/in<sup>2</sup> or 10<sup>-6</sup> bar (hence alternative name of microbar).

**BAS** 1 Bleed-air system.

2 Base allowance for subsistence (US armed forces).

3 Barrier arresting system.

**BASA** Bilateral Aviation Safety Agreement (FAA + foreign government).

**Basar** Breathing air, search and rescue (for diver in helo crew).

**BASE** Cloud base height AMSL (ICAO).

**BaSE** Battlespace synthetic environment.

**base** 1 Locality from which operations are projected or supported.

2 Locality containing installations to support operations.

3 In an object moving through atmosphere, any unfaired region facing rearwards (eg rear face of bullet or shell, trailing-edge area of wedge aerofoils, and projected gross nozzle area of rocket engine after cutoff).

4 Substance constructed of ions or molecules having one or more pairs of electrons in outer shells capable of forming covalent bonds.

5 Loosely, substance that neutralises an acid.

6 In transistor, region of semiconductor material into which minority carriers are emitted (hence, usually, between emitter and collector).

7 Underside of cloud. With cloud having grossly irregular undersurface, surface parallel to local Earth surface below which not more than 50 per cent of cloud protrudes, and which can be taken as upper limit of VFR. In mist or fog \* intersects Earth.

**Basea, BASEA** British Airport Services & Equipment Association [500+ members, office Bournemouth BH8 8EZ] (UK).

**base area** Aggregate area of unfaired rearward-facing surface of aerodynamic body.

**base check** Examination in flight of crew on completion of conversion to new type.

**base drag** Drag due to base area experiencing reduced pressures.

**base height** Minimum height AGL authorised on low-level training sortie, in peacetime typically 200 ft, 91 m.

**base leg** In airfield circuit, extends from end of downwind leg to start of turn on to finals.

**base line, baseline** 1 Yardstick used as basis for comparison, specif. known standard of build for functioning system, such as combat aircraft, against which developed versions can be assessed in numerical terms. Hence, \* aircraft.

2 Geodesic line between two points on Earth linked by common operative system, eg between two Loran, Decca or Gee stations.

3 In many types of visual display and pen recorder, line displayed in absence of any signal.

**base metal** 1 Major constituent of an alloy.

2 Metal of two parts to be joined by welding (as distinct from metal forming joint itself, which is modified or added during welding process).

**base pressure** Local aerodynamic pressure on base area of body moving through atmosphere.

**base surge** Expanding toroid surrounding vertical column in shallow underwater nuclear explosion.

**base/timing sequencing** Automatic sharing of transponder between several interrogators or other fixed stations by use of coded timing signals.

**BASF** Boron-augmented solid fuel.

**BASH, Bash** Bird/aircraft strike hazard (USAF team).

**BASI** Bureau of Air Safety investigation (Australia).

**Basic** British American Security Information Council (office DC).

**basic aircraft** Simplest usable form of particular type of aircraft, from which more versatile aircraft can be produced by equipment additions. In case of advanced aircraft, such as combat and large transports, \*\* includes IFR instruments, communications, and standard equipment for design mission.

**basic cloud formations** Subdivision of cloud types into: A, high; B, middle; C, low; D, clouds having large vertical development (International Cloud Atlas, 1930).

**basic commercial pilot's licence** Awarded after 220 h including 100 as P1, allows holder to do aerial work including VFR pleasure passenger flights in aircraft up to 5,700 kg. Suffix (A), aeroplanes; (H), helicopters.

**basic cover** Aerial reconnaissance coverage of semi-permanent installation which can be compared with subsequent coverage to reveal changes.

**basic encyclopedia** Inventory of one's own or hostile places or installations likely to be targets for attack.

**basic flight envelope** Graphical plot of possible or permissible flight boundaries of aerodyne of particular type. Cartesian plot with TAS or Mach number as horizontal and altitude or ambient pressure as vertical. Boundaries imposed by insufficient lift, thrust or structural strength (and sometimes by social and other considerations); see *basic gust* \*, *basic manoeuvring* \*.

**basic gross weight** Operating weight empty.

**basic gust envelope** Specified form of graphical plot for each new aerodyne design showing permissible limits of speed for passage through vertical sharp-edged gusts of prescribed strength (traditionally  $\pm 25$ , 50 and 66 ft sec $^{-1}$ ). Result is V-n diagram, with EAS as horizontal and gust load factor n as vertical. See *gust envelope*.

**basic load** 1 Load (force) transmitted by structural member in condition of static equilibrium, usually in straight and level flight (1 g rectilinear), at a specified gross weight and mass distribution.

2 Aggregate quantity of non-nuclear ammunition,

expressed in numbers of rounds, mass or other units, required to be in possession of military formation.

**basic manoeuvring envelope** V-n diagram with EAS as horizontal and manoeuvring load factor as vertical. See *manoeuvring envelope*.

**basic operating platform** See *bare base*.

**basic operating weight** *Operating weight empty*.

**basic research** See *pure research*.

**basic runway** Runway without aids and bearing only VFR markings: centreline dashes or arrows, direction number and, if appropriate, displaced threshold.

**basic 6** The instruments on a blind-flying panel.

**basic supplier** Nominated supplier of hardware item in absence of specific customer option.

**basic T** In traditional cockpit instrument panel, primary flight instruments (ASI, horizon, turn/slip and VSI) arranged in a standard T formation.

**basic thermal radiation** Thermal radiation from Quiet Sun.

**basic trainer** American military aeroplane category used for second stage in pilot training (after primary), with greater power and flight performance. Formerly also 'basic combat' (BC) category, which introduced armament and closely paralleled flight characteristics of operational type; called 'scout trainer' by Navy and redesignated 'advanced trainer' (obs).

**basic weight** Superseded term formerly having loose meaning of mass of aircraft including fixed equipment and residual fluids.

**basic wing** Aerofoil of known section used as starting point for modified design, often with wholly or partly different section.

**basket** 1 Radar-defined horizontal circular area of airspace into which dispensed payloads (eg anti-armour bomblets) are delivered by bus (5). More loosely, volume of sky designated to receive free-fall object(s).

2 Car suspended below aerostat for payload, not necessarily of wickerwork construction.

3 Drogue on a flight-refuelling tanker hose.

4 Across-board sample of aircraft types in calculation of airport charges.

**basket tube** Form of construction of liquid-propellant rocket thrust chamber in which throat and nozzle is formed by welded tubes, usually of nickel or copper, through which is pumped liquid oxygen or other cryogenic propellant for regenerative cooling.

**BASO** Brigade air support officer.

**Bassa** British Airlines Stewards and Stewardesses Association.

**BAT** 1 Boom-avoidance technique.

2 Beam-approach training.

3 Bureau of Air Transportation (Philippines).

4 Brilliant anti-tank (submunitions).

5 Bombe[s] d'appui tactique (F).

6 Blind-approach technique (WW2).

7 See *Bat-Cam*.

8 Binary-actuator technology.

**BATA** British Air Transport Association, formerly BCASC [office, Artillery House, London SW1P 1RT] (UK).

**Batap** B-type application to application protocol.

**Bat-Cam** Battlefield air targeting-camera autonomous micro air vehicle.

**Batco**

**Batco** The British Air Traffic Controllers' Association (UK, 1961–).

**BATDU** Blind-Approach Training and Development Unit (UK became WIDU).

**Bates** Battlefield artillery target-engagement system, UAV-integrated (UK).

**BATF** Beam Approach Training Flight (RAF).

**bathtub** 1 Bath-shaped structure of heavy plate or armour surrounding lower part of cockpit or other vital area in ground-attack aircraft.

2 Temporary severe recession in production in manufacturing plant or programme, or between programmes; named from appearance on graphical plot (US, colloq.).

3 Graphical plot of equipment's service life: burn-in, useful life, wearout.

**bathtub fitting** Fishplate (US).

**bathythermograph** Sonobuoy dropped ahead of others to measure water data at various depths.

**Batman** Battlefield air tactical micro air vehicle.

**BATOA** British Air Taxi Operators' Association.

**batonet** Tubular or rod-like toggle forming link between rigging line and band on fabric aerostat envelope.

**BATR** Bullets at target range (shows location in HUD).

**BATS** 1 Ballistic aerial target system.

2 Bathymetric and topographic survey.

**batsman** Member of crew of aircraft carrier [rarely, other landing place] charged with guiding landing aircraft by hand signals.

**batt** 1 Ceramic filler formed from chopped-strand mat.

2 Battery.

**batten** 1 Wood or metal strip used in interlinked pairs as ground control lock.

2 Wood or metal strips arranged radially from nose of non-rigid airship to stiffen fabric against dynamic pressure, or, where applicable, mooring loads.

3 Flexible strips used in lofting drawing.

**battery** Enclosed device for converting chemical energy to electricity. Most aerospace batteries are secondary (rechargeable), principal families being Ni/Cd (nickel, cadmium), Ag/Zn (silver, zinc) and lead/acid. Fuel cells are batteries continuously fed with reactants.

**battery booster** Starting coil.

**battle climb** A climb to near ceiling [c 16,000 ft] in the shortest time, routine training for the RAF and other air forces prior to WW2.

**battle damage** In-flight damage caused directly by enemy (not, eg, by collision with friendly aircraft).

**battlefield air interdiction** Air/ground sortie(s) tasked with restricting enemy's tactical movement and preventing him bringing up reserves to reinforce battle in progress.

**battle formation** Any of several formations characterised by open spacing and flexible interpretation.

**battleship model** Any model or rig used for repeated development testing, usually statically, in which major elements not themselves under test are made quickly and cheaply from 'boilerplate' material to withstand repeated use. Thus battleship tank.

**battleship tank** Tank for liquid propellant for static testing of rocket engines having same capacity and serving same feed system as in flight vehicle but made of heavy steel or other cheap and robust material for repeated outdoor use.

**battlespace** 1 Earth atmosphere and near space, region of human conflict.

2 3-d space in which actual conflict is taking place.

**bat turn** Maximum-rate turn in air combat (colloq.).

**bat wing** Becoming common term for BWB projects.

**BAUA** Business Aircraft Users' Association [1961–; office, Farnborough GU14 6XA, merged 2004 into BBGA] (UK).

**BAUAG** British Airports Users' Action Group.

**baud** Unit of telegraphic signalling speed, equivalent to shortest signalling pulse or code element. Thus speed of 7 pulses per second is 7 bauds (pronounced 'boards'); abbreviation Bd.

**baulk** 1 Aborted landing due to occurrence in final stages of approach (typical causes would be aircraft on airfield taxiing on to runway or a runaway stick-pusher in landing aircraft).

2 Verb, to obstruct landing of an approaching aircraft and cause it to overshoot.

3 Physical limiter on available movement of an inceptor, e.g. to prevent inadvertent operation of landing gear or reverser.

**baulked landing** See **baulk** (1).

**Baumé** Density scale of petroleum products; for S.G. less than 1, °B =  $\frac{140}{S.G.} - 1$ .

**BAWS** Biological aerosol, or agent, warning system, or sensor.

**bay** 1 In aerodyne fuselage or rigid airship hull, portion between two major transverse members such as frames or bulkheads.

2 In biplane or triplane, portion of wings between each set of interplane struts; thus, single-\* aircraft has but one set of interplane struts on each side of centreline.

3 In any aircraft or spacecraft, volume set aside for enclosing something (eg, engine \*, undercarriage \*, bomb \*, cargo \*, lunar rock \*).

**bayonet** Electronic subsystem permitting radar of strike aircraft to home on designated ground target and providing azimuth for release of weapons equipped with radiation sensors.

**bayonet exhaust** Formerly, form of piston engine exhaust stack designed to reduce noise.

**BAZ** 1 Bundesamt für Zivilluftfahrt Zentrale (Austria).

2 Back azimuth unit, MLS addition used for departure and overshoots.

**BAZL** Bundesamt für Zivilluftfahrt, Federal office for civil aviation (Switzerland).

**BB** 1 Back bearing.

2 Battleship (USN).

3 Bulletin board [S adds system] (US).

4 Base band.

**BBAC** British Balloon and Airship Club. [1965–; office, Bedminster BS3 4NH] (UK).

**BBAL** Association of smaller GA companies [D-53757 St Augustin] (G).

**BBC** 1 Broad-band chaff.

2 Before bottom centre.

**BBGA** British Business and General Aviation Association [formed 2004 by merger of BAUA and Gamta; office Aylesbury HP18 9RT] (UK).

**BBHS** Battle of Britain Historical Society.

**BBI** Bit bus interface.

**BBL** 1 Billion barrels liquid.

2 Bring-back load.	
<b>BBM, BBm</b> Back beam.	
<b>BBMF</b> Battle of Britain Memorial Flight (RAF).	
<b>BBN</b> 1 Basic backup network for future civil navaids (FRN).	
2 Baseband node.	
<b>BBOE</b> Billion barrels oil equivalent.	
<b>BBSU</b> British Bombing Survey Unit.	
<b>BBU</b> Battery back-up unit.	
<b>BBW</b> 1 Brake by wire.	
2 Bring-back weight.	
<b>BC</b> 1 Boron carbide armour.	
2 Back course.	
3 Bus (2) controller.	
4 Bomber Command (RAF, USAAF).	
5 Basic combat trainer category (USAAC, 1936–40).	
6 Patches [of cloud] (ICAO).	
7 Bottom of cylinder.	
8 Become, becoming.	
<b>BCA</b> 1 Board of Civil Aviation (Sweden).	
2 Baro-corrected altitude.	
3 Best cruise altitude.	
4 Belgian Cockpit Association, also called ABPNL.	
5 British Cargo Alliance [carrier pressure group, office London].	
<b>BCAA</b> British Cargo Airline Alliance.	
<b>BCAC</b> British Columbia Aviation Council.	
<b>BCAM</b> Best cruise altitude/Mach.	
<b>BCAOC</b> Balkan Combined Air Operations Centre (NATO).	
<b>BCARs</b> British Civil Air, or Airworthiness, Requirements.	
<b>BCAS</b> Beacon-based collision-avoidance system.	
<b>BCASC</b> British Civil Aviation Standing Conference, now BATA.	
<b>BCATP</b> British Commonwealth Air Training Plan (1939–45).	
<b>BCBP</b> Bar-coded boarding pass.	
<b>BCBS</b> Bomber Command Bombing School (RAF).	
<b>BCC</b> British Chambers of Commerce, representing 126,000+ businesses.	
<b>BCD, bed</b> 1 Binary coded decimal.	
2 Bulk chaff dispenser.	
<b>BCE</b> Battlefield control element.	
<b>BCF</b> Bromochlorodifluoromethane (fire extinguisherant).	
<b>BC/FC</b> Beam control, fire control [ABL <sub>i</sub> ]	
<b>BCFG</b> Fog patches.	
<b>BCFR</b> Bomber Command Forward Relay (RAF).	
<b>BCH</b> Binary coded hamming.	
<b>BC<sup>3</sup>I</b> Battlefield command and control communications and intelligence.	
<b>BCIU</b> Bus control and interface unit.	
<b>BCKG</b> Backing (ICAO).	
<b>BCL</b> Braked conventional landing (V/STOL).	
<b>BCM</b> 1 Basic combat manoeuvring, series of manoeuvres simulating interceptions and close dogfights.	
2 Best cruise Mach number.	
3 Background clutter matching.	
4 Back-course marker.	
<b>BCMG</b> Becoming.	
<b>BCMP</b> Bird control management plan.	
<b>bcn</b> Beacon.	
<b>BCO, bco</b> Binary coded octal.	
	<b>BCOB</b> Broken cloud[s] or better.
	<b>BCP</b> 1 Battery command post.
	2 BIT control panel.
	3 Breaking cloud procedure.
	<b>BCPL</b> See <i>Basic commercial pilot's licence</i> .
	<b>BCPR</b> Broad – coverage photo-reconnaissance (USAF satellites).
	<b>BCPT</b> Basic communications procedures trainer, for AEOs.
	<b>BCR</b> 1 European Community Bureau of Reference (co-ordinates R & D).
	2 Battle casualty replacement.
	3 Bombing, combat and reconnaissance.
	4 Business concept review.
	<b>B/CRS</b> Back course.
	<b>BCRU</b> Battery charger regulator unit.
	<b>BCS</b> 1 British Computer Society.
	2 Beam control system, esp. for laser on platform subject to jitter and atmospheric turbulence.
	3 Block check sequence.
	4 Buoy communication system.
	<b>BCSG</b> Bus-computer symbol generator.
	<b>BCST, best</b> Broadcast.
	<b>BCSV</b> Bearing-compartment scavenge valve.
	<b>BCT</b> Brigade Combat Team (USA).
	<b>BCU</b> 1 Bird control unit (on airfield).
	2 Bus control unit.
	<b>BCV</b> Belly cargo volume.
	<b>BCW</b> Binary chemical warhead.
	<b>BD</b> 1 Blowing dust.
	2 Baud (correct abbreviation is Bd).
	<b>B/D</b> Bearing and distance.
	<b>Bd</b> Baud.
	<b>bd</b> Candle (unit of luminous intensity), abb.
	<b>BDA</b> Bomb (or battle) damage assessment.
	<b>BDAC</b> Bilateral Defence/Defense Acquisition Committee [being negotiated from 2002 to resolve problems caused by US refusal to disclose information to UK defence partners].
	<b>BDC, b.d.c.</b> 1 Bottom dead centre.
	2 Bomb detection chamber.
	<b>BDFA</b> British Disabled Flying Association [office, Biggin Hill] (UK).
	<b>BDHI</b> Bearing/distance/heading indicator.
	<b>B/DHSI, BDHSI</b> Bearing/distance horizontal-situation indicator.
	<b>BDI</b> 1 Bearing/distance indicator.
	2 Association of defence industries (G)
	3 Bomb-damage intelligence.
	<b>BDL</b> Bistable-diode laser.
	<b>BDLI</b> Bundesverband der Deutschen Luft- und Raumfahrtindustrie eV [German aerospace industry association; office, Bonn D-53179] (G).
	<b>BDM</b> Buhr design method.
	<b>BDMIPG</b> British Defence Manufacturers Industrial Participation Group.
	<b>BDMIS</b> Business data management and invoicing.
	<b>BDOE</b> Barrels per day oil equivalent.
	<b>BDP</b> Bitsync descrambler preprocessor.
	<b>BDR</b> 1 Battle-damage repair.
	2 Basic dispatch rate, or reliability [percent].
	<b>BDRY</b> Boundary.
	<b>BDS</b> 1 Comm-B designation subfield.
	2 Boost defence segment.

- 3** Bypass-duct splitter.
- BDTF** Bomber Defence Training Flight (RAF).
- BDX** Beacon-data extractor, or extraction.
- BE** Business engineering.
- Be** Beryllium.
- BEA** 1 British European Airways 1946–72.  
2 Bureau Enquêtes Accidents (F).
- BEAB** British Electrotechnical Approvals Board.
- beaching** Pulling marine aircraft up sloping beach, out of water to position above high tide.
- beaching gear** Wheels or complete chassis designed to be attached to marine aircraft in water to facilitate beaching and handling on land.
- beacon** 1 System of visual lights marking fixed feature on ground (see *aeronautical light*).  
2 Radio navaid (see *fan marker*, *homing beacon*, *NDB*, *LFM*, *marker beacon*, *Z marker*).  
3 Radar transceiver which automatically interrogates airborne transponders (see *radar beacon*, *ATCRBS*).  
4 Portable radio transmitter, with or without radar reflector or signature enhancement, for assisting location of object on ground (see *crash locator beacon*, *personnel locator beacon*).
- beacon buoy** Self-contained radio beacon carried in emergency kit. Floats on water.
- beacon characteristic** Repeated time-variant code of some visual light beacons, esp. aerodrome beacons emitting Morse letters identifying airfield.
- beacon delay** Time elapsed between receipt of signal by beacon of transponder type (eg, in DME) and its response.
- beacon identification light** Visual light, emitting characteristic signal, placed near visual light beacon (pre-1950) to identify it.
- beacon skipping** Fault condition, due to technical or natural causes, in which interrogator beacon fails to receive full transponder pulse train.
- beacon stealing** Interference by one radar resulting in loss of tracking of aerial target by another.
- beacon tracking** Tracking of aerial target by radar beacon, esp. with assistance from transponder carried by target.
- bead** 1 Corrugation or other linear discontinuity rolled or pressed into sheet to stiffen it.  
2 Thickened edge to pneumatic tyre shaped to mate with wheel rim and usually containing steel or other filament reinforcement.  
3 Unwanted blob of weld metal.
- braided** See *bead* 1
- beading** Rolling or pressing sheet to incorporate beads.
- beadseat** Profiled seating on wheel for bead (2), hence \* life, on expiry of which wheel must be reprofiled.
- bead sight** Ring and bead sight.
- Be/Al** Beryllium-aluminium.
- beam** 1 Structural member, long in relation to height and width and supported at either or both ends, designed to carry shear loads and bending moments.  
2 Quasi-unidirectional flow of EM radiation.  
3 Quasi-unidirectional flow of electrons of particles, with or without focusing to point.  
4 Loosely, on either side of aircraft; specif. direction from 45° to 135° on either side measured from aircraft longitudinal axis and extending undefined angle above and below horizontal. Hence, \* guns (firing on either side), or surface object described as ‘on the port \*’ (90° on left side).
- BEAMA** British Electrical and Allied Manufacturers’ Association [London SE1 7SL] (UK).
- beam approach** Early landing systems in which final approach was directed by beam (2) from ground radio aid (see *BABS*, *ILS*, *SBA*).
- beam attack** Interception terminating at crossing angle between 45° and 135°.
- beam bracketing** Flying aircraft alternately on each side of equisignal zone of radio range or similar two-lobe beam.
- beam capture** To fly aircraft to intercept asymptotically a beam (2), esp. ILS localizer and glide path.
- beam compass** 1 Drawing instrument based on beam parallel to drawing plane having centre point and carrier for pen or other marker.  
2 Panel instrument providing radio and magnetic heading information.
- beam direction** In stress analysis, direction parallel to both plane of spar web, or other loadbearing member, and aircraft plane of symmetry.
- beam-index display** Full-colour CRT using single gun and no shadow mask, computer switching to illuminate spots of red, blue or green phosphor according to instantaneous beam position.
- beam jitter** Continuous oscillation of radar beam through small conical angle due to mechanical motion and distortion of aerial.
- beam rider** Missile or other projectile equipped with beam-rider guidance.
- beam-rider guidance** Radar guidance system in which vehicle being guided continuously senses, and corrects for, deviation from centre of coded radar or laser beam which is usually locked on to target. Accuracy degrades with distance from emitter.
- BEAMS** British Emergency Air Medical Service.
- beam slenderness ratio** Length of structural beam divided by depth (essentially, divided by transverse direction parallel to major applied load).
- beam softening** Progressive reduction in gain of ILS demand signal.
- beamwidth** Angle in degrees subtended at aerial [antenna] between limiting directions at which power [DoD states “RF power”, NATO states “emission power”] of radar beam has fallen to half that on axis. Often defined for azimuth and elevation. Symbol Θ. Determines discrimination.
- beam counting** Notional procedure of accountants whose sole interest is the balance sheet.
- beany hat** Soft brimmed hat, favoured by glider pilots.
- Bear** Electronic-warfare officer, usually in defence-suppression aircraft.
- beard radiator** piston engine radiator mounted under the engine.
- bearer** Secondary structure supporting removable part such as fuel tank or engine.
- bearing** 1 Angular direction of distant point measured in horizontal plane relative to reference direction.  
2 Angular direction of distant point measured in degrees clockwise from local meridian, or other nominated reference. Such measure must be compass, magnetic or true. True \* is same as azimuth angle.  
3 Mechanical arrangement for transmitting loads

between parts having relative motion, with minimum frictional loss of energy or mechanical wear.

**bearing chamber** Annular chamber surrounding shaft bearing, in gas-turbine engine as far as possible in cool location and incorporating low-friction sealing.

**bearing compass** Portable and hand-held, used for determining magnetic bearing of distant objects.

**bearingless rotor** Helicopter rotor in which all control is effected by flexibility in the blade attachments.

**bearing-only launch** Missile is launched along approximate known bearing of target and seeker is switched on to search sector ahead, thereafter following various commands depending on whether or not target is acquired.

**bearing plate** Simple geometric instrument for converting bearings of distant objects into GS (1) and drift.

**bearing projector** Powerful searchlight trained from landmark beacon or other point towards nearby airfield (obs.).

**bearing selector** See *omni-\**.

**bearing stress** In any mechanical bearing, with or without relative movement, load divided by projected supporting area.

**bear pads** Horizontal plates added to prevent helicopter skid sinking into snow. See *ski pad*.

**bear paws** Short skis [fixed-wing aircraft].

**beat** 1 Vibration of lower frequency resulting from mutual interaction of two differing higher frequencies. Often very noticeable in multi-engined aircraft.

2 One complete cycle of such interference.

**beat frequency** Output from oscillator fed by two different input frequencies which has frequency equal to difference between applied frequencies. (Other outputs have higher frequencies, such as sum of applied frequencies.)

**beat-frequency oscillator** Oscillator generating signals having a frequency such that, when combined with received signal, difference frequency is audible. Such \*\* is heterodyne, used in CW (1) telegraphy. Another is super-heterodyne, in which local \*\* produces intermediate frequency by mixing with received signal.

**beat reception** Heterodyne reception, as used in CW (1) telegraphy.

**beat-up** 1 Aggressive dive by aircraft to close proximity of surface object.

2 Repeated close passes in dangerous proximity to slower aircraft.

**Beaufort notation** System of letters proposed by Rear-Admiral Sir Francis Beaufort (1805) to signify weather phenomena.

**Beaufort scale** System of numbers proposed by Beaufort to signify wind strength, ranging from 0 (calm) to 12 (hurricane).

**beaver tail** Tail of fuselage or other body which has progressively flattened cross-section.

**beavertail aerial** Radar aerial emitting flattened beam having major beam width at 90° to major axis of aerial.

**BEC** Boron-epoxy composite.

**BeCA** Belgian Cockpit Association.

**BECMG** Becoming.

**becquerel** SI unit of radioactivity; Bq = 1 disintegration /s, =  $2.7 \times 10^{-11}$  Ci.

**Be/Cu** Beryllium-copper.

**bed** See *zeolite*.

**Beddown** Process of introducing major new weapon system to combat duty, esp. aircraft (eg B-2) at first operating base.

**BEEF, Beef** Base emergency engineering force (USAF).

**beefing up** Strengthening of structural parts, either by redesign for new production or by modification of hardware already made. Thus, beef (= added material), beefed (US colloq.).

**beehive** Small formation of bombers with close fighter escort (RAF pre-1945).

**beep box** Station for remote radio control of activity or vehicle, such as RPV (colloq.).

**beeper** 1 Personal radio alerting receiver.

2 RPV pilot.

3 Manual two-way command switch, eg electric trimmer or cyclic-stick thumbswitch for fuel valve control.

**BEES, Bees** Battle-force electromagnetic interface evaluation system.

**before-flight inspection** Pre-flight inspection (NATO).

**behavioural science** Study of behaviour of living organisms, especially under stress or in unusual environments.

**Beier gear** Infinitely variable mechanical transmission accomplished by stacks of convex discs intermeshing with stacks of concave discs, drive ratio being varied by bringing parallel shafts closer together, for extreme ratios, or further apart.

**bel** Unit for relative intensity of power levels, esp. in relation to sound. One bel is ratio of power to be expressed divided by reference power, expressed as logarithm to base 10. Numerically equal to 10 decibels.

**BELF** Breakeven load factor (BLF also common).

**Belgospace** Trade association for space industry companies and organisations [B-1050 Brussels] (Belgium)

**Belleville washer** Washer, usually of thin elastic metal in form of flat or convex/concave disc, which offers calibrated resistance to linear deflection of centre, perpendicular to plane of washer.

**Bell-Hiller stabilizer** Two masses on short arms attached to hub of two-blade main rotor of helicopter in plane of blades, crossing at 90°.

**Bellini-Tosi** First directional radio stations, using triangular loop antennas.

**bellows** Aneroid capsule(s).

**belly** Underside of central portion of fuselage.

**belly-in, belly landing** To make premeditated landing with landing gear retracted or part-extended; belly-in is a verb.

**below minima** Weather precludes takeoff or landing.

**BEMT** Helicopter blade-element momentum theory.

**bench** Static platform or fixture for manual work, system testing or any other function requiring firm temporary mounting (need not resemble a workshop \*).

**bench check** Mandatory manual strip, inspection, repair, assembly and recalibration of airborne functional parts, made at prescribed intervals and by station and staff certified by airworthiness authority and/or hardware manufacturer.

**bench engine** For bench testing, not cleared for flight.

**bench test** Test of complete engine or other functional system on static testbed or rig.

**bend** To damage an aircraft, especially in a crash, hence bent (UK colloq.).

**bend allowance** Additional linear distance of sheet material required to form bend of specified radius.

**bending brake** Workshop power tool for pressing metal sheet without dies.

**bending moment** Moment tending to cause bending in structural member. At any section, algebraic sum of all moments due to all forces on member about axis in plane of section through its centroid.

**bending relief** Design of aircraft to alleviate aeroelastic deflection, especially of main wing (eg, by distributing mass of fuel and engines across span).

**bending stress** Secondary stresses (eg, in wing skins and spar booms) which resist deflection due to applied bending moments.

**bends** Acute and potentially dangerous or lethal discomfort caused by release of gases within a mammalian body exposed to greatly reduced ambient pressure. Thus, a hazard of high-altitude fliers and deep-sea divers (see *aeroembolism, decompression sickness*).

**bent** 1 Feature of many gun mechanisms, engaging in cocked position with sear.

2 Signal code indicating that facility is inoperative (DoD).

3 Transverse frame capable of offering vertical support and transmitting bending moment.

4 Damaged in an accident (colloq.).

**bent beam, bent course** Radio or radar beams significantly diverted from desired rectilinear path by topographic effects, hostile ECM or other cause.

**benzene** Liquid hydrocarbon,  $C_6H_6$ , s.g. 0.899, with characteristic ring structure forming base of large number of derivatives. Used as fuel or fuel additive, as solvent in paints and varnishes, and for many other manufactures.

**benzine** Mixture of hydrocarbons of paraffin series, unrelated to benzene. Volatile cleaning fluid and solvent.

**benzol** Benzene  $C_6H_6$ .

**BEP** Back-end processor; MS adds management system.

**BER** 1 Beyond economic repair.

2 Bit error rate, also b.e.r.

**BERD** Business enterprise research and development.

**Berline** Single-engined transport aircraft (F).

**Bermuda triangle** Region at base of stiffener bonded to composite sheet subject to high stress.

**Bernoulli's theorem** Statement of conservation of energy in fluid flow. Basis for major part of classical aerodynamics, and can be expressed in several ways. One form states an incompressible, inviscid fluid in steady motion must always and at all points have uniform total energy per unit mass, this energy being made up of kinetic energy, potential energy and (in compressible fluid) pressure energy. Making assumptions regarding proportionality between pressure and density, and ignoring gravity and frictional effects, it follows that in any small parcel of fluid or along a streamline, sum of static and dynamic pressure is constant, expressed as  $p + \frac{1}{2} \rho V^2 = k$ . Thus, if fluid flows subsonically through a venturi, pressure is lowest at throat; likewise, pressure is reduced in accelerated flow across a wing.

**BERP, Berp** British experimental helicopter main rotor programme.

**Berp rotor** RAE 9648 profile inboard, 9645 outboard, broad tip 9634.

**BERR** Business enterprise and regulatory reform.

**Berry Amendment** Prohibits use of appropriated funds to purchase items [e.g. speciality metals] unless they are certified as US products.

**beryllium** Hard, light, strong and corrosion-resistant white metal, m.p. about  $1,278^\circ\text{C}$ , density about 1.8. Expensive, but increasingly used for aerospace structures, especially heat sinks and shields.

**BES** Best estimate.

**b.e.s.** Best-endurance speed.

**bespoke software** Designed for a specific application.

**best-climb speed** Usually  $V_{IMD}$ .

**best-economy altitude** Narrow band of altitudes where specific range is maximum.

**best-endurance speed** Always  $V_{IMD}$ .

**best-fit parabola** Profile of practical parabolic aerial capable of being repeatedly manufactured by chosen method. In many cases \*\*\* is made up of numerous flat elements.

**best-range speed**  $V_{IMR}$ ; speed at which tangent to curve of speed/drag is a minimum; hence where speed/drag is a maximum and fuel consumption/speed a minimum.

**BET** Best estimate of trajectory.

**BETA, Beta** Battlefield exploitation and target acquisition.

**beta** 1 Sideslip ( $\beta$ ).

2 Angle of sideslip.

**beta-dot,  $\dot{\beta}$**  First-order derivative used to model delay in rate of change of sidewash at vertical tail.

**beta-1,  $\beta_1$**  Yaw pointing angle (zero sideslip).

**beta-2,  $\beta_2$**  Lateral translation (constant yaw angle).

**Bet-AB** Rocket-accelerated free-fall deep-penetration bomb (USSR, R).

**beta blackout** Communications interference due to beta radiation.

**beta control** Control mode for normally automatic propeller in which pilot exercises direct command of pitch for braking and ground manoeuvring. Also called beta mode.

**beta lines,  $\beta$ -lines** Arbitrary lines drawn roughly parallel to compressor surge line to assist off-design performance calculations.

**beta mode** See Beta control.

**beta particle** Elementary particle emitted from nucleus during radioactive decay, having unit electrical charge and mass  $1/1,837$ th that of proton. With positive charge, called positron; with negative, electron. Biologically dangerous but stopped by metal foil.

**beta strips** Low-intensity strip lights on skin of military aircraft to assist close formation flying at night.

**beta target** The trapezoid on a PFD.

**beta vane** Transducer measuring yaw (sideslip) angle.

**BETT, Bett** Bolt extrusion thrust-terminator.

**bev** Billion electron volts. No longer proper term;  $10^9\text{ev}$  is correctly 1 GeV.

**bevel gear** Gearwheel having teeth whose straight-line elements lie along conical surface (pitch cone); thus, such gears transmit drive between shafts whose axes intersect.

**bevelled control** Flight-control surface whose chordwise taper in thickness is increased close to the trailing edge.

**BEVS** Boom [for air-refuelling] enhanced visual system.

**BEW** Bare engine weight.

**BEXR** Beacon extractor and recorder.

**bezel** Sloping part-conical ring that retains glass of

watch or instrument; esp. rotatable outer ring of pilot's magnetic compass.

**BF** 1 Block fuel.

- 2 Blind-flying; thus \* instrument, \* panel.
- 3 Base Flight (USN)
- 4 Below freezing.
- 5 Bomber/fighter category (USN, 1934–37).
- 6 Blue Force [many suffixes].

**BFA** 1 Balloon Federation of America.

- 2 Battlefield Airlifter (RAAF).

**BFAANN** British Federation Against Aircraft Noise Nuisance.

**BFCU** Barometric fuel control unit.

**BFDAS** Basic flight-data acquisition system.

**BFDK** Before dark.

**BFE** 1 Buyer-furnished equipment [MS adds management system].

- 2 Basic flight envelope.

**BFG** British Forces in Germany.

**BFL** 1 Basic field length.

- 2 *Balanced field length*.

**BFM** Basic fighting/fighter/flight manoeuvring (or manœuvres).

**BNF** Beam-forming network [satcoms].

**BFO** 1 Beat-frequency oscillation, or oscillator.

- 2 Battlefield obscuration.
- 3 Bits falling off.

**BFOM** Basic flight-operations management.

**BFoV, BFOV** Binocular field of view.

**BFP** 1 Blind-flying panel.

- 2 British Flying Permit (ultralights).
- 3 Best-fit parabola.
- 4 Blown fuse-plug (tyre).

**BFR** 1 Biennial flight review, for renewal of pilot licence (FAA).

- 2 Before.

**BFRP** Boron-fibre reinforced plastics.

**BFS** 1 Bundesanstalt für Flugsicherung (= ATC, G).

- 2 Back-up flight system.

**BFT** 1 Basic fitness test[ing].

- 2 Blue Force Tracking; I adds Initiatives.

**BFTS** 1 Basic flying training school.

- 2 British Flying Training School (US 1941–44); A adds Association (from 1948, office Coulson, Surrey).
- 3 Bomber/Fighter Training System (USAF).

**BFU** Accident-investigation office (G).

**BG** 1 Bomb, or Bombardment, Group (USAAC, USAAF, USAF).

- 2 Bomb glider, aircraft category (USAAF 1943–46).
- 3 See \*lighting.

**BGA** The British Gliding Association [1929–; office, Leicester LE1 4SE] (UK).

**BGAN** Broadband global area network.

**BGFOO** British Guild of Flight Operations Officers.

**BGI** 1 Basic ground instructor.

- 2 Bus grant inhibit.

**BG lighting** Blue/green.

**BGM** Designation code; multiple launch environment surface-attack missile, = cruise missile.

**BGN** Begin, begun.

**BGP** Border gateway protocol.

**BGR** Best glide-ratio.

**BGS** 1 Blasting grit, soft, such as Carboblast.

- 2 Bombing and Gunnery School.

**BGW** Basic gross weight; not normally defined.

**B/H** Curves of magnetic flux density plotted against magnetising force.

**BHA** 1 Brazilian Helicopter Association.

- 2 Bird-hit area, dangerous during migrations.

**BHAB** British Helicopter Advisory Board [office Fairoaks Airport, GU24 8HXJ] (UK).

**BHGA** British Hang Gliding Association, now BHPA.

**BHGMF** British Hang Glider Manufacturers Federation.

**BHI** Bureau Hydrographique International.

**BHN** Brinell hardness number.

**BHO** Black-hole ocarina (tactical IR suppressor).

**b.h.p., bhp** Brake horsepower.

**BHPA** British Hang gliding and Paragliding Association [formed by merger 1992, office Leicester LE4 5PJ] (UK).

**BHRA** British Hydromechanics Research Association.

**BHS** Baggage-handling system.

**BI** 1 Burn-in.

- 2 Basse intensité.

**BIA** Bomb-impact assessment; M adds modification.

**BIAM** Beijing Institute of Aeronautical Materials.

**BIAS** Battlefield-illumination airborne system.

**bias** Voltage applied between thermionic valve (vacuum tube) cathode and control grid.

**biased fabric** Multi-ply fabric with one or more plies so cut that warp threads lie at angle (in general, near 45°) to length.

**bias error** Any error having constant magnitude and sign.

**bias force** Output of accelerometer when true acceleration is zero.

**bias ply** Tyre [tire] construction with alternate layers of rubber-coated cord extending under the bead at alternate angles; tread usually circumferentially ribbed.

**bias temperature effect** Rate of change of bias force, usually in g °C<sup>-1</sup>.

**BIATA** British Independent Air Transport Association; formed 1946 as BACA.

**BIBA** British Insurance Brokers Association.

**Bigby coupling** Drive for transmitting shaft rotation without vibration, using multiple flexural cantilevers linking adjacent discs.

**Bicep** Battlefield integrated-concept emulation program.

**Bices, BICES** Battlefield information collection and exploitation systems.

**biconvex** Presenting convex surface on both sides. Such wings usually have profile formed from two circular arcs, not always of same radius, intersecting at sharp leading and trailing edges. Inefficient in subsonic flight.

**BICP** Back-up integrated control panel [see BUIC].

**bicycle** Form of landing gear having two main legs in tandem on aircraft centreline.

**BID** 1 Baggage information display.

- 2 Blast-initiation detector [establishes precise location of warhead detonation].

**bid** Formal request to receive fuel from a tanker (RAF).

**bidding** 1 Phase in procurement process in which rival manufacturers submit detailed proposals with prices.

- 2 Competitive procedure within air carrier's flying staff for licence endorsement on new type of aircraft.

**BIDE** Blow-in door ejector (engine nozzle).

## **bidirectional cable**

**bidirectional cable** Runway emergency arrester cable which can stop aircraft from either direction.

**BIDS, Bids** Battlefield [or baggage] information distribution [or display] system.

**BIFA** British International Freight Association [office Feltham TW13 7EP] (UK).

**BIFAP** Bourse Internationale de Fret Aérien de Paris.

**BiFET** Bistable field-effect transistor (gate).

**BIFF, Biff** 1 Battlefield identification friend or foe.

2 British Industrial Fasteners Federation.

**bifilar** Suspension of mass by two well separated filaments; mass normally swings in plane of filaments.

**BiFOV** Binocular field of view.

**bi-fuel** 1 Bipropellant.

2 More rarely, heat engine which can run on either of two fuels but not both together.

**bifurcated** Rod, tube or other object of slender form which is part-divided into halves; fork-ended.

**bifurcation** 1 Point at which duct [eg jetpipe] splits into two, usually left/right.

2 Analysis of steady states, a \* occurring when stability changes from one state to another as an input [eg, control-surface angle] is altered.

**Big BLU** Proposed large [30,000-lb, 13.6-tonne] deep-penetration bomb (USAF).

**big bone** Very large indivisible part of airframe structure, such as a spar or monolithic bulkhead.

**Big Chop, the** Killed (RAF, colloq.).

**Big Ear** Battle group exploitation airborne radio.

**Big F** Commander (Flying) on carrier (RN).

**bigraph** Two-letter code for airfield name painted on local buildings, eg gasholders.

**Bigs** Bilingual ground station (Acars).

**Bigsworth** Chartboard, transparent overlay, Douglas protractor, parallel rules, all integrated (obs).

**big-ticket item** Subject of a high-value contract (US).

**Bihrlé** See *CAP* (7).

**bilateral** Agreement between two parties.

**bilateration** Position determination by use of AF signal beamed to vehicle, which re-radiates it to original ground station and to second at surveyed location giving known delay path. Can be used for control of multiple vehicles beyond LOS.

**Bill, BILL** Beacon illuminator, or illuminating, laser (ABL).

**billet** Rough raw material metal form, usually square or rectangular-section bar, made by forging or rolling ingot or bloom.

**bill of material** List of raw material and/or parts needed to make something.

**billow** Inflation of each half of Rogallo wing.

**BIM** 1 Ballistic intercept missile.

2 Blade inspection method (helicopters).

3 Blade integrity monitor.

4 British Institute of Management.

**bimetallic joint** Joint between dissimilar metals.

**bimetallic strip** Strip made of sandwich of metals, usually two metals chosen for contrasting coefficients of thermal expansion. As halves are bonded together any change in temperature will tend to curve the strip. Principle of bimetallic switch and temperature gauge.

**bi-mono aircraft** Monoplane having detachable second wing for operation as biplane.

**bin** 1 Electronic three-dimensional block of airspace.

## **biological decay**

All airspace in range of SSR or other surveillance radar is subdivided into \*, size of which is much greater than expected dimensions of aircraft. Thus presence of an aircraft cannot load more than one (transiently two)\* at a time.

2 Upright cylindrical receptacle, esp. some early gun turrets.

**BINA** British Isles and North Atlantic.

**binary actuator** Patented technique in which fluid is controlled by valve driven by spring-loaded armature with either of two positions within magnetic field.

**binary code** Binary notation.

**binary munition** One whose filling is composed of two components, mixed immediately before release or launch.

**binary notation** System of counting to base of 2, instead of common base of 10. Thus 43 (sum of  $2^5$ ,  $2^3$ ,  $2^1$  and  $2^0$ ) is written 101011. All binary numbers are expressed in terms of two digits, 0 and 1. Thus digital computer can function with bistable elements, distinction between a 0 or 1 being made by switch being on or off, or magnetic core element being magnetised or not.

**binary phase modulation** Radar pulse-compression technique in which the phases of certain echo segments are reversed.

**binary switch** Bistable switch.

**binaural** Listening with both ears.

**bind** Noun, boring duty; verb, to complain incessantly (RAF, traditional).

**BINDT** British Institute of Non-Destructive Testing (office, Northampton).

**bingo** 1 As an instruction, radioed command to aircrew (usually military) to proceed to agreed alternative base.

2 As information, radioed call from aircrew (usually military) meaning that fuel state is below a certain critical level (usually that necessary to return to base). Thus calls “\*fuel” or “Below\*”. See next entries.

3 In some single-seat aircraft, alarm [usually bell] in headset at \* fuel point.

**Bingo 1** External tanks are empty.

**Bingo 2** At start of what must be last practice engagement.

**Bingo 3** Must break off combat area and recover to base, but with margins not present at Chicken.

**binor** Binary optimum ranging. Binary code modified for range measurement and minimising receiver acquisition time.

**BINOVC, BinOvc** Break[s] in overcast.

**BIO** Biotechnology Industry Organization (US).

**bioastronautics** Study of effects of space travel on life forms.

**biochemical engineering** Technology of biochemistry.

**biochemistry** Chemistry of life forms.

**biodegradable** Of waste material, capable of being broken down and assimilated by soils and other natural environments.

**biodynamics** Study of effects of motion, esp. accelerations, on life forms.

**BIOG** British Industry Offset Group [DMA, SBAC] (UK).

**biological agent** Micro-organism causing damage to living or inanimate material and disseminated as a weapon.

**biological decay** Long-term degradation of material due to biological agents.

**biological warfare** Warfare involving use as weapons of biological agents, toxic biological products and plant-growth regulators.

**biomedical monitoring** Strictly ‘biomedical’ is tautological, but term has come to denote inflight monitoring of heartbeat, respiration and sometimes other variables, esp. of astronauts in space.

**biometric recognition** Identification of individual humans by their unique features, eg eye iris, finger/hand-print.

**biometry** Geometric measurement of life forms, esp. humans.

**bionics** Study of manufactured systems, esp. those involving electronics, that function in ways intended to resemble living organisms.

**bio-pak** Container for housing and monitoring life forms, usually plants, insects and small animals, in space payload. May be recoverable.

**biophage** Literally, destructive of life : CBW defence payload.

**BIOS** British Intelligence Objectives Sub-committee (1944 – 46).

**biosatellite** Artificial satellite carrying life forms for experimental purposes.

**biosensor** Sensor for measuring variables in behaviour of living systems.

**biosphere** Location of most terrestrial life: oceans, surface and near-surface of land, and lower atmosphere.

**bioterrorism** Loosely, germ warfare; hence bioweapons.

**Biot-Savart** Law for computing induced velocities in a vortex filament.

**biowaste** All waste products of living organisms, esp. humans in spacecraft.

**BIP** 1 Borescope inspection port.

2 Baggage improvement program (IATA).

**biphase coding** Standard coding for both the 1553B and A629 [which see] data buses, also known as Manchester coding. In this protocol a 1 is signified by a change of signal from positive to negative during the bit period, and a 0 [zero] is signalled by a change from negative to positive.

**biplane** Two-seat (US, F usage).

**biplane** Aeroplane or glider having two sets of wings substantially superimposed (see *tandem-wing*).

**biplane interference** Aerodynamic interference between upper and lower wings of biplane or multiplane.

**biplane propeller** Propeller having pairs of blades rotating together in close proximity, resembling biplane wings.

**BIPM** Bureau International des Poids et Mesures.

**bipropellant** 1 As adjective, rocket which consumes two propellants – solid, liquid or gaseous – normally kept separate until introduction to reaction process. In most common meaning, propellants are liquid fuel and liquid oxidiser, stored in separate tanks.

2 As noun, rocket propellant comprising two components, typically fuel and oxidiser.

**BIR** Biennial infrastructure review.

**BIRD** Banque Internationale pour la Reconstruction et le Développement.

**bird** Any flight vehicle, esp. aeroplane, RPV, missile or ballistic rocket (colloq.).

**bird gun** Gun, usually powered by compressed air, for

firing real or simulated standard birds at aircraft test specimens to demonstrate design compliance.

**BIRDiE** Battery integration and radar display equipment (USA).

**birdie** Spurious radar echo, usually from PRF harmonics.

**bird impact** Birdstrike; design case for all aerodynes intended for military or passenger carrying use (see *standard bird*).

**bird ingestion** Swallowing of one or more birds by gas-turbine or other air-breathing jet engine, with or without subsequent damage or malfunction (see *ingestion certification*).

**birdnesting** Tendency of chaff to stick together in tight bundles, hence forming **bird(s) nests**.

**bird strike, birdstrike** Collision between aerodyne and natural bird resulting in significant damage to both. Certification requirements for large turbofan engines include the ability to continue to give useful thrust after ingesting a single large bird [in 2002, one weighing 3.629 kg/8.0 lb, but with more severe demands being discussed] or various numbers of smaller birds, whilst running at maximum takeoff power.

**Birmabright** Trade name of many British alloys of Al, Mg and Mn.

**BIRMO** British IR Manufacturers' Organisation.

**birotative** Having two components on the same axis rotating in opposite directions, or in the same direction at different speeds.

**BIS** 1 British Interplanetary Society [1933–; office, London SW8 1SZ] (UK).

2 Board of Inspection and Survey (US Navy).

3 Burn-in screening.

4 Boundary intermediate system.

5 Biometric identification system.

**bis** Second version of product, equivalent to Mk 2 (F.I.R.).

**BISA** Battlefield Information System Application (GBAD, UK).

**Bise** Cold, dry wind in S France.

**bi-signal zone** Portions of radio-range beam on either side of centreline where either A or N signal can be heard against monotone on-course background.

**BISMS** BIS(4) management system.

**BISPA, Bispa** British Iron and Steel Producers Association.

**BISS** Base and installation security system.

**BIST, Bist** Built-in self-test.

**bistable** Capable of remaining indefinitely in either of two states: thus, bistable switch is stable in either on or off position (see *flip-flop*).

**bistatic radar** Radar whose transmitter and receiver are at different locations when seen from the target.

**BIT** 1 Built-in test.

2 Bureau International du Travail (ILO).

**bit** Unit of data or information in all digital (binary) systems, comprising single character (0 or 1) in binary number. Thus, capacity in bits of memory is  $\log_2$  of number of possible states of device. From ‘binary digit’.

**Bitching Betty** UAV voice system which reminds operator of fuel state and other important factors.

**BITD** Basic- instruments training device.

**BITE, bite** Built-in test equipment.

**BIT/Fi** Built-in test and fault isolation.

## bit rate

**bit rate** Theoretical or actual speed at which information transmission or processing system can handle data. Measured in bits, kbits, Mbits or Gbits per second.

**bitube** Single automatic weapon with two barrels.

**BIU** Bus interface unit.

**biz** Business (colloq.).

**bizav** Business aviation.

**bizjet** Business [executive] jet aircraft.

**b<sub>j</sub>** Span of CC blowing slit.

**BJA** Baseline jamming assets.

**BJSID** British Joint Service Designation.

**BJSIM** British Joint Services Mission.

**BK, bk** Break [in transmission].

**BKEP** Boosted kinetic-energy penetrator.

**BKN** Broken [clouds].

**BKSA** British Kite Soaring Association.

**BL** 1 Buttock line.

2 Base-line (hyperbolic nav).

3 Bulk loader.

4 Between layers.

5 Blowing [DU adds dust, SA sand, SN snow].

**BLA** Pilotless aerial vehicle (R).

**blabbermouth** Foam monitor.

**BLAC** British Light Aviation Centre (50a Cambridge St. London SW1V 4QQ).

**Black** 1 SAO security classification.

2 Code, runway is unusable.

**black** 1 Big error of judgement or faux pas (RAF, as in "he put up a \*\*").

2 With all externally visible lighting switched off [interceptor squadrons] (USAF).

**black aluminium** Carbon-fibre composite (colloq.).

**black ball** 1 Traditional form of artificial horizon based on black hemisphere or bi-coloured sphere.

2 Suspended on mast in signals area: TO and landing directions may differ.

**black body** Theoretical material or surface which reflects no radiation, absorbs all and emits at maximum rate per unit area at every wavelength for any given temperature. In some cases wavelength is restricted to band from near-IR through visible to far-UV.

**black-body radiation** EM spectrum emitted by black body, theoretical maximum of all wavelengths possible for any given body temperature.

**black box** 1 Avionic equipment or electronic controller for hardware device or system, removable as single package. Box colour is immaterial (colloq.).

2 In particular, flight-data or accident recorder, usually Day-Glo scarlet or orange.

**blacker-than-black** In TV system, portion of video signal containing blanking and synchronizing voltages, which are below black level (with positive modulation) and prevent electrons from reaching screen.

**black hole** 1 IRCM design giving engine efflux (esp. of helicopter) or other heat source greatest protection.

2 Approach to land in near-absence of external visual cues.

**black hot** TV or IR display mode giving negative picture (warm ship looks black against white sea).

**blackjack** Hand tool for manually forming sheet metal; has form of flexible (often leather) quasi-tubular bag filled with lead shot too small to cause local indentations.

**Black Label** Hardware used in first-build or prototype

## bladed spinner

that is not only physically representative but is also cleared for flight.

**black level** In TV system, limit of video (picture) signal black peaks, below which signal voltages cannot make electrons reach screen.

**black men** Ground crew [Schwarze Männer] (Luftwaffe).

**black metal** See *black aluminium*.

**blackout** 1 In war, suppression of all visible lighting that could convey information to enemy aircraft.

2 Fadeout of radio communications, including telemetry, as result of ionospheric disturbances or to sheath of ionised plasma surrounding spacecraft re-entering atmosphere.

3 Fadeout of radio communications caused by disruption of ionosphere by nuclear explosions.

4 Dulling of senses and seemingly blackish loss of vision in humans subjected to sustained high positive acceleration. In author's experience, more a dark red, not very unlike red-out.

**blackout block** Block of consecutive serial numbers deliberately left unused.

**black picture** See *black hot*.

**bladder tank** Fluid tank made of flexible material, especially one not forming part of the airframe.

**Blade** Bristol Laboratory for Advanced Dynamics Engineering.

**blade** 1 Radial aerofoil designed to rotate about an axis, as in propeller, lifting rotor, axial compressor rotor or axial turbine. Also see stator \*.

2 Rigid array of solar cells, especially one having length much greater than width.

3 Operative element of windscreens wiper.

**blade activity factor** Non-dimensional formula for expressing ability of blade (1) to transmit power; integral between 0.1 and 0.5 of diameter of chord and cube of radius with respect to radius. Loosely, low aspect ratio means high activity factor.

**blade aerial** Radio aerial, eg for VHF communications, having form of vertical blade, either rectilinear, tapered or backswept.

**blade angle** 1 In propeller or fan blade, angle (usually acute) between chord at chosen station and plane of rotation.

2 In helicopter lifting rotor, acute angle between no-lift direction and plane perpendicular to axis of rotation.

**blade angle of attack** Angle between incident airflow and blade (1) tangent to mean chord at leading edge at chosen station.

**blade articulation** Attachment to hub of helicopter lifting rotor blades by hinges in flapping and/or drag axes.

**blade back** Surface of blade (1) corresponding to upper surface of wing.

**blade beam** Hand tool in form of beam incorporating padded aperture fitting propeller or rotor blade; for adjusting or checking blade angle.

**blade centre of pressure** Point through which resultant of all aerodynamic forces on blade (1) acts.

**blade damper** Hydraulic, spring or other device for restraining motion of helicopter lifting rotor blade about drag (lag) hinge.

**bladed spinner** Zero stage of part-height blades added to spinner ahead of fan of turbofan; proposed by Rolls-

## blade element

BlastGard

Royce, \* is unshrouded and not separated from fan by stators, otherwise similar in principle to TF39 of 1966.

**blade element** Infinitely thin slice (ie having no spanwise magnitude) through blade (1) in plane parallel to axis of rotation and perpendicular to line joining centroid of slice to that axis. Thus, blade is made up of infinity of such elements from root to tip, usually all having different section profile and blade angle. \*momentum theory deals with the rotor of a hovering helicopter.

**blade face** Surface of blade (1) corresponding to underside of a wing. With propellers, called thrust face.

**blade inspection method** Spars of helicopter main-rotor blades are pressurized, loss of pressure warning of crack (Sikorsky).

**blade loading** Of helicopter or autogyro, gross weight divided by total area of all lifting blades (not disc area).

**blade loading coefficient** Helicopter rotor thrust coefficient divided by solidity,  $C_r\sigma$ .

**blade passing noise** Component of internally generated noise of turbomachinery, caused by interaction between rotating blades and wakes from inlet guide vanes and stationary blades. Generates distinct tones at blade-passing frequencies, which in turn are product of number of blades per row and rotational speed.

**blade root** 1 Loosely, inner end of blade (1).

2 Where applicable, extreme inboard end of blade incorporating means of attachment (see *blade shank*).

**Blades** Battlespace laser detection system (AEFB/AFRL).

**blades!** Verbal call to pull piston engine through specified number of propeller blades before start.

**blade section** Shape of blade element.

**blade shank** Where applicable, portion of blade of non-aerofoil form extending from root to inboard end of effective aerofoil section. Unlike root, \* of propeller is outside spinner.

**blade span axis** 1 Axis, defined by geometry of root pitch-change bearings, about which blade is feathered.

2 Axis through centroids of sections at root and tip.

**blade station** Radial location of blade element, expressed as decimal fraction of tip radius (rarely, as linear distance from axis of rotation, from root or from some other reference).

**blade sweep** Deviation of locus of centroids of all elements of blade from radial axis tangential to that locus at centre. Was marked in early aircraft propellers, usually towards trailing edge (ie, trailing sweep); leading sweep, in which tips would be azimuthally ahead of hub, is rare.

**blade tilt** Deviation of locus of centroids of all elements of blade from plane of rotation. Again a feature of early aircraft propellers, more common form being backward tilt, visible in side view as propeller flat at back and tapered from boss to tip in front.

**blade tip grinding** Precise grinding of the tips of an assembled axial compressor rotor. In some engines the final trim is by allowing the tips to rub inside the casing.

**blade twist** 1 Unwanted variation in pitch from root to tip caused by aerodynamic loads.

2 Natural twist which reduces blade angle from root to tip.

**blade/vortex interaction** Between each helicopter main-rotor blade and the vortex created by its predecessor, a principal cause of slap.

**blade width ratio** Ratio of mean chord to diameter.

**BLAGF** British Light Aviation and Gliding Foundation (London W8).

**BLAM** Barrel-launched adaptive munition(s).

**blank** 1 Workpiece sheared, cut, routed or punched from flat sheet before further shaping.

2 Action of cutting part from flat sheet, esp. by using blanking press and shaped die.

3 Round of gun ammunition without projectile.

4 All-weather cover tailored to engine inlet or other aperture, forming part of AGE for each aircraft type.

**blanket** 1 Layer of thermally insulating material tailored to protect particular item, typically refractory fibre housed in thin dimpled stainless steel. Term is not normally used for noise insulation.

2 Layer of heating material supplied with electrical or other energy.

**blanket cover** Fabric cover for aircraft machine-sewn into large sheet, draped over structure, pulled to shape and sewn by hand.

**blanketing** 1 Suppression, distortion or other gross interference of wanted radio signal by unwanted one.

2 In long-range radio communication, prevention of reflection from F layers by ionisation of E layer.

**blanketing frequency** Signal frequency below which radio signals are blanketed (2).

**blank-gore parachute** Parachute having one gore left blank, without fabric.

**blanking** 1 Using press and blanking die to cut blanks (1).

2 In electron tube or CRT, including TV picture tubes, suppression of picture signal on fly-back to make return trace invisible.

**blanking cap** Removable cap fitted to seal open ends of unused pipe connections or other apertures in fluid system.

**blanking plate** Removable plate fitted to seal aperture in sheet, such as unused place for instrument in panel.

**blanking signal** Regular pulsed signal which effects blanking (2) and combines with picture signal to form blanked picture signal. Sometimes called blanking pulse.

**blanks** See *blank* 4, *blanking plate*.

**Blasius flow** Theoretically perfect laminar flow.

**blast** 1 Loosely, mechanical effects caused by blast wave, high-velocity jet or other very rapidly moving fluid.

2 Rapidly expanding products from explosion and subsequent blast wave(s) transmitted through atmosphere.

**blast area** Region around launch pad which, before final countdown of large vehicle, is cleared of unnecessary personnel and objects.

**blast cooling** In rotating electrical machines and other devices, removal of waste heat by airflow supplied under pressure.

**blast deflector** Structure on launch pad or captive test stand to turn rocket or jet engine efflux away from ground with minimal erosion and disturbance.

**blast fence** Large barrier constructed of multiple horizontal strips of curved section, concave side upwards, which diverts efflux behind parked jet aircraft upwards and thus reduces annoyance and danger at airfields.

**blast/fragmentation** Warhead, common on AAMs and SAMs, whose effect combines blast of HE charge and penetration of fragments of rod(s) or casing.

**BlastGard** Proprietary honeycomb materials in which

## blast gate

compartments are part-filled with various foams or expanding materials which attenuate blast and serve as a flame barrier.

**blast gate** See *waste gate*.

**blast line** Chosen radial line from ground zero along which effects of nuclear explosion (esp. blast effects) are measured.

**blast-off** Launch of rocket or air-breathing jet vehicle; usually, from ground or other planetary surface (colloq.).

**blast pad** Area immediately to rear of runway threshold across which jet blast is most severe. Constructed to surface standards higher than overrun or stopway beyond.

**blast pen** Small pen, enclosed by strong embankments on three sides, but open above, for ground running jet or rocket aircraft or firing missile engines.

**blast pipe** see *blast tube*.

**blast tube** Refractory tube linking rocket combustion chamber or propellant charge with nozzle, where these have to be axially separated.

**blast valve** Valve in air-conditioning and other systems of hardened facilities which, upon sensing blast wave, swiftly shuts to protect against nuclear contamination.

**blast wave** Shock wave (N-wave) of large amplitude and followed by significant (4 ata; 40 kPa or more) overpressure. Travels at or above velocity of sound and causes severe mechanical damage. Centred on explosions (local \*\* caused by lightning); attenuation and effective radius depend on third or fourth power of released energy.

**blast-wave accelerator** Concept for launching small payloads into space by accelerating them along an evacuated tube incorporating a long series of circumferential shaped charges pointed towards the muzzle.

**Blaugas** German gas used for airship lift and fuel; mixture of ethylene, methylene, propylene, butylene, ethane and hydrogen; literal meaning, blue gas.

**BLC** Boundary-layer control, especially gross control of airflow around lifting wing to increase circulation and prevent flow breakaway.

**BLD** 1 DSB, double sideband.

2 Berufsverband Luftfahrt-Personal in Deutschland eV (G).

**BLDG, Bldg** Building (cloud).

**BLE** Boundary-layer energiser.

**bleed** 1 To allow quantity of fluid to escape from closed system.

2 To extract proportion (usually small) of fluid from continuously flowing supply; eg compressed air from gas-turbine engine(s).

3 To allow fluid to escape from closed system until excess pressure has fallen to lower level or equalised with surroundings.

4 To remove unwanted fluid contaminating system filled with other fluid, eg \* air from hydraulic brakes.

5 To allow speed or height of aircraft to decay to desired lower level, thus \*-off speed before lowering flaps.

6 To allow electronic signal or electrical voltage to decay to zero (eg, \* glide path during flare in automatic landing).

**bleed air** Compressed air bled from main engines of gas-turbine aircraft. Uses can include cabin and seal pressurization, anti-icing and environmental control.

**bleed and burn** Vertical lift system in which fuel is burned in a vertical combustion chamber fed with air from main

## blind nut

engine (extra airflow may or may not be induced by ejector effect).

**bleeder resistor** Resistor permanently coupled across power supply to allow filter capacitor charge to leak away after supply is disconnected (see *bleed-off relay*).

**bleeder screw** Small screw in tapped hole through highest point of hydraulic or other liquid system to facilitate bleeding (4) air or vapour.

**bleeding** 1 Expulsion of every trace of air or other gas from an enclosed liquid system.

2 Extraction of bleed air.

**bleeding edge** Edge of map or chart where cartographic detail extends to edge of paper.

**bleed-off relay** In laser, discharges capacitors when switched off, to render accidental firing impossible.

**blended** Aerodynamic (arguably, also hydrodynamic) shape in which major elements merge with no evident line of demarcation. Thus, aeroplane having \* wing/body (see next two entries).

**blended-hull seaplane** Marine aeroplane, generally called in English flying boat, in which planing bottom is blended into fuselage. Involves dispensing with chine, sacrificing hydrodynamic behaviour in order to reduce aerodynamic drag.

**blended wing/body** Aircraft in which wing/fuselage intersections are eliminated. Today important for reasons of *stealth*.

**blended point** In aerodynamic shapes having rigid and flexible surfaces mutually attached (eg Raevam, variable inlet ducts, flexible Krügers), point in section profile at which flexibility is assumed to start.

**BLEU** Blind Landing Experimental Unit (Bedford, UK).

**BLF** Breakeven load factor.

**BLG** 1 Laser-guided bomb (F).

2 Body (-mounted) landing gear.

**BLI** Belgische Luchtvaart Info.

**blimp** Non-rigid airship (from 'Dirigible Type B, limp', colloq. until made official USN term in 1939).

**blind** 1 Without direct human vision.

2 Without external visibility, e.g. in dense cloud.

3 Of radar, incapable of giving clear indication of target (eg see \* speed).

**blind bombing** Dropping of free-fall ordnance on surface target unseen by aircrew.

**blind bombing zone** Restricted area (strictly, volume) where attacking aircraft know they will encounter no friendly land, naval or air forces.

**blind fastener** See *blind rivet* [though need not have rivet-like form].

**blindfire** Weapon system able to operate without visual acquisition of target.

**blind flying** Manual flight without external visual cues.

**blind-flying panel** Formerly, in British aircraft, separate panel carrying six primary flight instruments: ASI, horizon, ROC (today VSI), altimeter, DG and TB (turn/slip).

**blind landing** 1 Landing of manned aircraft, esp. aerodyne, with crew deprived of all external visual cues.

2 Landing of RPV unseen by remote pilot except on TV or other synthetic display.

**blind nut** Nut inserted or attached on far side of sheet or other member to which there is no access except through bolt hole.

**blind rivet****blocking up**

**blind rivet** Rivet inserted and closed with no access to far side of joint. Apart from explosive and rare magnetic-pulse types, invariably tubular.

**blind speed effect** Characteristic of Doppler MTI systems used with radars having fixed PRF which makes them blind to targets whose Doppler frequencies are multiples of PRF (see *staggered PRF*).

**blind spot** 1 Not reached by radio or radar, for whatever reason.

2 Region of airfield hidden from tower.

**blind toss** Programmed toss without acquisition of target (eg on DR from an offset).

**blind transmission** Station called cannot talk back.

**bling** Monolithic bladed ring forming one rotor stage of a compressor or turbine [gas-turbine].

**blink** 1 Of light or other indicator, to be illuminated and extinguished, or to present black/white or other contrasting colour indication, more than 20 times per minute.

2 In aircraft at night in VFR, manually to switch off navigation lights (typically, twice in as many seconds) as acknowledgement of message.

**blinker** Light or indicator that blinks (1), eg to confirm oxygen feed. See *doll's eye*.

**Blip, blip** Background-limited IR performance.

**blip** 1 Visible indication of target on radar display. Due normally to discrete target such as aircraft or periscope of submarine; in ground mapping mode, term used only to denote strong echo from transponder.

2 Spot, spike or other indication on CRT due to signal of interest.

3 To control energy input to early aeroplane by switching ignition on and off as necessary (normally, on landing approach).

4 To operate bang/bang control manually (eg, electric trim).

**blip driver** Operator of synthetic trainer for SSR or other surveillance radar with rolling ball or other means of traversing system co-ordinates to give desired blip (1) position and movement (colloq.).

**blip/scan ratio** Also written blip: scan, an expression for probability of detection of a target by radar.

**blisk** Axial turbine rotor stage (rarely, compressor stage) in which disc [US = disk] and blades are fabricated as single piece of material.

**Bliss** Bi-level integrated system synthesis.

**blister** 1 Streamlined protuberance on aerodynamic body, usually of semicircular transverse section and often transparent to selected EM wavelengths.

2 See *blister spray*.

**blister aerial** Aerial projecting from surface of aircraft and faired by dielectric blister.

**blister hangar** Prefabricated and demountable hangar having arched roof and fabric covering.

**blister spray** Arching sheet of water thrown up and outwards above free water surface on each side of planing hull or float. Compared with ribbon spray, has lower lateral velocity, rises higher, is clear water rather than spray, and is much more damaging.

**blister spray dam** Strong strip forming near-vertical wall projecting downwards along forebody chine of hull or float.

**blivet** Flexible bag for transporting fuel, usually as helicopter slung load.

**BLK** 1 Block.

2 Black.

**BLM** 1 Background luminance monitor.

2 Bureau of Land Management, Federal agency responsible for firefighting in wild regions (US).

**BLN** Balloon.

**BLO** Below clouds (ICAO).

**blob** Local atmospheric inhomogeneity, produced by turbulence, with temperature and humidity different from ambient. Can produce angels (2).

**block** 1 In quantity production, consecutive series of identical products having same \* number. In World War 2 aircraft production a \* might number several hundred; with large spacecraft and launch vehicles, fewer than ten. In general, products of two \* normally differ as result of incorporation of engineering changes.

2 In research, groups of experimental items subjected to different treatment for comparative purposes.

3 In EDP, group of machine words considered as a unit.

4 In aircraft (usually commercial) operation, chocks (real or figurative) whose removal or placement defines the beginning and end of each flight.

**blockbuster** Large thin-case conventional bomb [British term for German = land mine, 1940–45] (colloq.).

**block check sequence** Cyclic code used as reference bits in error-detection procedure.

**block construction** Arrangement of gores of parachute such that fabric warp threads are parallel to peripheral edge.

**block diagram** Pictorial representation of system, other than purely electrical or electronic circuit, in which lines show signal or other flows between components, depicted as blocks or other conventional symbols.

**blocker** See *inlet* \*.

**blocker door** In installed turbofan engine, hinged or otherwise movable reverser door (normally one of peripheral ring) which when closed blocks fan exit duct and opens peripheral exits directing airflow diagonally forward.

**block fuel** Fuel burned during block time.

**block-hour cost** DOC for one hour of block time.

**blockhouse** Fortified building close to launch pad for potentially explosive vehicles, from which human crew manage launch operations or perform other duties (eg photography).

**block in** To park transport aircraft at destination. Term spread from commercial to military transport use.

**blocking** 1 In wind tunnel, gross obstruction to flow caused by shockwaves at Mach numbers close to 1, unless throat and working section designed to avoid it (see *choking*).

2 Use of struts and wedges to prevent movement of loose cargo or cargo inside container.

3 Use of form block.

**blocking capacitor** Capacitor inserted to pass AC and block DC.

**blocking layer** Barrier layer in photovoltaic (ie solar) cell.

**blocking oscillator** Any of many kinds of oscillator which quench their output after each alternate half-cycle to generate sawtooth waveform.

**blocking up** To use shaped masses behind sheet metal being hammered.

## block letter

**block letter** Suffix to aircraft serial number, equivalent to USAF *block number* (USN).

**block number** See *block* (1).

**block out** To move off blocks, esp. at start of scheduled flight.

**block shipment** Rule-of-thumb logistic supply to provide balanced support to round number of troops for round number of days.

**block speed** Average speed reckoned as sector distance divided by block time.

**block stowage** Loading all cargo for each destination together, for rapid off-loading without disturbing cargo for subsequent destinations.

**block template** Template for making form block.

**block time** Elapsed period from time aircraft starts to move at beginning of mission to time it comes to rest at conclusion. Historically derived from manual removal and placement of blocks (chocks). Normally used for scheduled commercial operations, either for intermediate sectors or end-to-end.

**block upgrade plan, programme** Introduction of successive groups of modifications, each in a particular FY or production block.

**Bloctube** Patented mechanical control in which command is transmitted by push/pull action of steel cable on which are threaded guidance rings running inside a tube.

**blood-albumen glue** Adhesive used in aircraft plywood, made from dry cattle blood albumen.

**blood chit** 1 Form signed by aircraft passenger before flight for which no fare has been paid (eg, in military aircraft) indemnifying operator against claims resulting from passenger's injury or death (colloq.).

2 Plastic or cloth message, usually in several languages, promising reward if bearer is helped to safety. Often includes representation of bearer's national flag (colloq.).

**blood wagon** Ambulance.

**bloom** 1 Ingot from which slag has been removed, sometimes after rough rolling to square section.

2 Of ECM chaff, to burst into large-volume cloud after being dispensed as compact payload.

**blooming** 1 In surface-coating technology, to coat optical glass with layer a few molecules thick which improves optical properties (by changing refractive index and/or reducing external reflection).

2 In CRT, defocusing effect caused by excessive brightness and consequent mushrooming of beam.

3 In atmospheric laser operations, defocusing or undesired focusing of pulses or beam caused by lens-like properties in atmosphere (see *blob*).

**BLOS** Beyond, or below, line of sight.

**blossom effect** Sudden apparent growth in size of aircraft on collision course as distance approaches zero.

**blow** 1 Rupture in case of solid rocket during firing.

2 To activate blowing system.

**blowback** 1 Type of action of automatic gun in which bolt, or other sliding breech-closure, is never locked and is blown back by combustion pressure on its face, or by rearwards motion of empty case, inertia sufficing to keep breech closed until projectile has left muzzle.

2 Improper escape of gas through breech during firing of gun, due to ruptured case, faulty breech mechanism or other malfunction.

3 Closure, or partial closure, of spoiler or speed brake

## blow-off valve

due to aerodynamic load overcoming force exerted by actuation system.

**blowback angle** Maximum angle to which a spoiler can be extended under given  $q$  (dynamic pressure) without blockback (3).

**blowby** 1 Loss of gas leaking past piston-engine piston ring.

2 Increasingly used to mean seepage past rings of lubricating oil.

**blowdown** 1 Pilot input or pfcu force overcome by aerodynamic load on control surface, the latter being either prevented from moving or returned to neutral position.

2 In captive firing of liquid rocket, expulsion of residual propellant[s] by gas [usually nitrogen] after burnout or cutoff.

**blowdown period** Period in cycle of reciprocating IC engine in which exhaust valve or port is open prior to BDC.

**blowdown tunnel** Open-circuit wind tunnel in which gas stored under pressure escapes to atmosphere, or into evacuated chamber, through working section.

**blowdown turbine** Turbine driven by piston engine exhaust gas in such a way that kinetic energy of discharge from each cylinder is utilised.

**blower** 1 Centrifugal compressor with output (from NTP input) at between 1 and 35 lb/sq in gauge ( $6.9\text{--}240 \text{ kN m}^{-2}$ ).

2 Centrifugal fan used on piston engine, esp. on radial engine, to improve distribution of mixture among cylinders.

**blower pipe** In an airship, duct through which propeller slipstream is rammed to pressurize ballonets.

**blow-in door** Door free to open inwards against spring upon application of differential pressure (eg, in aircraft inlet duct).

**blowing** Provision for discharging high-pressure, high-velocity bleed air from narrow spanwise slit along wing leading edge, tail surface or ahead of flap or control surface. Greatly increases energy in boundary layer, increases circulation and prevents flow breakaway.

**blowing coefficient** For jet or blown-flap or blown aerofoil,  $\frac{MV_j}{qS}$

**blown** 1 Supercharged [piston engine].

2 Failed [electrical fuse].

3 See next.

**blown flap** Flap to which airflow remains attached, even at sharp angles, as result of blowing sheet of high-velocity air across its upper surface (see *boundary-layer control, supercirculation*).

**blown periphery** Parachute in which part of peripheral hem becomes blown between two rigging lines in another part of canopy, and attempts to inflate inside-out.

**blown primer** Percussion cartridge primer which blows rearward out of its pocket, allowing primer gases to escape.

**blow off** 1 Explosive or other enforced separation of instrument pack or other payload from rocket vehicle or other carrier. Hence, \*\* signal.

2 Controlled reduction [if necessary to zero] of deflection of flap, tab or [rare] control surface because of aerodynamic load.

**blow-off valve** 1 Safety valve set to open at predetermined dP at chosen point in axial compressor casing to

**blowout**

allow escape of part of air delivered by stages upstream. Common in early axial gas turbines to prevent surging and other malfunctions, especially during starting and acceleration.

**2** One-way valve in top of fuel tank to enable escape of air displaced during pressure fuelling.

**blowout** **1** Flameout in any fuel/air combustion system caused by excessive primary airflow velocity.

**2** In particular, afterburner flameout.

**blowout disc** Calibrated disc of thin metal used to seal fluid system pipe, rocket combustion space or any other device subject to large dP. If design dP limit is exceeded, \*\* ruptures. Also called safety diaphragm.

**BLR** **1** Bundesverband der Luftfahrt Zubehör und Raketenindustrie eV (G).

**2** Beyond local repair.

**3** Bomber, long-range category (USAAC 1934–36).

**BLS** Blue-line speed.

**BLSN** Blown snow (ICAO).

**BLSS** Base-level supply sufficiency.

**BLT** Bilinear transform.

**BLU** **1** Bande latérale unique, = SSB.

**2** Bomb, live unit (US).

**BLUE** Friendly.

**Blue airway** Originally in US, N–S civil airway.

**Blue angels** Principal formation aerobatic team (USN 1953–).

**blue box** Pre-1945 Link trainer (colloq.).

**Blue Core** Versatile wireless technology which, with Bluetooth, enables almost anything to be done remotely.

**Blue Flag** Command post exercise emphasising tac-air warfare C<sup>3</sup> management (USAF).

**Blue Force** In military exercise, forces used in friendly role.

**Blue Force Tracking** Methods devised after 9–11 of combining space and airborne sensors, GPS and advanced com. to give real-time picture of every individual on battle area.

**blue ice** Formed when water or lavatory fluids leak at high altitude; on descent, large pieces can cause damage to the aircraft or on ground.

**blue key** Blue annotation or image on original map or diagram which does not show in subsequent reproduction.

**blue line** Computer-generated track for attack aircraft across hostile territory, minimising exposure to defences.

**blue-line speed** For multi-engined aircraft, best rate of climb airspeed after failure of one engine (usually thus marked on ASI), usually called V<sub>YSE</sub>.

**Blue List** Schedule of standard units of measurement (ICAO).

**blue-on-blue** Mistaken engagement between friendly fighters.

**Blue Paper** Notice of proposed amendment (BCARs).

**blue-pole** S-seeking pole of magnet.

**blueprint** Drawing reproduced on paper by ammonium ferric citrate or oxalate and potassium ferrocyanide to give white lines on blue background. Seldom used today, but word has common loose meanings: any drawn plan; any written plan of campaign or course of action.

**blue room** Toilet, esp. on commercial transport.

**Blue sector** That half of ILS localiser beam modulated at 150 Hz (right of centreline).

**blue-sky** Research considered [perhaps in ignorance] to have no goal.

**blue suit** US Air Force; usually in contradistinction to white suit = contractor personnel (colloq.).

**Bluetooth** Low-power short-range radio link for mobile [eg pax] devices and for WAN/LAN access points.

**blue water** Oceanic, far from land, as distinct from brown.

**bluff body** Solid body immersed in fluid stream which experiences resultant force essentially along direction of relative motion and promotes rapidly increasing downstream pressure gradient. Causes flow breakaway and turbulent wake. Broadly, bluff is opposite of streamlined.

**BLUH** Battlefield light utility helicopter (UK).

**blunt** A \* trailing edge or rear face of body causes turbulence immediately downstream, but main airflow cannot detect that body or aerofoil has come to an end and thus continues to behave as if in passage over surface of greater length or chord.

**blushing** Spotty or general milkiness or opacity of doped or varnished surface, caused by improper formulation, too-rapid solvent evaporation or steamy environment.

**BLW** Below (ICAO).

**BLZD** Blizzard.

**BM** **1** Bus monitor.

**2** Bubble memory.

**3** Battle management.

**4** Back marker.

**5** Ballistic missile.

**BM, B.M.** Bending moment.

**B/M** Boom/mask (switch).

**BMAA** British Microlight Aircraft Association [office, Deddington OX15 0TT] (UK).

**BMC** **1** Basic mean chord.

**2** Battle management center.

**BMIC**<sup>2</sup> Battle management/command and control.

**BMIC**<sup>3</sup> Battle management/command, control and communications [I adds intelligence].

**BMIC**<sup>4</sup>I As above, plus computers.

**BMCE** Base maintenance certifying engineer.

**BMD** **1** US Air Force Ballistic Missile Division (later SAMSO).

**2** Ballistic-missile defence.

**BMDS** Ballistic-Missile Defense System (DoD).

**BMDO** Ballistic Missile Defense Organisation (USAF).

**BME** **1** Basic mass empty.

**2** Bulk memory element.

**BMEC** Battlespace Management Evaluation Centre, BAE Systems facility at Farnborough.

**BMEP** Brake mean effective pressure.

**BMEW** Basic mass empty weight.

**BMEWS** Ballistic-missile early-warning system.

**BMF** Ministry of Finance (G).

**BMFA** British Model Flying Association [office, Leicester LS2 8RE] (UK).

**BMFT** Ministry for research and technology (G).

**BMH** Basic mechanical helmet.

**BMI** Bismaleimide, high-temperature-resistant resin adhesive.

**BMO** Ballistic Missile Office [became BMD] (USAF).

**BMR** Bearingless main rotor.

**BMS** **1** Bureau Militaire de Standardization (F).

**2** Building, budget, business or battle-management system.

- 3** Ballistic-missile sensor.
- 4** Battle-management shelter (RAF).
- BMTC** Basic Military Training Center (USAF Lackland AFB).
- BMTOGW** Basic mission takeoff gross weight.
- BMTS** Ballistic-missile target system.
- BMUP** Block Modification Upgrade Program (USN).
- BMV** Brake metering valve.
- BMVBW** Ministry of Transport and Construction [D-53175 Bonn] (G).
- BMVg** Bundesministerium der Verteidigung [Ministry of Defence; D-53003 Bonn] (G).
- BMVIT** Ministry of Transport, Innovation and Technology (Austria).
- BN** *1* Night bomber (F, obs).
- 2* Boron nitride.
- B/N** Bombardier/navigator.
- Bn** Beacon.
- B<sub>n</sub>** Receiver noise bandwidth.
- BNAE** Bureau de Normalisation de l'Aéronautique et de l'Espace (F, office, Issy-les-Moulineaux).
- BNASC** Belgian National AIS (1) Centre.
- B/NB** Bid or no bid.
- BNEA** British Naval Equipment Association.
- BNFAAB** See BAH.
- BNG** Boosted, not guided.
- BNH battery** Bipolar nickel/hydrogen.
- BNK** Bureau of new construction (USSR).
- BNL** Brookhaven National Laboratory.
- B<sub>NN</sub>** Null-to-null bandwidth.
- BNR** Binary.
- BNRID** Basic net radio interface device.
- BNS** Boundary notation system.
- BNSC** British National Space Centre, formed 1985 as successor to British Space Development Co. [office, London SW1W 9SS] (UK)
- BO** Boom operator.
- Bo** *1* Boundary lights.
- 2* Boron.
- BOA** *1* Basic ordering agreement.
- 2* Bulle Operationnelle Aéroterrestre (F).
- boarding** Noun, one passenger.
- boarding card, boarding pass** Document issued at check-in which admits passenger to aircraft.
- boarding status** Current stage reached at gate, ending with ‘closing’.
- boardroom bomber** Former WW2 or similar warplane converted for executive use.
- boards** Speed brakes (colloq.).
- boat seaplane** Flying boat (US).
- boat-tail** Rear portion of aerodynamic body, esp. body of revolution, tapered to reduce drag. Taper angle must be gentle to avoid breakaway.
- BOB** Bureau of the Budget (US).
- bobbing** Rare fluctuation in strength of radar echoes allegedly due to alternate attenuation and reinforcement of successive pulse waves.
- BOBS, Bobs** Beacon-only bombing system.
- bobweight** Mass inserted into flight-control system, usually immediately downstream of pilot's input, to impart opposing force proportional to aircraft linear or angular acceleration.
- BOC** *1* Bottom of climb.
- 2* Binary offset carrier.
- 3** Binary operating code.
- BOD** *1* Biochemical, or biological, oxygen demand.
- 2* Beneficial occupancy date.
- bod** Male of lowly rank (RAF WW2).
- Bode plot** Gain or decibel magnitude and phase angle against system frequency [usually expressed in rad/s].
- Bodie** Severe test of gas-turbine engine: soak to maximum carcase temperature, slam deceleration to flight idle, then slam to MTO.
- body** *1* Any three-dimensional object in fluid flow.
- 2* In most aircraft, central structure: hull of marine aircraft or airship, fuselage of aeroplane or helicopter, \* of missile.
- 3* Any observable astronomical object, esp. within solar system.
- body axes** Outlined by G.H. Bryan in 1903, orthogonal reference axes, fore/aft or longitudinal [called X], transverse or lateral [Y] and vertical [Z]. Problem: they have their origin at the c.g., which has no fixed location. See other axes: *principal, stability, wind*.
- body bag** *1* Occupied by pilot of hang glider, instead of open harness: reduces drag and keeps occupant warm.
- 2* Container for corpse in transit.
- body burden** Aggregate radioactive material (not dose received) in living body.
- body English** Guiding the flight of an aerodyne, usually a glider, by shifting the c.g. of one's body.
- body gear, body landing gear** Main landing gear retracting into fuselage.
- body lift** Lift from fuselage of supersonic aircraft or missile at AOA other than zero.
- body of revolution** Body (2) having circular section at any station and surface shape described by rotating side elevation about axis of symmetry. Ideal streamlined forms are generally such.
- body plan** Full-scale elevations and sections of aircraft body in lofting.
- body sensor** Biomedical sensors worn by astronauts or aircrew to measure parameters such as body temperature, pulse rate and respiration.
- body stall** Gross flow breakaway from core engine and afterbody in installed turbofan.
- BOE** Black-out exit; predicted time in manned re-entry at which communications will be resumed.
- boe** Barrels of oil equivalent; thus boe/d = boe per day.
- boffin** Research scientist, esp. senior worker on secret defence project (colloq.).
- bog** To taxi across ground so soft that landing gear sinks in and halts aircraft (see *flotation*).
- bogey** Air contact (5) not yet identified, usually assumed to be enemy (UK spelling often *bogy*).
- bogie** Landing gear having multi-wheel truck on each leg.
- bogie beam** Pivoted beam linking front and rear axles of bogie to each other and to leg.
- bog in** To become stuck in soft airfield surface.
- bogy** See *bogey*.
- BOH** Break-off height.
- BOI** *1* Board of Inquiry.
- 2* Basis of issue.
- boiler** Gas-turbine used as a core engine in high-ratio turbofan, as source of hot gas for tip-drive rotor or fan-lift system or any other application calling for central power source (colloq.).

**boilerplate** Non-flying form of construction where light weight is sacrificed for durability and low cost (see *battleship*).

**boiloff** Cryogenic propellant lost to atmosphere through safety valves as result of heat transfer through walls of container (which may be static storage or tank in launch vehicle).

**BOK** Bureau of special designers (USSR).

**BOL** 1 Bearing-only launch.

2 Bottom of loop [engine s.f.c.].

3 Blade [of compressor or turbine rotor] overtip leakage.

**bold-face procedures** Emergency procedures, written in flight manual in bold-face type.

**bollard** Mooring attachment in form of short upright cylinder on marine aircraft hull or float bow.

**bollock** APFC (colloq.).

**bolometer** Sensitive instrument based on temperature coefficient of resistance of metallic element (usually platinum); used to measure IR radiation or in microwave technology (see *radiometer*).

**BOLT** Build, operate, lease, transfer.

**bolt** 1 In advanced airframe structure, usually precision fitted major attachment device loaded in shear.

2 In firearm, approximately cylindrical body which oscillates axially behind barrel feeding fresh rounds, closing breech and extracting empty cases (see *breech-block*).

**bolter** 1 In carrier (1) flying, aircraft which fails to pick up any arrester wire and overshoots without engaging barrier.

2 Verb, to perform 1; in the US, boltering.

**Boltzmann constant** Ratio of universal gas constant to Avogadro's number;  $1.380546 \times 10^{-23} \text{ J K}^{-2}$ .

**Boltzmann equation** Transport equation describes behaviour of minute particles subject to production, leakage and absorption; describes distribution of such particles acted upon by gravitation, magnetic or electrical fields, or inertia. Boltzmann-Vlasov equations describe high-temperature plasmas.

**BOM** 1 Bill of material.

2 Burst overspeed margin.

**bomb** 1 Transportable device for delivery and detonation of explosive charge, incendiary material (including napalm), smoke or other agent, esp. for carriage and release from aircraft.

2 Streamlined body containing pitot tube towed by aircraft and stabilized by fins to keep pointing into relative wind in region undisturbed by aircraft.

**bomb aimer** Aircrew trade in RAF (formerly) and certain other air forces.

**Bomb Alarm System** Automatic system throughout Conus for detecting and reporting nuclear bursts.

**bombardier** Aircrew trade. bomb aimer, in USA and USAF (formerly).

**bombardment ion engine** Rocket engine for use in deep space which produces ion beam by bombarding metal (usually mercury or caesium) with electrons.

**bomb bay** In specially designed bomber aircraft, internal bay for carriage of bombs (in fuselage, wings or streamlined nacelles).

**bomb-burst** Standard manoeuvre by formation aerobatic teams in which entire team commences vertical dive, usually from top of loop, in tight formation; on

command, trailing smoke, members roll toward different azimuth directions and pull out of dive, disappearing at low level 'in all directions'.

**bomb damage assessment** Determination of effects on enemy targets of all forms of aerial attack.

**bomb detection chamber** Explosion-containment chamber in which objects, such as cargo containers, can be subjected to a complete simulated air-travel environment.

**bomb door** Door which normally seals underside of bomb bay. Can slide rearwards, sideways and upwards, open to each side or rotate through 180° about longitudinal axis to release stores from its upper face.

**bombed out** Forced to leave home because of serious damage caused by air attack (UK).

**bomber** Aircraft designed primarily to carry and release bombs. Term today reserved for strategic aircraft.

**Bomber Box** Secure teletalk link between Bomber [later Strike] Command HQ and crews on alert in cockpits [1958–68] (RAF).

**Bomber Command Forward Relay** Special unjammable v.h.f. and u.h.f. transmitters which would have launched an attack with NW (RAF).

**Bomber Controller** The individual who, so ordered by the Prime Minister, would have ordered an attack with NW (RAF).

**bomber-transport** Former category of military aircraft capable of being used for either type of mission.

**bomb fall line** Bright line on HUD along which free-fall bombs would fall to the ground if they were released.

**bomb impact plot** Graphical picture of single bombing attack by marking all impact of detonation centres on pre-strike vertical reconnaissance photograph(s).

**bombing angle** Angle between local vertical through aircraft at bomb release point and line from that point to target.

**bombing errors** 1 50% circular error: radius of circle, with centre at desired mean point of impact, which contains half missiles independently aimed to hit that point (see *CEP* (1)).

2 50% deflection error: half distance between two lines drawn parallel to track and equidistant from desired mean point of impact which contain between them half impact points of missiles independently aimed to hit that point.

3 50% range error: half distance between two lines drawn perpendicular to track and equidistant from desired mean point of impact which contain between them half missiles independently aimed to hit that point.

**bombing height** Vertical distance from target to altitude of bombing aircraft.

**bombing run** Accurately flown pass over target attacked with free-fall stores.

**bombing teacher** Primitive classroom rig in which pupil uses actual bombsight in simulated environment.

**bombing up** Loading one or more bombers with bombs.

**bomblet** Small bomb, usually of fragmentation type, carried in large clusters and released from single streamlined container.

**bomb line** Forward limit of area over which air attacks must be co-ordinated with ground forces; ahead of \*\* air forces can attack targets without reference to friendly ground troops.

**bomb park** Semi-permanent deck area on carrier

## bomb rack

devoted to storage of ordnance, tanks and other stores [today often eliminated].

**bomb rack** Formerly, attachments in bomb bay or externally to which bombs were secured; provided with mechanical or EM release, fusing and arming circuits and sometimes other services. Replaced by universal store carriers tailored to spectrum of weapons.

**bomb release line** Locus of all points (often a near-circle) at which aircraft following prescribed mode of attack must release particular ordnance in order to hit objective in centre.

**bomb release point** Particular point in space at which free-fall ordnance must be released to hit chosen target.

**bomb-release safety lock** Manually activated by captain, allowed Nav Radar to release NW [RAF V-bombers].

**bombsight** Any device for enabling aircraft to be steered to bomb release point, esp. one in which aimers sights target optically and releases bombs by command.

**bomb site** Urban area completely cleared of rubble after WW2 (UK).

**bomb trolley** Low trolley for carriage of ordnance from airfield bomb stores to aircraft (and often equipped to raise bombs into position on bomb racks).

**bomb truck** Originally [1943–45], bomber engaged in carpet or non-precision bombing. Today, deliverer of ordnance to a target marked by a laser in another aircraft or on ground.

**bomb winch** Manual or powered winch for hoisting bombs from trollies into or beneath racks.

**bonding** 1 Structurally joining parts by adhesive, esp. adhesives cured under elevated temperature and/or pressure.

2 Joining together all major metal parts of an aircraft, especially an aircraft not of all-metal construction, to ensure low-resistance electrical continuity throughout. Even where metal structures are squeezed together by bolts or rivets a bond of copper strip or braided wire must link them reliably. Bonding is necessary for Earth-return systems and to dissipate lightning strikes and other electrical charges safely with no tendency to arcing or spark formation.

3 Legal agreement linking a pilot to an airline who pays for his tuition.

**bonding noise** In older aircraft, radio interference caused by relative movement between metal parts bonded (2) together.

**Bondolite** Low-density sandwich of balsa faced with aluminium.

**Bone** B-one next enhancement.

**bonedome** Internally padded rigid protective helmet worn by combat aircrew (colloq.).

**boneyard** Graveyard of unwanted aircraft, usually stripped of potential spares (colloq.). Particularly refers to AMARC, Arizona.

**bonker** Small rocket giving high thrust for a fraction of a second designed to impart powerful disturbing blow to extremity of airframe in investigation of aerodynamic/structural damping.

**bonnet** Valve hood in aerostat envelope.

**BOO** Build, own, operate.

**boob** Noun, error; verb, to make mistake (RAF 1935–).

**Boolean algebra** Powerful and versatile algebra compatible with binary system and with functions AND, OR and NOT.

## boosted controls

**boom** 1 Any long and substantially tubular portion of structure linking major parts of an aircraft (esp. linking the tail to the wing or to a short body).

2 Longitudinal structural members forming main compression and tension members of a wing spar, having large section modulus as far as possible from wing flexural axis.

3 Device used in some air-refuelling tanker aircraft in form of pivoted but rigid telescopic tube steered by aerodynamic controls until its tip can be extended into a fuel-tight receptacle on receiver aircraft.

4 Sound heard due to passage of shockwaves from distant supersonic source, such as SST flying high overhead.

5 Spanwise pipe conveying ag-liquid to spraying nozzles; hence \* width, \* pivots.

**boom avoidance** Technique of flying aircraft for minimal boom (4) disturbance on ground.

**boom avoidance distance** Distance along track over which \*\* technique is enforced. Hence, BAD (departure) and BAD (arrival).

**boom carpet** Strip of Earth's surface along which observers hear sonic boom from supersonic aircraft.

**boomer** 1 Operator of refuelling boom (5) in tanker aircraft (colloq.).

2 USN submarine armed with ballistic missiles [FBMS] (colloq.).

**Boomerang** Aerobatic manoeuvre comprising near-vertical ascent with rotation about longitudinal axis, near-stalled apex with rotation about transverse axis, followed by near-vertical descent with rotation about vertical axis.

**boom microphone** Voice microphone carried on cantilever boom (slender structural beam) pivoted at side of headset so that it can be moved away from the mouth for avoiding unwanted speech broadcasting.

**boom receptacle** Flight refuelling socket on military aircraft with which a boom (3) forms a fuel-tight connection despite motion and changes of orientation relative to tanker.

**boom throw-forward** Distance along track from origin of shockwave to ground impact.

**boom trough** See *boom well*.

**boom well** Recess in deck plating of marine-aircraft float or hull to take end-fitting of struts or booms (1).

**boondocks** Open land area remote from habitation, esp. when site of forced landing.

**boost** 1 Any temporary augmentation of thrust or power in a mechanical or propulsive system.

2 Excess pressure, over and above a datum, in induction manifold of piston engine as result of super-charging. Datum is usually one standard atmosphere.

3 Jettisonable booster rocket for unmanned vehicle (UK, colloq.).

4 Fast-burning portion of a boost/sustain motor.

**boost control** Control system, today invariably automatic, for maintaining suitable boost pressure in aircraft piston engine and, in particular, for avoiding excessive boost.

**boost/cruise motor** Rocket motor having very large but brief thrust for vehicle launch followed by lower but long-duration thrust for aerodynamic cruise.

**boosted controls** Aeroplane flying control surfaces in which balance is reduced and pilot input augmented by

brute force, usually by hydraulic jacks. Much simpler and cruder than a powered flying-control system (see *servo*).

**booster** 1 Boost rocket.

2 Sensitive high-explosive element detonated by fuze or primer and powerful enough to detonate a larger main charge.

3 LP compressor, with from one to five stages, downstream of an HBPR fan and rotating with it to supercharge the core airflow into the HP spool. In the US such an engine is often called a mixed-twin-spool turbofan.

**booster APU** APU capable, usually in emergency only, of augmenting aircraft propulsion.

**booster coil** Battery-energised induction coil to provide a spark to assist piston engine starting.

**booster magneto** Auxiliary magneto, often turned by hand, for supplying hot sparks during piston engine starting.

**booster pump** 1 Centrifugal pump, often located at lowest point of a liquid fuel tank, to ensure positive supply and maintain above-ambient pressure in supply line. In integrao wing tanks usually mounted outside the tank on back of rear spar web.

2 Auxiliary impeller in cryogenic propellant system to maintain system pressure and prevent vaporization upstream of main pump.

**booster rocket, booster stage** See *boost rocket*, though \* stage implies a large long-burning stage for a large vehicle.

**booster stages** Booster (3).

**boost/glide vehicle** Aerodyne launched under rocket thrust and accelerated to hypersonic speed in upper fringes of atmosphere, thereafter gliding according to any of various predetermined trajectories over distances of thousands of miles.

**boost motor** See *boost rocket*.

**boost phase** Initial phase of launch and rapid acceleration of missile or other short-range aerodynamic vehicle fitted with boost rockets.

**boost pressure** See *boost (2), international \*, override \**.

**boost pump** Booster pump.

**boost rocket** Rocket motor, usually solid propellant and sometimes used in multiple, used to impart very large thrust during stages of launch and initial acceleration of missile or other vehicle launched from ground or another aerial vehicle. Almost all kinds of \*\* burn for a few seconds only, and in some cases for only a fraction of a second. Sometimes case and chamber forms part of vehicle, but most boost rockets are separate and jettisoned after burnout.

**boost rocket impact area** Area within which all \*\* should fall during launches on a given range.

**boost separation** Process by which boost rocket thrust decays and becomes less than drag, causing rearward motion relative to vehicle and subsequent progressive unlocking, possibly relative rotation, and detachment.

**boost/sustain motor** Rocket comprising fast-burning high-thrust portion followed by slow-burning low-thrust portion.

**boost vehicle** SDI term for space or long-range missile launcher.

**boot** 1 Flat array of flexible tubes bonded to leading edge of wings, fins and other aircraft surfaces to break up ice. Fluid pressure is alternately applied to different sets of tubes in each boot to crack ice as it forms.

2 Shroud or vizor enabling cockpit radar to be viewed in bright sunlight.

**bootie** 1 Protective cover for pitot tube, usually with streamer.

2 Soft fabric overshoe worn before walking on aircraft skin or entering engine duct.

**bootstrap** Noun, hoisting gear to remove disabled engine or lift replacement engine to pylon or [trijet] to tail engine position; and verb, to perform lifting operation. Can also be applied to modules.

**bootstrap exploration** Using each space mission to bring back information to help subsequent missions, esp. in lunar exploration (colloq.).

**bootstrap operation** Dynamic system operation in which once cycle has been started by external power, working fluid maintains a self-sustaining process. A gas turbine, once started, sustains bootstrap operation because the turbine keeps driving the compressor which feeds it. Thus, \* cycle (cold-air unit), \* mainstage engine pump (turbine being fed by propellants delivered by pump), etc.

**Boozer** Code name for British ECM [two-colour warning lights] carried by Mosquito aircraft in 1944.

**BOP** 1 Balance of payments, esp. with regard to national participation in multinational programme.

2 Basic operating platform (bare base airfield).

3 Bit-oriented protocol.

**BOPS** 1 Burn-off per sector; fuel burned on each sector, or segment, or stage (all three words are used in flight-planning documents) in commercial transport operation.

2 Beam-offset phase shifter (Awacs).

**bops** Billions of operations per second.

**BOR** Basic operational [or operating] requirement.

**Bora** Cold, squally wind (Adriatic, Aegean).

**Boram** Block-orientated random-access memory.

**boresafe fuze** Projectile fuze rendered safe by interrupter until projectile has cleared gun muzzle.

**borescope** Slender optical periscope, usually incorporating illumination, capable of being inserted into narrow apertures to inspect interior of machinery.

**borescope port** Circular ports, fitted with openable caps, through which borescopes may be inserted (esp. in aircraft engines).

**boresight** 1 Verb, to align gun or other device by means of optical sighting on a target.

2 Noun, precise aim direction of gun, directional aerial/antenna, camera, etc.

**boresight camera** Optical camera precisely aligned with tracking radar and used to assist in alignment of aerial [antenna].

**boresight coincidence** Optical alignment of different adjacent devices, such as radar waveguide, reflector, passive interferometer and IR or optical camera.

**boresight line** Optical reference line used in harmonising guns and other aircraft weapon launchers.

**boresight mode** Radar is locked at one chosen angle between dead ahead and -2° or -3°.

**boresight test chamber** Anechoic chamber containing movable near-field test targets and aerials, capable of being wheeled over nose of radar-equipped fighter aircraft.

**BORG** Basic Operational Requirements Group (ICAO).

**boring** Process of accurately finishing already-drilled

**boron, Bo**

hole to precise dimension, usually by using single-point tool.

**boron, Bo** Element, either greenish-brown powder, density 2.3, or brown-yellow crystals [2.34], MPt 2,300°C. Used as alloying element in hard steels, as starting point for range of possible high-energy fuels, and above all as chief constituent of boron fibre.

**boron doping** Addition, finely divided, to increase  $I_{sp}$  of solid rocket motor.

**boron/epoxy** Composite plastic materials comprising fibres or whiskers of boron in matrix of epoxy resin.

**boron fibre** High-strength, high-modulus structural fibre made by depositing boron from vapour phase on white-hot tungsten filament. Used as reinforcement in aerospace composite materials.

**Borsic** Boron fibre coated with silicon carbide. Structurally important as reinforcement in matrices of aluminium and other metals.

**bort** Side, hence \* number = serial painted on fuselage (R).

**Boscombe** Aeroplane & Armament Experimental Establishment, Boscombe Down, Wiltshire, England.

**bosom tank** Detachable (usually jettisonable) fuel tank scabbed on under fuselage.

**Boss, BOSS** 1 Ballistic offensive suppression system (EW).

2 Battlefield optical surveillance system.

3 Bureau of State Security (S Africa).

4 Bio-optic synthetic systems (inspired by optics of life forms).

**boss** 1 In traditional wooden or one-piece metal propeller, the metal mounting comprising front and rear steel plates joined by numerous bolts passing through the thickened, non-aerodynamic central portion.

2 In a casting, locally thickened area to provide support for shaft bearing, threaded connection or other load.

3 Squadron commander, often initial cap (RAF).

4 Leader of aerobatic team.

**BOT** 1 Boom-operator trainer.

2 Brakes-off time.

3 Build, operate [or own], transfer.

**BoT** Board of Trade.

**BOTB** British Overseas Trade Board.

**Bottlang** Commercially produced loose-leaf binder describing European VFR airfields.

**bottle** A JATO rocket (filled or empty case) (colloq.).

**bottle to throttle** Stipulates interval between alcohol and flying (colloq.).

**bottom dead centre** Position in piston engine in which centre of crankpin is precisely aligned with axis of cylinder, with piston at bottom limit of stroke; at BDC piston cannot exert a turning moment on crankshaft.

**bottom rudder** In aeroplane in banked turn, applying rudder towards lower side of aircraft; among other things this will lower the nose.

**bottom shock** On underside of supersonic aerofoil.

**bottom-up** See *requirements capture*.

**bouclier the boucle** Looping the loop [anglicised French, pre-1914, see comment at end of preface].

**bought it** Killed (RAF colloq.).

**bounce** 1 In air combat, to catch enemy aircraft unawares; to intercept without being seen.

2 In piston engine poppet valve gear, elastic bounce of valves on their seats.

**bounce table** Vibration test machine.

**bouncing bomb** Air-dropped weapon designed to skip across water surface [several types].

**boundary layer** Layer of fluid in vicinity of a bounding surface; eg, layer of air surrounding a body moving through the atmosphere. Within the \*\* fluid motion is determined mainly by viscous forces, and molecular layer in contact with surface is assumed to be at rest with respect to that surface. Thickness of \*\* is normally least distance from surface to fluid layer having 99 per cent of free-stream velocity. \*\* can be laminar or, downstream of transition point, turbulent.

**boundary-layer bleed** Pathway for escape of \*\* adjacent to engine inlet mounted close beside fuselage wall. Bleed is either open or ducted, and removes stagnant \*\* which would otherwise reduce ram pressure recovery and propulsion system performance.

**boundary-layer control** Control of \*\* over aircraft surface to increase lift and/or reduce drag and/or improve control under extreme flight conditions. BLC can be effected by: passive devices, such as vortex generators; ejecting high-velocity bleed air through rearward-facing slits; sucking \*\* away through porous surfaces; use of engine slipstream to blow wings or flaps.

**boundary-layer duct** Duct to carry \*\* from \*\* bleed to point at which it can advantageously be dumped overboard.

**boundary-layer energiser** Low sharp-edged wall normal to airflow across aerodynamic surface (eg immediately upstream of aileron).

**boundary-layer fence** Shallow fence fixed axially across swept wing to reduce or check spanwise drift of \*\* and its consequent thickening and proneness to separation.

**boundary-layer noise** Major source of noise inside aircraft.

**boundary-layer scoops** Forward-facing inlets designed to remove thick \*\* upstream of engine inlet or other object.

**boundary-layer separation** Gross separation of \*\* from boundary surface, space being filled by undirected, random turbulence.

**boundary light** Visible steady light defining boundary of landing area.

**boundary marker** Markers, often orange cones, defining boundary of landing area.

**bound vortex** 1 Circulation round a wing.

2 Vortex embracing any solid body or touching a surface.

**Bourdon tube** Flat spiral tube, either glass filled with alcohol or metal filled with mercury, whose radius increases (rotating the centre) with increasing temperature.

**Boussinesq** Formula giving distance along uniform tube necessary for laminar, viscous, incompressible flow to become fully developed.

$$x = \frac{0.26 Um r^2}{v} = 0.25 rR.$$

where  $Um$  is mean velocity,  $r$  tube radius,  $v$  kinematic viscosity and  $R$  Reynolds number.

**BOV** Blow-off valve.

**BOVC** Base of overcast.

**BOW** Basic operating weight [OWE is more precise].

**bow** Rhyming with cow, nose of airship or marine hull or float.

**bow** Rhyming with go:

1 Curvature along length of turbine blade or other slender forging, or curvature due to instability in structural compression member.

2 Curved member forming tip of wing or other aerofoil, esp. one with fabric covering.

**bow cap** Structure forming front end of airship hull or envelope. Alternatively, nose cap.

**Bowen-Knapp camera** High-speed strip-film camera used in vehicle flight testing.

**bowser** 1 Airfield fuel truck, roadable and self-propelled; unpropelled, \* trailer.

2 Used as adjective, specially modified to contain overload or ultra-long range fuel, hence \* wing, \* fuselage.

**Bow's notation** Conventional system of representing structural forces and stresses by letters and/or numbers in graphical stress analysis (rhymes with slow).

**bow stiffeners** Longitudinal stiffeners arranged radially around nose of aerostate envelope (esp. blimp or kite balloon) to prevent buckling under aerodynamic pressure. Alternatively called battens.

**bow wave** 1 Shockwave from nose of supersonic body, esp. one not having sharply pointed nose.

2 Shockwave caused by motion of planetary body through solar wind.

3 Form of wave caused by bows of taxiing marine aircraft.

4 Form of wave caused by landplane nosewheels running through standing water.

**box** 1 Tight formation of four aircraft in diamond (leader, left, right, box).

2 Structural heart of a wing comprising all major spars, ribs and attached skins (often forming integral tankage), but usually excluding leading and trailing edges, secondary structure and movable surfaces.

3 Major sections of fuselage, especially where these are of rectilinear form and thus not describable as *barrel sections*.

4 Aircraft structure formed from two or more lifting planes (wing or tail), linked by struts and bracing wires. In early aviation no other form could compete for lightness and strength.

5 Airlifter cargo compartment, simplified to basic rectilinear form and dimensioned overall.

6 Above-floor removable cargo container, with various standard dimensions.

7 Container of lights in visual ground guidance system, thus 4 \* VASI.

**box beam** Hollow beam (1) of essentially square or rectilinear cross section.

**box connector** Multi-circuit connector having four-sided box sockets, with linear pin engagements (2 or 3 rows, up to 240 circuits).

**boxer** piston engine having two crankshafts and [e.g. four or six] parallel cylinders in rectilinear formation.

**box girder** See *box spar*.

**boxing** Process of assembling major airframe sections in erection jig; includes fuselage *box* (3) sections.

**boxkite** Kite in form of rectangular- (often square-) section box, open at mid-section and at ends. Structurally related to early biplanes in form of *box* (4).

**box position** Rear aircraft in *box* (1).

**box rib** Rib assembled from left and right sides

separated by a peripheral member following profile of aerofoil.

**box sizing** Part of GAMM in which an aircraft fuselage cross-section is selected and optimum cargo box length determined for groupings of vehicles or other large loads.

**box spar** Spar assembled from front and rear webs separated by upper and lower booms.

**box tool** Tangential cutting tool incorporating its own rest, used on automatic turning machines.

**box wing** *Diamond wing*.

**Boyle's law** In an ideal gas at constant temperature, pressure and volume are inversely proportional, so that  $PV = f(T^{\circ})$  and  $P/\rho = RT$ .

**BP** 1 Bite processor.

2 Bottom plug.

3 Braided pultruded.

4 Boron phosphide.

5 Beam pointing.

**b.p.** 1 Bypass (jet engine); thus, \* ratio.

2 Band-pass filter.

**BPA** 1 British Parachute Association, successor to British Parachute Club (1956, office Leicester).

2 Blanket purchase agreement.

3 Beam-pointing accuracy.

**BPC** 1 Gas-turbine barometric pressure control.

2 Benchmark pricing guide.

3 British Purchasing Commission (WW2).

4 Basic primer concept (paint).

**BPCU** Bus power control unit.

**BPDMs** Base, or basic, point-defense missile system.

**BPE** 1 Best preliminary estimate.

2 Bomber penetration evaluation.

**B Per T** Squadron for testing heavy aircraft (AAEE, WW2).

**BPF** 1 Band-pass filter.

2 Blade-passing frequency.

3 British Pacific Fleet (WW2).

**BPI** 1 Boost-phase intercept[or].

2 or **bpi**, bits per inch (EDP).

**BPIS** Boost-phase intercept system.

**BPL** Band-pass limiter.

**BPLI** Boost phase launch[er] intercept.

**BPM** Binary phase-modulation.

**BPP** Breakthrough [in] propulsion physics (NASA).

**BPPA** British Precision Pilots Association; affiliated to FAI, orienteering without navaids, assisting handicapped/paraplegic pilots (office Saxmundham).

**BPR** Bypass ratio.

**BPS** Balanced pressure system: buried glycol pipes trigger alarm if stepped on.

2 Bistable phosphor storage.

3 Bytes per second.

4 See next.

5 Ballistic protection system.

**bps** Bits per second (EDP).

**BPSK** Binary phase-shift keying.

**BPt** Boiling point.

**BP,L** Union of aircraft maintenance engineers [D-53815 Neunkirchen] (G).

**BQ** Ground-launched controllable bomb [ie, SSM] (USAAF 1942–45).

**Bq** Becquerel[s].

**BR, Br** 1 Bomber-reconnaissance.

2 Mist (Metar code).

- 3** Bearing.  
**4** Baggage reconciliation.  
**5** Bridge.  
**6** 1553B bus request.  
**7** British.
- br** Reference length.
- BRA** *1* Bureau des Recherches Aériennes (ICAO).
- 2** Barrel-roll attack.
- 3** Bomb-rack assembly.
- 4** Braking action; F,G,N,P add fair, good, nil, poor.
- 5** Beam rotational, or reference axis.
- 6** Basewide remedial assessment.
- BRAAT** Base recovery after attack training.
- BRAC** Base realignment and closure.
- brace position** Adopted for ditching or crash-landing: shoes removed, bent forward with arms protecting head.
- Bracis** Biological, radiological and chemical information system (UK).
- bracket** Limits of time/distance/altitude for one pre-planned in-flight refuelling.
- bracketing** *1* Obsolete method of flying a radio range in order to establish correct quadrant and hence direction to next waypoint.
- 2** In flak or other artillery, establishing a short and an over along desired line and then successively splitting resulting 'bracket' in half.
- bracket propeller** Variable-pitch (usually two-position) propeller in which each blade is pivoted and automatically adopts a fine or coarse setting according to the position of a sliding mass at the root.
- Braduskill** 'Slow kill' technique proposed in SDI for gradual closure on hostile satellites.
- BRAG** Batteries Research Advisory Group.
- Brahms** Baggage reconciliation and handling management system.
- brake** *1* Device for removing energy from a moving system to reduce its speed or bring it to rest. Energy withdrawn may be rejected to atmosphere (airbrake, speed brake) or absorbed in heat sinks (wheel brake, propeller or rotor brake). The inceptor can be a handgrip or pedals.
- 2** In sheet-metalwork, a power press for edging and folding.
- brake by wire** Pilot's demands are transmitted to wheel brakes as electrical signals.
- brake horsepower** Power available at output shaft of a prime mover. Generally synonymous with shaft horsepower [preferred] and torque horsepower.
- brake mean effective pressure** A measure of MEP in an operating piston engine cylinder calculated from known BHP (BMEP is to be expressed in kPa or bars and derived from power in kW).
- brake-up** Aeroplane nose-over caused by harsh braking (colloq.).
- braking action** Measure of likely adhesion of tyres to runway, thus \* advisory warns of snow, ice or other hazard.
- braking coefficient** Braking force coefficient.
- braking ellipse** Elliptical orbit described by spacecraft on entry to a planetary atmosphere. If continued, successive ellipses are smaller, due to drag; purpose of manoeuvre is to dissipate re-entry or entry energy over a much greater time and distance and thus reduce heat flux.
- braking force** Linear force exerted by a braked vehicle (ie, aircraft) wheel.
- braking force coefficient** Coefficient of friction between wheel and fixed surface (whether rolling or sliding).
- braking nod** Nose-down pitch of aircraft when wheel-braked, or nose-up pitch when brakes released at full power, esp. maximum angular movement thus imparted.
- braking parachute** Parachute streamed from aircraft to increase drag, increase dive angle or reduce landing run.
- braking pitch** Predetermined propeller pitch to give maximum retardation, either windmilling drag or reverse thrust under power.
- braking rocket** Retrorocket.
- branch** *1* In electrical system, portion of circuit containing one or more two-terminal elements in series.
- 2** In computer program, point at which \* instructions are used to select one from two or more possible routines.
- 3** In crystal containing two or more kinds of atom, either of possible modes of vibration, termed acoustic \* or optical \*.
- branch pipe** Pipe conveying exhaust gas from piston engine cylinder to manifold or collector ring.
- brass** Alloys of copper with up to 40 per cent zinc and small proportions of other elements.
- brassboard** Functioning breadboard model of avionic system; also adjective and verb.
- brassed off** See *browned off*.
- BRAT** *1* Benchtop reconfigurable automatic tester.
- 2** Beyond line of sight reporting and tracking.
- Brat** *1* Bomb-responsive anti-terrorist.
- 2** Graduate of RAF Apprentice School, Halton (colloq.).
- Bratt-DaRos** Method of solving problems of inertial coupling.
- Bravo exercise** Combat mission called off at point when aircraft ready to taxi.
- Brayco** Also Braycote, trade names of turbine fuels and lubricants (BP).
- Brayton cycle** Thermodynamic cycle used in most gas turbines: diagram comprises compression and expansion curves joined by straight lines representing addition or rejection of heat at constant pressure. The so-called 'open cycle'.
- brazier-head rivet** Light-alloy rivet having head shallower but of larger diameter than round-head.
- brazing** Joining metals by filling small space between them with molten non-ferrous metal having a melting point above a given arbitrary value (originally 1,000°F = 538°C).
- breadboard** Preliminary assembly of hardware to prove feasibility of proposed system, without regard to packaging, reliability or, often, safety. May be laboratory rig or flyable system. Often adjective or verb.
- break** *1* Point at which pilot senses stall of wing.
- 2** Breakaway (1) (colloq.).
- 3** Chief meaning in modern air combat: to make maximum instantaneous turn to destroy hostile fighter's tracking solution. Used as noun or as verb.
- 4** In carrier flying, point at which aircraft turns sharply left across bows and on to downwind leg.
- 5** Word inserted by harassed controller to indicate that following words are for a different recipient.
- breakaway** *1* Point at which aircraft breaks off trajectory directed against another object, such as stern attack on enemy aircraft or gun-firing run on ground target.

## **breakaway thrust**

2 Altitude at which pilot abandons approach in bad weather.

3 In nuclear explosion, point in space or time at which shockfront moves ahead of expanding fireball.

**breakaway thrust** Engine power needed to initiate movement and reach taxiing speed.

**breakdown book** Record of physical changes introduced during maintenance, servicing or repair.

**breakdown drawing** Isometric or perspective drawing showing parts separated from each other by being displaced along one or more axes. Often called exploded drawing.

**breakdown potential** Dielectric strength.

**breaker strip** 1 Linear narrow de-icing element, either thermal or mechanical, arranged along leading edge (eg of wing or engine inlet strut) to split ice accretion into two parts.

2 See *stall strip*.

**break-even load factor** Load factor at which a particular flight, service, aircraft type or overall airline operation shows a net profit.

**break-even point** 1 In any commercial aircraft operation, load factor at which total revenue equals total cost.

2 In manufacture, number of sales required to cover investment.

**breakin, break-in** First bench run of new type of engine or other device, or following major overhaul.

**break lock** To use ECM or other countermeasure to make hostile tracking system (eg IR or radar) cease to track friendly or own aircraft.

**breakoff phenomenon** Mental state experienced by crews of high-altitude aircraft and spacecraft of being divorced from other humanity.

**break-out** Point at which flight crew receive first forward visual cues after an approach through cloud.

**breakout force** Minimum force required to move pilot's flying controls (each axis considered separately). If not measured at zero airspeed, airspeed must be quoted.

**breakout panel** One panel in aircraft canopy through which occupant[s] can escape in emergency.

**breakpoint** 1 In system responding to high-frequency input, the corner frequency (as seen on a Bode plot) where  $f = 1/2T\pi$ .

2 In EDP, point in program or routine at which, upon manual insertion of \* instruction, machine will stop and verify progress.

3 Sudden change in slope of graphic plot, eg point at which payload has to fall from maximum value in plot against range. Also called *knee*.

**break price** Quantity at which unit price changes.

**breakthrough propulsion physics** NASA project searching for a way to travel at a significant fraction of the speed of light.

**break-up** Separation of single radar blip into discrete parts each caused by a target.

**break-up circuit** Electrical circuit linking airborne portions of break-up system.

**break-up shot** Artillery shot designed to break into small fragments upon leaving muzzle and thus travel only a short distance.

**break-up system** System designed to break unmanned vehicle, such as ballistic missile, space launcher or RPV, into fragments sufficiently small to cause minor damage if they should fall on inhabited area.

## **bridge**

**break X** To break (2) at point of minimum range for launch of own AAM, where X symbol appears on cockpit display.

**breather** 1 An open pipe connecting interior of device, such as piston engine to atmosphere to dissipate moisture or oil vapour.

2 A centrifuge to which air carrying finely divided lubricating oil is piped at the start of the return circuit; all oil is centrifuged out for re-use, the hot air being expelled.

**breathing** 1 Flow of air and exhaust gas through piston engine, esp. the way this is limited by constraints of flow path.

2 Flow of air and/or gas into and out of aerostat in course of flight.

3 Very small air and oil vapour flow through breather holes or ducts provided to equalise pressure inside and outside an engine.

4 Generally, escape of air from all volumes as aircraft climbs, to be replaced by [usually more humid] air on descent.

**breach** In a gun, end of barrel opposite muzzle, through which shot is normally loaded.

**breach-block** Rigid metal block normally serving to insert and withdraw shell cases, resist recoil force on fired case and seal breech during firing; usually oscillates in line with barrel axis.

**breeches piece** Tubular assembly, often shaped like pair of shorts, serving to bifurcate jetpipe or join two jetpipes into common pipe.

**breeze** In Beaufort scale, ranges from light\* (4 mph) to fresh \* (24 mph).

**Breguet formula** Rule-of-thumb formula for giving flight range of classical aeroplane, and reasonably accurate for all types of aerodyne; range given by multiplying together L/D ratio, ratio of cruising speed divided by sfc, and log<sub>e</sub> of ratio of aircraft weight at start and finish expressed as decimal fraction greater than 1. Units must be compatible throughout.

**BREMA, Brema** British Radio and Electronic-equipment Manufacturers Association.

**bremsstrahlung** Electromagnetic radiation emitted by fast charged particles, esp. electrons, subjected to positive or negative acceleration by atomic nuclei. Radiation has continuous spectra (eg, X-rays).

**brennschluss** Cessation of operation of rocket, for whatever cause.

**BREO** On-board avionics (R).

**Brétigny** Location, southwest of Paris, of Centre des Essais en Vol (CEV).

**brevet** Flying badge worn on uniform, especially denoting qualification as flight-crew member.

**BRF** Short approach is required or desired (ICAO).

**BRG, Brg** Bearing (2).

**BRH** Bundesrechnungshof [Federal audit office] (G).

**BRHZ** Mist, haze.

**BRI** Basic-rate interface.

**brick** Portable data store which transfers mission data to aircraft systems (colloq.).

**bridge** Permanently installed pedestrian connector linking terminal with aircraft. Almost all are covered, and provided with powered movement controlled from the free end. The movement usually includes vertical elevation, lateral traverse and telescopic linear extension, and the terminal end may be able to interface with one level

**bridgehead**

for arrivals or another for departures. Apron-drive bridges are controlled by steerable powered wheels at the free end, running over the apron surface. A variant is the over-the-wing bridge, which with the more common ADB enables a rear-fuselage door to load/unload from the same terminal walkway. So-called glass walls are becoming popular. Noseloaders are parallel to the parked fuselage and have a fixed outer end provided with a short section at 90° to mate with the aircraft door. Commuter bridges provide covered access at ground level. Other names are passenger-boarding or passenger-loading \*, airbridge or jetlink; Jetway is a trademark.

**bridgehead** End of apron-drive bridge which abuts aircraft; hence \* cab.

**bridge-type stick** In side-by-side cockpit, control columns linked by pivoted connector.

**bridle** 1 Towing linkage, other than expendable strop, transmitting pull of catapult to two hard points on aircraft.

2 Assembly of electric cables or fluid system pipes which, after disconnection, can be removed from supporting structure (eg, landing gear) as a unit.

3 Rigging attached to two or more points on aerostat, esp. blimp, to distribute main mooring pull.

**brief** To issue all relevant instructions and information in advance of flying mission (not necessarily military), static test, war game or other operation involving human decision-taking.

**bright display** Normally, display which can be viewed clearly without a hood in brightest daylight.

**brightness control** Facility provided in radar, TV and other display systems for adjusting CRT bias to control average brightness.

**brilliant** Describes munition having both guidance (smart) and programmable software; in practice also means with ability to guide itself to target without external help.

**Brinell hardness** Measure of relative hardness of solids, expressed as numerical value of load (either 500 kg or 3,000 kg) and resulting area of indentation made by hard 10 mm ball.

**bring-back weight** Weight at which combat aircraft recovers to airbase or carrier, with remaining fuel and unexpended ordnance.

**BRITE** 1 Broadcast request imagery technology experiment (satellites).

2 Basic research in industrial technologies for Europe [Int.]

3 Boston rocket ionospheric tomography experiment.

4 Bright radar indicator tower equipment.

**BritGFO** British Guild of Flight Operations Officers.

**British Parachute Association**, controlling the sport in the UK (office Leicester).

**British Thermal Unit** Obsolete [from 1995] measure of heat: quantity required to raise temperature of 1 lb of water from 63° to 64°F; six definitions, all close to 1 Btu = 1,055 J.

**brittle fracture** Fracture in solid, usually metal, in which plastic deformation and energy dissipated are close to zero. Contrasts with ductile fracture, and is rare except at very low temperatures.

**BRKG, BRKS** Breaking, breaks (ICAO).

**BRM** British Rotorcraft Museum, see IHM.

**B-RNAV, B-RNav** Basic area navigation, accurate 95

per cent of time to 5 nm (9.3 km); was VOR/DME, now increasingly GPS.

**Broach** Bomb, Royal Ordnance, augmented charge.

**broach** Cutting tool having linear row(s) of teeth, each larger than its predecessor.

**broad-arrow engine** In-line piston engine having three banks of cylinders with adjacent banks spaced at less than 90°; W-engine.

**broadband aerial** Aerial [antenna] capable of operating efficiently over spread of frequencies of the order of ten per cent of centre frequency.

**broadband GAN** Worldwide secure shared IP service providing 144 kbit/s.

**broadcast** Radio transmission not directed at any specific station and to which no acknowledgement is expected.

**broadcast control** Air interception in which interceptors are given no instructions other than running commentary on battle situation.

**broad goods** Carbon-fibre and other fibre-reinforced sheet as delivered in the bale.

**broadside array** Aerial array in which peak polarization is perpendicular to array plane.

**Broficon** Broadcast flight-control (originally fighter control) management of tac-air warfare (USAF).

**broken clouds** Sky coverage between 'scattered' and 'continuous', defined by ICAO as five-tenths to nine-tenths, UK usage 5–7 oktas.

**broken field** Covered by craters and debris, especially on runway.

**brolly** Parachute.

**bromine** Br, toxic liquid, density 3.1, BPt 59°C, used in a range of aerospace products.

**bronze** Alloys of copper and tin and/or aluminium.

**Bronze C** First qualification for glider pilot (BGA).

**browned off** Discouraged, bored (RAF WW2).

**brown job** Member of friendly army (RAF, WW2).

**brownout** Often hyphenated, near-zero surface visibility because of blown sand or topsoil.

**brown water** Littoral, close inshore.

**BRP** Braked retarded parachute [S adds super].

**BRS** 1 Best-range speed.

2 Baggage reconciliation system.

3 Ballistic recovery system.

**BRSL** Bomb-release safety lock.

**Br-Stoff** Avgas or benzole (G).

**BRT** 1 Brightness.

2 Bomb retarding tail.

**BRTF** Battery repair and test facility (artillery, guided weapons).

**BRU** Bomb release unit, normally complete interface between hardpoint and munition.

**brush discharge** See *Corona discharge*.

**brush seal** Ring of fine wire bristles continuously rubbing on erosion-resistant [ceramic] sleeve on rotating shaft.

**BRW** Brake release weight, ie at start of takeoff run.

**BS** 1 Commercial broadcasting station.

2 British Standard, thus \* parts.

3 Bomb (or bombardment) squadron (USAAC, USAAF, USAF).

4 Blowing snow.

**b/s** Bits per second.

**BSB** British Satellite Broadcasting.

- BSC** 1 Beam-steering computer (EW).  
   2 Bird-scaring cartridge.
- BSCU** Brake-system control unit.
- BSDH** Bus shared-data highway.
- BSI** 1 British Standards Institution [formed 1901 as Engineering Standards Committee; office London W4 4AL] (UK).  
   2 Bus system interface [U adds unit].
- BSIN** Alternative for BSI (2).
- BSL** 1 British Standard family of light alloys.  
   2 Base second level (servicing).
- BSM** Breakaway support mast.
- BSN** Backbone subnetwerk.
- BSP** 1 Barra side processor.  
   2 Board support package.
- BSPL** Band sound pressure level; sound pressure level in bands each one-third of an octave wide from 50 to 10,000 Hz.
- BSPR** Boost/sustainer pressure ratio (rocket).
- BSPS** Beam-steering phase-shifter (Awacs).
- BSS** 1 British Standard Specification.  
   2 British Standard family of steels.
- BSSM** British Society of Strain Measurement [Surrey Research Park, GU2 5YG] (UK).
- BST** 1 British Summer Time.  
   2 TSB [French language].
- bst** Boresight.
- BS/TA** Battlefield surveillance and target attack.
- BSTS** Boost-phase surveillance and tracking satellite (or system), for detection of enemy launches, tracking of BVs and PBVs and kill assessment (SDI).
- BSU** 1 Beam-steering unit.  
   2 Bypass switch unit.  
   3 Baggage-screening unit.
- BSV** Burner staging valve.
- BSW** British Standard Whitworth [screwthreads].
- BT** 1 Burn time (rocket).  
   2 Basic trainer (USAAF, USAF category 1930–47).  
   3 Bomber/torpedo (USN category, 1942–45).  
   4 Bathythermograph.
- b<sub>t</sub>** Span of horizontal tail.
- BTAA** 1 Beam transfer Assembly (BC/FC)  
   2 Bonus tax allowance (US).
- BTB** Bus tie breaker.
- BTC** 1 Bus tie connector, or contactor.  
   2 Before top centre.  
   3 Belgocontrol Training Centre, Brussels.  
   4 Business Travel Coalition (US).
- BTF** Buried-target fuze.
- BTB** Beyond the horizon (radar).
- B<sub>3dB</sub>** 3-decibel bandwidth.
- BTI** Battlefield target identification; D adds device, S system. The USA has used BTID to mean battlefield target identification.
- BTL** 1 Between cloud layers.  
   2 Biomass to liquid.
- BTM** 1 Bromotrifluoromethane (extinguishant).  
   2 Burn, then mix.
- BTMU** Brake-temperature monitor unit
- BTN** Between [also BTW, BTWN].
- BTO** Bombing through overcast (WW2).
- BTP** 1 Bureau Trilateral de Programmes (Eur).  
   2 British Transport Police.
- BTR** 1 Bus tie relay.
- 2 Better (ICAO).
- BTS** 1 Bureau of Transportation Statistics (US).  
   2 Border and Transportation Security [DoT] (US).
- BTsVM** On-board [digital] computer (R).
- BTT** Basic training target [aircraft].
- Btu** 1 British Thermal Unit (alternatively, BTU, BThU).  
   2 Bus, or basic, terminal unit.
- BTV** 1 Boost [rocket motor] test vehicle.  
   2 Ballistic test vehicle.  
   3 Brake to vacate.
- BTVOR** Weather broadcast terminal VOR.
- BTW, BTWN** Between.
- BTX** 1 Telephone information system (G).  
   2 Benzene, toluene, xylidene.
- BU** 1 Break-up, thus a guided-weapon \* unit.  
   2 Back-up.  
   3 Broken up.
- BUAA** Beijing University of Aeronautics & Astronautics [subsidiary of AVIC; 100183 Beijing] (China).
- BuAer** Bureau of Aeronautics (USN, 1921–59).
- BUB** Back-up battery/batteries.
- bubble** 1 Continuous ovate-blister film of fuel from airspray-type burner at low flow rate.  
   2 Region of continuous EW protection.
- bubble horizon** Bubble turn and slip.
- bubble memory** Computer memory whose bits are distributed among microscopic voids (bubbles) in a 3-D volume of solid.
- bubble sextant** Sextant in which local horizontal is established by a bubble device. Often called bubble octant, because arc is usually not greater than 45°, restricting altitude to 90°.
- bubble turn and slip** Primitive flight instrument in which lateral acceleration is indicated by sideways displacement of bubble in arched glass tube of liquid.
- BUCD** Back-up command destruct.
- buck** Dolly or transport frame, with or without wheels and usually making no provision for inverting (rolling over) contents, tailored to carry complete engine or other major equipment item.
- bucket** 1 In US, a turbine rotor blade.  
   2 Principal member of most types of thrust reverser, two buckets normally rotating and translating to block path of efflux and divert it diagonally forwards. Alternative (UK) = clamshell.  
   3 Graphical plot having basic U shape resembling \*, notably produced by adding one plot of negative slope (eg operating and servicing cost against MTBF) to a related plot of positive slope (eg capital cost against MTBF).  
   4 A new [2004] buzzword meaning subdivision or part (USAF).
- bucket brigade** Integrated-circuit device, comprising MOS transistors connected in series, serving as shift register by transferring analog signal charge from one storage node to next.
- bucket shop** Retail outlet (shop) offering non-IATA passenger tickets at cut prices.
- bucking** Repeated succession of stalls and recoveries, deliberate or otherwise.
- bucking bar** Shaped bar held against shank in manual riveting.
- buckling** Lateral deflection of structural member under

## buckling coefficient

compressive load; state of instability or unstable equilibrium, but may be purely elastic.

**buckling coefficient** In an overstressed panel, overall \* is given by  $K_E = (\pi k/b)^2$ , where  $k$  is the bending radius of each skin/stringer element and  $b$  is stringer pitch.

**BUCS** Back-up control system.

**buddy** Aircraft providing preplanned in flight assistance to another, specifically by providing fuel to an aircraft of similar type [as distinct from normal tanker] or by laser-marking a target. Hence \*-\* refuelling.

**buddy lasing** Designation of a target by one aircraft for attack by another.

**buddy pack** Flight-refuelling hose reel and drogue packaged in streamlined container for carriage by standard weapon rack; thus, aircraft A can refuel buddy B flying identical aircraft (formerly colloq.).

**BUF** Back-up facility.

**buffer** 1 In radio, low-gain amplifier inserted to prevent interaction between two circuits.

2 Amplifier stage having several inputs, any of which may be connected to output.

3 In EDP, temporary store used to smooth out information flow between devices, esp. between I/O and main processor or core store.

**buffer air** Air fed under pressure to buffer regions surrounding gas-turbine shaft-bearing compartments to ensure that lubricating oil does not seep away through the labyrinth seals. Hence **buffer air seal**, **buffer compartment**.

**buffer distance** In nuclear warfare, horizontal distance (expressed in multiples of delivery error) which, added to radius of safety, will give required acceptable risk to friendly forces; alternatively, vertical distance (expressed in multiples of vertical error) added to fallout safe height to ensure that no fallout will occur.

**buffet** Irregular rapid oscillation of structure caused by turbulent wake. \* in aeroplanes may be caused by excessive angle of attack (due to low airspeed, extreme altitude or excessive g) or, in subsonic aircraft, an attempt to fly at too high a Mach number.

**buffet boundary** For any given aircraft and environment, plot of limiting values of speed and altitude beyond which buffet will be experienced in unaccelerated flight. Also defined as condition at which a 'significant' region of separated flow appears.

**buffet boundary parameter**  $M^2 C_L$ , product of lift coefficient and square of Mach number, at which buffet becomes unacceptable.

**buffet inducer** Small projection, usually in form of strake, intended to induce buffet (usually as warning in advance of dangerous buffet affecting major part of aircraft).

**buffet margin** For any given aircraft and environment, highest vertical acceleration (g) which can be sustained without exceeding given buffet severity (in some cases severity is zero).

**buffet threshold** For any given aircraft and environment, point at which buffet is first perceptible, expressed in terms of speed, altitude and vertical acceleration (g).

**buffing** Process for polishing sheet metal by rotary tool of soft fabric impregnated with fine abrasive.

**BUFR** Binary universal format.

**bug** 1 Heading marker on navigational instrument.

2 Fiducial index, esp. on flight instrument, having

## bulk modulus

appearance of \*. Can be painted, Chinagraph or removable by peeling.

3 Clandestine monitoring device, esp. for audiosurveillance.

4 To install and conceal (3).

5 System malfunction or other fault, esp. one not yet traced and rectified; hence, to debug (colloq.).

**Bug-E** Battlefield universal gateway equipment, translator between SADL and other tactical datalinks (USAF).

**bug-eye canopy** Small canopy (usually two, left and right) over each projecting pilot's head in large aircraft (1942–50).

**bugged** Value marked by bug (2).

**buggying** Riding a ground vehicle, eg trike unit, pulled by kite.

**bugle bag** Sick bag (colloq. among cabin crew).

**bug out** Eject (colloq.).

**bug speed** Speed at which ASI needle passes *bug* (2), usually  $V_{REF}$ .

**BUIC** Back-up interceptor control; add-on to SAGE system [see BICP].

**build** Growth in received radio signal; opposite of fade.

**build standard** Detailed schedule of all possible variable or unresolved items in aircraft or other complex hardware in stage of development or pre-production. Original \*\* may list features of airframe, development state of engines, system engineering and, esp. equipment fitted or absent; altered as aircraft is modified.

**built-in hold** Pre-planned hold during countdown to provide time for defect correction or other activity without delaying liftoff.

**built-up section** Structural members having section assembled from two or more parts, rather than rolled, extruded, hogged from solid or forged. Reinforced composites are not regarded as built-up; essentially parts should be assembled by joints and could be unfastened.

**bulb angle, bulb flange** Structural sections, usually used as booms, having circular or polyhedral form. Nearly all were rolled from strip and had eight to 12 faces after assembly, complete \*\* being built up from one to five segments.

**bulk cargo** Homogenous cargo, such as coal. Today also means cargo carried loose; has come to mean cargo or baggage not contained in standard container or pallet.

**bulk erasure** Erasure of complete magnetic tape by powerful field.

**bulkhead** Major transverse structural member in fuselage, hull or other axial structure, esp. one forming complete transverse barrier. Certain \*, such as pressure \* in aircraft fuselage and tank \* in rocket vehicle, must form pressure-tight seal.

**bulk-injection** In piston engine injection of fuel into induction airflow upstream of distribution to individual cylinders.

**bulk loader** Self-drive belt conveyor vehicle for loading bulk cargo.

**bulkmeter** Instrument, esp. in refuelling of aircraft, for measuring liquid flow, typically as mass per second or as summing indication of total mass passed. Some \* measure volume and require density correction for each liquid handled.

**bulk modulus** Elastic modulus of solid under uniform compressive stress over entire surface, as when immersed

## bulk out

in fluid under pressure; numerically, stress multiplied by original volume divided by change in volume.

**bulk out** To run out of cargo space while still within allowed weight.

**bulk petroleum products** Liquid products carried in tankcars or other containers larger than 45 gal (55 US gal).

**bullet** 1 Gun-fired projectile intended to strike target, having calibre less than 20 mm (0.7874 in).

2 Streamlined fairing having form of quasiconical nose or forepart of body of revolution. If rotating, called spinner.

3 Aluminium or steel peg at top of hot-air-balloon rip line.

**bull gear** Largest gear in train, esp. large gear on which aerial of surveillance radar is mounted.

**bull session** Informal discussion on serious aviation topics, between engineers and/or aviators.

**bull's eye** 1 Circular thimble.

2 Ring used to guide or secure rope.

3 Cockade having concentric rings (colloq.).

**bump** 1 See *Gust* (1).

2 Sensation experienced in flight through gust (1). See *bumps*.

3 To form sheet metal on bumping hammer.

4 *Thrust bump*.

5 See *bumping*.

6 Confusingly, in view of 5, to upgrade a passenger to a higher class.

**bumper** Also called tail\*, a strong skid or shock-absorbed wheel unit to protect the underside of the rear fuselage of a nosewheel-type aircraft.

**bumper bag** Padded or inflated bag beneath lowest point of aerostat to absorb shock of ground impacts.

**bumper rocket** Pre-1955, first stage of two-stage launch vehicle.

**bumper screen** On spacecraft, protective screen intended to arrest micrometeorites and other macroscopic solids.

**bumper wheel** Wheeling machine.

**Bumpf** One of earliest of 35 English-language safety mnemonics: brakes, undercarriage, mixture, pitch, fuel/flaps; G added gills/gyros.

**bumping** Practice of denying a fully booked and confirmed passenger the right to board an overbooked flight; officially called IBR (involuntary boarding refusal). Bumped pax qualify for DBC.

**bumping hammer** Power hammer for bumping.

**bump rating** Increased engine thrust rating (beyond GM or average TO) cleared for short periods; fixed-wing equivalent of contingency.

**bumps** 1 Repeated uncommanded excursions in the vertical plane caused by atmospheric turbulence. Term particularly applies to passage through gusts (2) of exceptional severity.

2 Landings, from circuits and \*.

**Buna** A synthetic rubber mass-produced in G, WW2 (tradename).

**bunching** 1 In traffic control, tendency of vehicles (esp. aircraft) to reduce linear separation, esp. to dangerous degree.

2 In klystron, separation of steady electron stream into concentrated bunches to generate required very high frequency in oscillatory circuit.

## burner can

**bund** 1 Earth bank constructed at airfield to reduce environmental noise.

2 Fuel/ammo dump sufficient for one day's operations from a STOVL hide, replenished daily from Logspark (RAF).

**bungee** Elastic cord comprising multiple strands of rubber encased in braided (usually cotton) sheath.

**bunny suit** Electrically heated [usually blue] suit for high-altitude unpressurized aircraft (US, colloq.).

**bunt** 1 Severe negative-g manoeuvre comprising first half of outside loop followed by half roll or second half of inside loop.

2 In surface-attack missile trajectory, negative-g pushover from climb to dive in terminal phase near target.

**BuOrd** Bureau of Ordnance (USN)

**buoyancy** Upthrust due to the displaced surrounding fluid just sufficient to support a mass. Thus, in aerostat, condition in which aircraft mass equals mass of displaced air. In marine aircraft at rest, mass of aircraft equals mass of water displaced (in this case, as with all aerodynes, displaced air mass is usually ignored).

**buoyant spacecraft** Spacecraft designed to operate as aerostat in planetary atmosphere.

**Buoy communication system** VHF links via satellite from buoys to improve com. over Gulf of Mexico (FAA).

**BUP** Block upgrade programme.

**Buran** Strong NE wind (Russia, Central Asia).

**burble** 1 Turbulent eddy in fluid flow, esp. in proximity to, or caused by, a bounding surface.

2 Brakedown of unseparated flow (not necessarily with laminar boundary layer) across aircraft surface, esp. across top of wing. First region of separated flow due to excessive angle of attack or to formation of shockwaves at  $M_{crit}$ .

**burble point** 1 Angle of attack at which wing first suffers sudden separation of flow.

2 Mach number at which subsonic wing first suffers sudden separation of flow due to shockwave formation.

**Bureau Veritas** International organisation for certifying companies [eg, to ISO 9000] and surveying and underwriting vessels, including aircraft.

**buried engine** Engine contained within air frame, esp. without causing significant protuberance. Normally applied to jet engine inside wing root.

**burn** 1 Operation of rocket engine, esp. programmed operation for scheduled time. Thus, first \*, second \*.

2 Operation of main flame in burner of hot-air aerostat, Thus, a 20-second \*.

3 Authorized destruction of classified material, by whatever means.

**burner** 1 In gas turbine, device for mixing fuel or fuel vapour with swirling primary airflow with minimal axial velocity to sustain stable combustion; generally synonymous with fuel nozzle, fuel injector.

2 Afterburner (colloq., R/T).

3 Incorrectly, though common in US, gas-turbine combustion chamber.

4 In liquid or hybrid rocket, device for injecting and/or mixing liquid propellants to sustain primary combustion; more usually called injector.

5 Stainless-steel vaporizing coil and jet of hot-air balloon.

**burner can** Combustion chamber in engine of can-annular type [UK = flame tube].

**burn in**

**burn in** 1 To enter data in EDP core store so that it will subsequently resist nuclear explosion effects and other hostile action.

2 To operate avionic and other electronic equipment under severe overload conditions to stabilize it before operational service and reduce incidence of faults.

**burnish** To smooth and polish metal surface by rubbing (usually with lubricant) with convex surface of harder metal.

**burn-off** In aeroplane (esp. commercial transport) operation, fuel burned between takeoff and critical position for establishing terrain clearance.

**burnout** 1 Termination of rocket operation as result of exhaustion of propellants. Also called all-burnt.

2 Mechanical failure of part subject to high temperature as result of gross overheating, esp. rocket case or chamber.

**burnout plug** In certain rocket motors, esp. storable liquid and hybrid types, combustible plug which, when ignited, releases and fires liquid propellant.

**burnout velocity** Vehicle speed at burnout (theoretically, highest attainable for given trajectory).

**burnout weight** Mass of vehicle at burnout, including unusable fuel.

**burn rate** In solid rocket, linear velocity of combustion measured (usually in millimetres per second) normal to burning surface. Symbol  $r_b$ .

**burn-rate constant** Factor applied to  $\int r_b^2 dt$  calculations dependent upon initial grain temperature.

**burn-rate exponent** Pressure exponent  $n$  in burn rate law  $r = aP_c^n$ .

**burn table** Refractory surface in tail of plume target on which jet fuel is burnt.

**burn-through** Operation of radar in face of jamming and similar ECM, esp. by virtue of high transmission power to overcome interference.

**burn-through range** Limit of range at which  $\int r_b^2 dt$  operation can yield useful information, if necessary in emergency short-life operation at abnormally high power.

**burn time** Duration in seconds of rocket motor burn. Burn time starts when chamber pressure has risen to 10% of maximum (or averaged maximum during level portion of thrust curve) and ends when pressure drops to 75%. Alternative criterion is to draw tangents to level portion and descending portion of thrust curve and measure time to point at which curve is cut by bisector of angle between tangents. Symbol  $t_b$ .

**burn-time average chamber pressure** Integral of chamber pressure versus time taken over burn time interval divided by burn time. Symbol  $P_{c\bar{b}}$ .

**burn-time average thrust** Integral of thrust versus time taken over burn time interval divided by burn time. Symbol  $F_{b\bar{b}}$ .

**burnup** 1 On entry to atmosphere from space, partial or complete destruction due to kinetic heating.

2 In nuclear reactor, esp. thermal fission reactor, percentage of available fissile atoms that have undergone fission.

**BURR** Basic unscheduled removals rate.

**Burro** Broad-area unmanned responsive resupply operations.

**burst** In colour TV, transmission of small number of cycles of chroma sub-carrier in back-porch period (in military systems this signal not always used).

**buster**

**2 One round (payload)** of ECM dispensed from attacking vehicle; can be active jammer or flare.

**3 Period of fire** by automatic gun[s].

**4 See turbulent** \*.

**5 Catastrophic failure** of a rotating part, especially turbofan fan hub.

**burst controller** *Burst limiter*.

**burst criteria** Design of fan disc to ensure that it will survive any overspeed condition.

**burst diaphragm** Diaphragm sealing fluid system and designed to rupture either upon command or at predetermined dP.

**burst height** Height at which nuclear weapon is programmed to detonate.

**burst limiter** Preset control of number of rounds to be fired in burst (3).

**burst order** Detonation of missile warhead by command.

**BUS** 1 Break-up system (of unmanned vehicle upon command).

2 Backscatter ultraviolet spectrometer.

**bus** 1 Spacecraft carrier vehicle for various payloads.

2 In EDP, main route for power or data. Alternatively, trunk.

3 Busbar.

4 In ICBM, carrier vehicle for MIRV payloads.

5 In any delivery system, carrier vehicle for multiple warheads or submunitions

6 A particular aeroplane (affectionate usage, UK c 1910–30).

**busbar** In electrical system, main conductor linking all generators and/or batteries and distributing power to operative branches.

**Busemann biplane** Aeroplane, so far not built, in which at supersonic speed shockwaves and flows around upper and lower wings would react favourably.

**Busemann theory** First theory for two-dimensional supersonic wing to take into account second-order terms (1935).

**bush** Open-ended drum tailored to fit inside hole, eg to reduce its diameter, act as shaft bearing or serve as electrical insulation (see *grommet*).

**bush aircraft** Aerodyne tailored to utility service in remote (eg Canadian Arctic) regions.

**bushie** Bush pilot (Australia).

**bush pilot** Operator (often also owner) of bush aircraft, usually freelance jobbing professional.

**business aircraft** Aerodyne tailored to needs of business management and executives of government and other organisations.

**Business Class** Airline passenger category between Tourist and First; no universal definition of seat pitch or services provided.

**business engineering** BE, a business integration strategy based on net value to the business, not functional optimisation.

**business jet** Rapidly growing class of business aircraft, abb. bizjet, subdivided by passenger seating into: micro <5, light <7, super light <10, midsize <12, super-midsize <19, and large 20+.

**bust** A failure to comply with instruction to fly at assigned FL.

**buster** R/T command [usually said at least twice] “Fly at

## butterfly

maximum continuous power”, normally to effect interception.

**butterfly** Distorted figure-8 pattern, looking like a butterfly, flown by orbiting combat aircraft on weapon-guidance, EW or, rarely, AWACS duty.

**butterfly tail** Comprises two oblique (dihedral in region 25°–45°) fixed stabilizer surfaces each carrying a hinged surface, the latter operating in unison as elevators or in opposition as rudders; also called V tail.

**butterfly valve** Fluid-flow valve in form of pivoted plate, usually having circular form to close a pipe.

**butt joint** Sheet joint with edge-to-edge contact without overlap, with jointing strip along either or both sides.

**buttock lines** Profiles of intersection of longitudinal vertical planes with surface of solid bodies, esp. aircraft fuselages and marine floats. Zero \*\* is that on axis of symmetry. Used in lofting, these lines do not necessarily correspond with structural members.

**button** Extreme downwind end of usable runway (colloq.).

**button contact** Electrical connector in which a plunger is pressed against the surface of a convex disc [button]; this ensures clean separation, e.g. on launch of a missile.

**buttonhead rivet** Rivet with approximately hemispherical head; used where tensile load may be high.

**butt rib** Compression rib at joint between outer and inner wing, or wing and fuselage.

**butts** Facility for testing aircraft guns [rare, singular].

**BUV** Backscatter ultraviolet.

**BuWeps** Bureau of Weapons, combined BuAer and BuOrd in 1959 (USN).

**Buy's Ballot's law** Professor Buy's Ballot postulated that an observer with back to wind in N hemisphere has lower pressure to left (in S hemisphere, to right). True for any isobar pattern.

**buy the farm** To be killed in a crash, not excluding military action (colloq.).

**buzz** 1 Oscillation of skin or other structure at frequency high enough to sound as a note.

2 Oscillation of control surface at high frequency.

3 Loosely, any single-direction-of-freedom vibration at audible frequency.

4 Wake-interaction noise generated by turbo-machinery, esp. large fans, at 900–4,000 Hz.

5 High-frequency, often violent, pulsation of airflow at supersonic air-breathing engine inlet.

6 To fly aircraft, esp. one of high performance and manoeuvrability, in way designed to harass another aircraft or ground target. Transitive, thus “to \* the control tower”.

7 Collective noun for micros.

**buzz liner** Sound-absorbent liner to fan duct or other surface bounding wake-interaction noise.

**buzz number** Extra-large individual aircraft number (can be unit number or aircraft serial), readable from a distance.

**buzz-saw noise** Buzz (3) from shock system of fan with supersonic flow over blades, composed of discrete tones at multiples of  $N_1$ .

**BV** 1 Bureau Veritas.

2 Bleed valve.

3 Boost vehicle.

4 Present visibility.

**BVA** Bleed-valve actuator.

## bypass turbojet

**BVCU** Bleed-valve control unit.

**BVD** Battlespace visualization display.

**BVI** Blade/vortex interaction (helicopter).

**BVID** Barely visible impact damage.

**BVIS** Baggage vector interface server, provides routing system for host systems of all carriers at one airport.

**BVOR/BVortac** Weather broadcast VOR or Vortac.

**BVQI** Bureau Veritas Quality International.

**BVR** 1 Beyond visual range.

2 Best-value rate.

**BVTRU** Bleed-valve transient reset unit (controls BVs during transients).

**BVU** On-board computer (R).

**b<sub>w</sub>** Wing span [alternative to b].

**BW** 1 Biological warfare [or weapons].

2 Bomb (or bombardment). Wing (USAAC, USAAF, USAF).

3 Bandwidth; also B/W.

**BWA** Blast-wave accelerator.

**BWAN, B-Wan** Back-up WAN.

**BWB** 1 Blended wing/body.

2 Bundesamt für Wehrtechnik und Beschaffung [MoD procurement office] (G).

**BWC** Biological and Toxin Weapons Convention, 1972.

**BWEA** British Wind Energy Association [a major programme is to evaluate impact of wind farms on radars].

**BWEC** Bristol and West of England Consortium [academia, industry, Government] (UK).

**BWER** Bounded, or boundary of weak echo region [of thunderstorms].

**BWFT** Ministry of research and technology (G).

**BWO** Backward-wave oscillator.

**BWPA** British Women Pilots' Association [1955–; office, Weybridge KT13 0QN] (UK).

**BWRA** British Welding Research Association.

**BX** Base Exchange, today AAFES.

**BXA** Bureau of Export Administration (US).

**BY** Blowing spray.

**BYD** Beyond.

**BY\$** Base-year dollars.

**BYG** Blue/yellow/green.

**Bygrave** Slide rule for solving vector triangles, esp. from sextant readings (obs.).

**bypass** 1 Capacitor connected in shunt to provide low-impedance alternative path.

2 Alternative flow path for fluid system.

**bypass duct** Annular space surrounding engine core through which bypass air flows; in modern turbofans usually called fan duct. May be short, or extended back to a mixer.

**bypass engine** Air-breathing jet engine in which air admitted at inlet may take either of two flow paths (see *bypass turbojet*).

**bypass ratio** In bypass turbojet or turbofan, numerical ratio of mass flow in bypass duct divided by that through core, ie cold jet divided by hot. Some have defined as total mass flow divided by core mass flow; this is incorrect, and would always yield numbers greater than 1. BPR is normally measured at TO power at S/L.

**bypass turbojet** Turbojet in which mass flow through LP compressor stages is slightly greater than that through HP stages, excess being discharged along bypass

duct. Also called leaky turbojet. In principle difference between this and turbofan is purely of degree; turbofan has much higher bypass ratio (greater than 1) and probably at least two shafts. In general subsonic engines may be considered turbofans and supersonic engines bypass turbojets.

**byte** 1 Group of bits normally processed as unit.

2 Sequence of consecutive bits forming an EDP word, thus an 8-bit \*, which gives  $2^8 = 256$  possible combinations.

**BZ** Benactyzine.

# C

- C**
- 1 Degrees Celsius.
  - 2 Coulomb[s].
  - 3 Yawing moment of inertia.
  - 4 Compass heading/bearing/course.
  - 5 Capacitance, capacitor, capacity (electrical).
  - 6 Ceiling, or bottom of cloud layer.
  - 7 Thermal conductance.
  - 8 Any constant.
  - 9 Aggregate fuel consumption.
  - 10 Carrier-wave power in watts.
  - 11 Basic mission, cargo (USAS, USAAC, USAAF, USAF since 1925, USN since 1962, UK mission prefix since 1941).
  - 12 JETDS code: air-transportable, carrier-wave, common use.
  - 13 Fighter category (F).
  - 14 Prefix: ground service connection (BSI).
  - 15 Viscous-damping coefficient.
  - 16 Council (ICAO).
  - 17 Customs available.
  - 18 Clear, clears, clearance delivery (ATC).
  - 19 Cell of storm.
  - 20 Continental (air mass).
  - 21 Circling landing minimum.
  - 22 Dirigible class (USN 1914–16).
  - 23 Sport-parachuting certificate; 50+ jumps, 20 landing  $\leq 20$ m of target.
  - 24 Heat capacity per mole.
  - 25 Chemical concentration.
  - 26 Site of Contrôle d'Aérodrome office [large black on yellow sign] (F).
  - 27 Aircraft category: aeroplanes (FAI).
  - 28 Centre (runway identification).
  - c 1 Chord [needs defining in each case].
  - 2 Speed of light in vacuum,  $= 2.997925 \times 10^8 \text{ ms}^{-1}$ .
  - 3 Collector of semiconductor device.
  - 4 Prefix, centi ( $\times 10^{-2}$ , non-SI).
  - 5 Compass.
  - 6 Prefix, circa, = approximate.
  - 7 Subscript, convective, convection.
  - 8 Specific heat.
  - C' Lowey's function.
  - c' Thrust specific fuel consumption.
  - $\bar{C}$  Mean aerodynamic chord [US usage].
  - $\bar{c}$  Geometric mean chord; sometimes  $\bar{C}$ .
  - $\bar{\bar{C}}$  Aerodynamic mean chord; sometimes  $\bar{C}$  [UK usage].
  - $\hat{C}_b$  Chord length ratio.
  - (c) Astronomical Unit, see AU.
  - $C^*$  1 Characteristic exhaust velocity of a rocket.
  - 2 Weighted linear combination of pilot's pitch-control input to aircraft pitch-rate and normal acceleration. In 1964 refined to  $C^{*(t)=g+12.4q}$  where t is time in s, g normal acceleration and q pitch rate in rad/s.
  - C0 to C9** See *cloud types*.
  - C1, C2** Avion de chasse [fighter] with 1 or 2 seats (F).
  - $c_1$  Mean chord of wing from root to tip.
  - C1A** Cr/Al oxidation/oxysulphuration coating.
  - $C^2$  1 Also called C-squared = command and control; BMC adds battle-management communications, I adds

interface or intelligence, IPS information-processing subsystem, ISR intelligence, surveillance and reconnaissance [to which C adds center], IT interoperability trial, MC mobile-capable, P processing, RAD robotics assets display, S status, SIM simulation, SS or S<sup>2</sup> switching system, V vehicle, and W warfare.

2 Camouflage and concealment, thus C2D (usually not C<sup>2</sup>D) is camouflage, concealment and deception.

**C**<sup>3</sup> 1 Also called C-cubed = command, control and communications; CM adds countermeasures, I intelligence, and ISRSS intelligence, surveillance, reconnaissance and space systems.

2 Crash-crew chart[s], detailed airfield plan[s] carried on RIV.

3 Coated carbon/carbon.

**C**<sup>3</sup>**D**, **C3D** Cross-cockpit collimated display.

**C4** Plastic explosive based on RDX/PETN.

**C**<sup>4</sup> Command, control, communications and computers; addition of I and ISR as above, C4ISR previously being called ACN(3); IFTW adds information for the Warrior.

**c**<sup>4</sup> Wing or tail surface quarter-chord line.

**C-band** EM frequencies 3.9–6.2 GHz, now covered by Bands S and X (see *Appendix 2*).

**C-certificate** The first [most junior] awarded to a glider pilot. In 1929 the requirement was 5+ min, landing at a place not lower than point of departure; in 1952 raised to 15+ min.

**C-channel** C = circuit-mode, provides full duplex, voice 9.6 kbit/s, data 10.5, assigned in pairs uplink/downlink.

**C-check** A-check plus thorough inspection of structure, removing fairings where necessary, plus test of systems. For modern airline engine, 24 months.

**C-clamp** Headset.

**C-class** Controlled airspace near busy airport, usually a radar service area.

**C-code** IFR flight-plan suffix: no-code transponder and approved area navigation.

**C-cycle** One complete flight simulated in engine development or test.

**C-display** Rectangular display in which horizontal axis is target bearing and vertical axis is its angle of elevation.

**C-duct** Half a fan duct forming part of an engine pod cowl, usually pivoted at the top for access to the core.

**C-licence** Permits ground engineer to inspect and rectify engines.

**C-Lite** Small polycarbonate fin on wingtip for guidance on crowded airfields and showing if wingtip lights are illuminated.

**C-mode** Transponder transmits altitude.

**C power supply** Between cathode and grid, for grid bias.

**C-scope** C-display.

**C-spar** Structural member along helicopter rotor blade between D-nose and main spar or I-beam, closed at front, open at rear.

**C-stars** Carriage, stream, tow and recovery (AMCS3).

**C-stoff** Rocket propellant (fuel+coolant), hydrazine hydrate plus methyl alcohol, often plus water, usual percentages 30/57/13 (G).

**C-wing** Blended wing/body.

**CA** 1 Controller Aircraft; holder of this office is also Deputy Chief of Defence Procurement (UK).

2 Controlled airspace.

3 Cabin attendant[s] (airline costings).

4 Conversion angle.

5 Circuit analog.

6 Cruiser, gun armed [can have SAM secondary armament] (USN).

7 Cetyl alcohol, a lubricant.

8 Control advises.

9 Conflict alert.

10 Component availability.

**CIA** 1 Coarse acquisition (GPS).

2 Course acquisition.

**CAA** 1 Civil Aviation Authority [1972–, said to mean ‘campaign against aviation’; London WC2B 6TE] (UK).

2 Civil Aeronautics Authority [1938–40] (US).

3 Civil Aeronautics Administration [1940–58, part of Department of Commerce, became FAA] (US).

4 Civil Aviation Administration (Israel).

5 Conformal-array antenna, or aerial.

6 Chromic-acid anodizing.

7 Cargo Airline Association (US).

8 Component application architecture.

9 Continued airworthiness assessment (FAA).

**CAAA** 1 CAA(1) Approved.

2 Commuter Airlines Association of America, also called C3A or C-triple-A, and now the RAA.

3 Canadian Aviation Artists Association.

**CAAC** Civil Aviation Administration of China, from 1964.

**CAACU** Civilian Anti-Aircraft Co-operation Unit (UK, various dates 1950–71).

**CAADRP** Civil Aircraft Airworthiness Data Requirements [originally Recording] Programme (UK).

**CAAFI** 1 Commercial aviation alternative fuels initiative (Int.).

2 CAA(1) of the Fiji Islands.

**CAAFU** CAA(1) Flying Unit, originally for navaid calibration, now examines candidates for licences.

**CAAG** CFIT/ALAR Action Group (FSF).

**CAAM** Continued airworthiness assessment methodologies (FAA).

**CAAP** Common avionics architecture for penetration.

**CAARC** Commonwealth Advisory Aeronautical Research Council (Int., office in London).

**CAARP** Cooperatives des Ateliers Aéronautiques des la Région Parisienne (formed 1965).

**CAAS** 1 Computer-assisted approach sequencing.

2 Common avionics- [sometimes translated as aviation] architecture system.

3 Civil Aviation Authority of Singapore.

**CAASA** Commercial Aviation Association of Southern Africa [office, Johannesburg].

**CAASD** Center for Advanced Aviation System Development (Mitre Corp.).

**CAASP** Common avionics architecture system program (USSOF).

**CAASS** Computer-aided aircrew scheduling system (USAF).

**CAATER** Co-ordinated access to aircraft for transitional environmental research (EU).

**CAATS** 1 Computer-assisted aircraft trouble-shooting.

2 Canadian automated ATC system.

3 Computer-aided aerodrome training suites.

**CAAV** CAA of Vietnam.

**CAAVTS** Compact airborne automatic video tracking system.

**CAAZ** CAA of Zimbabwe.

**CAB** 1 Civil Aeronautics Board (US, 1940–84).

2 Common avionics baseline.

**cab** 1 Structure containing cockpit of large aircraft, often excluding nose.

2 Airport tower, especially workplace of controllers.

**CABA** Consolidated agile-beam antenna.

**cabane** Structure of braced struts used to carry load above fuselage or wing, such as upper wing of biplane or parasol wing, engine nacelle or bracing wires to wingtips.

**cabin** 1 Enclosure for aircraft occupants; today excludes cockpit or flight deck.

2 Occupied part of simulator, with or without motion.

**cabin altitude** Altitude corresponding to pressure inside cabin.

**cabin blower** In some pressurized aircraft, shaft-driven cabin blower, also called cabin supercharger.

**CabinCall** First certificated system allowing use of mobile phone, initially on business aircraft.

**cabin crew** Staff who attend to passengers in flight.

**cabin distribution system** Links CTV with passenger and crew telephone and data terminals.

**cabin file server** Links CMU to ISVSs and POSTs.

**cabin fog** Caused when cold dry input hits warmer humid cabin air.

**cabin pressure** Ambiguous; can mean absolute pressure inside aircraft or pressure differential (dP) between cabin and surrounding atmosphere.

**cabin supercharger** See *cabin blower*.

**cabin telecommunications unit** A complex PBX for satcoms, to Arinc 746.

**cable** 1 Non-SI unit of length, =  $2.19456 \times 10^{-2}$ m,

2 Traditional term for filament for winch or other surface launch of glider, irrespective of material.

**cable cutter** One-shot guillotine, powered by cartridge, on wing leading edge to cut barrage cables.

**cable-drag drop** Low-level airdrop with load extracted and arrested by ground cable installation.

**cable hover** Design requirement for ASW helicopter autopilot while dunking.

**cable-strike protection** See *wire-strike protection system*.

**cabotage** Freedom of air transport operator to pick up or set down traffic in (usually foreign) country for hire or reward.

**cabrage** Rotation of aeroplane about lateral axis to increase angle of attack (obs.).

**cab-rank patrol** Close air-support technique in which instead of striking designated targets or targets of opportunity, aircraft loiter awaiting assignments from surface forces.

**CABS** Centre for Airborne Systems (DRDO).

**cabs, CABS** Cockpit air-bag system [USA/Simula].

**CAC** 1 Combat Air Command.

2 Combat-assessment capability.

3 Computer acceleration control.

4 Centralised approach control.

5 Caution advisory computer.

6 Ciurse acquisition code.

**CACA** National certification authority (Poland).

- Cacas** Civil Aviation Council of the Arab States.
- CAC<sup>3</sup>**, **CACCC** Combat air command and control center.
- CIA code** Coarse acquisition code (GPS).
- CACP** Cabin-air, or area, control panel.
- CACRC** Commercial aircraft composite repair committee [formed by US airframers and operators 1991, administered by the SAE].
- CAC<sup>2</sup>S** Common aviation command and control system (USMC).
- CACTCS** Cabin-air conditioning and temperature control system.
- CACU** Coast Artillery Co-operation Unit (RAF c1926–).
- CAD** Computer-assisted design [/CAM adds computer-assisted manufacturing, D adds drafting].
- 2 Cushion-augmentation device [US = LID].
  - 3 Cartridge-actuated [or activated] device; /PAD adds propellant-actuated device.
  - 4 Close-in air defence.
  - 5 Computer-aided dispatch.
  - 6 Component advanced development.
  - 7 Civil Aviation Department (Hong Kong).
  - 8 Chemical agent defeat.
  - 9 Continuous [i.e., 24-hour] airborne deterrent.
- Cadal** Communications automation and data-link.
- CADC** 1 Computerised air-data centre (Elbit).
- 2 Central air-data computer.
- CAD-DET** Pronounced ‘Cadet’, close air-defence detachment engagement trainer [22 MoD sites] (UK).
- CADS** Canadian dollars.
- CADE** Computer-aided design evaluation.
- CADEA** Confederación Argentina de Entidades Aero deportivas.
- cadence braking** Rapidly repeated jabs on pedals or other input.
- cadensicon** Measures fuel density and permittivity as it enters aircraft tank.
- Cades, CADES** Computer-aided design and evaluation system.
- Cadets** Computer-assisted documentation education tutorial system.
- CADF** 1 Commutated-aerial (or antenna) direction-finder, or finding.
- 2 China Aviation Development Foundation (Taiwan).
- Cadin** Czech aeronautical data-interchange network.
- Cadiz** Canadian air-defense identification zone.
- CADM** Clustered airfield defeat, or dispensed, munition(s).
- Cadmat** Computer-assisted, or augmented, design, manufacture and test.
- cadmium** Symbol Cd, soft white metal, density 8.7, MPt 321°C, major uses electroplating, NiCd batteries, CdS IR detectors and fusible alloys.
- CADO** Central Air Documents Office (USA).
- CADP** Central annunciator display panel.
- CADRE, Cadre** 1 Communications-actuated data-retrieval equipment.
- 2 Center for, now College of, Aerospace Doctrine, Research and Education (Air University, Maxwell AFB).
- cadre** 1 Adjective: formed from regular and reserve personnel.
- 2 Initial, incomplete military unit, deploying new hardware for first time.
- Cads, CADS** 1 Cushion-augmentation device[s] to increase jet lift near ground.
- 2 Concept and design study/studies.
  - 3 Computer-aided debriefing system.
  - 4 Controlled aerial delivery system [without aircraft having to land].
- CADSI** The Canadian Association of Defence and Security Industries.
- CADWS** Close air-defence weapon system[s].
- CAE** 1 Computer-aided, or assisted, engineering.
- 2 Component-application engineer.
  - 3 Control-area extension.
- CAé** Commission d’Aérolégie (WMO).
- CAEA** Confederación Argentina de Entidades Aero deportivas [federation of air sport, office BA] (Argentina).
- CAEDM** Community/airport economic-development model.
- CAEE** Committee on Aircraft Engine Emissions (ICAO).
- CAEM** Cargo-airline evaluation model.
- Caem** Commission for Aeronautical Meteorology (WMO).
- CAEP** Committee on Aviation Environmental Protection, or Protocol (ICAO).
- Caepe, CAEPE** Centre d’Achèvement et d’Essais de Propulseurs d’Engins (F).
- CAER** See **EARC**.
- Caerat, CAERAT** Common American/European Reference Aeronautical Telecommunications [F adds facility, NF network facility].
- Caesar, CAESAR** 1 Component and engine structural assessment and research.
- 2 Coalition aerial surveillance and reconnaissance (NATO).
  - 3 Captor active electronically scanned array radar.
- caesium** In N America cesium, symbol Cs, gold-colour soft metal, density 1.9, MPt 28°C, used in glasses (but the hydroxide dissolves glass), highly reactive and toxic.
- CAEW** Compact, or conformal, airborne early warning.
- CAF** 1 Canadian Armed Forces.
- 2 Citizen Air Force (South Africa).
  - 3 Confederate Air Force [US, from 1961, now called Commemorative AF, Midland, TX].
  - 4 Chinese Air Force.
  - 5 Cleared as filed.
  - 6 Cyprus Airports Federation [Nicosia 2122].
  - 7 Charities Aid Foundation (UK).
- CAFAC** CAF(1) Air Command.
- Cafac** Commission Africaine de l’Aviation Civile (Int.).
- CAFATC** Canadian Air Transport Command.
- CAFID** Collection, analysis, fusion and dissemination.
- Cafda** Commandement Air des Forces de Défense Aérienne (F).
- CAFH** Cumulative airframe flight hours.
- CAFI** Commander’s annual facilities inspection.
- CAFMS** Computer-assisted force management system.
- CAFT** 1 Combined advanced field team (evaluated new captured hardware in WW2).
- 2 Civil Airworthiness Flight Testing (ETPS).
- C/Aft** CNS/ATM focus team.
- CAFU** Civil Aviation Flying Unit (UK).
- CAG** 1 Carrier air group (USN).

- 2 Civil Air Guard (UK, 1937–39).  
 3 Circulation aérienne générale (F).
- CAGE** 1 Commercial and governmental entity.  
 2 Commercial avionics GPS engine.  
 3 Combined arms gateway environment.
- cage** 1 To orientate and lock gyro into fixed position relative to its case.  
 2 Housing for bearing balls/rollers/needles.
- caged switch** Protected against inadvertent operation by spring-loaded hinged box.
- CAGR** Compound average, or annual, growth rate.
- CAGS** Central attention-getting system.
- CAH** Cabin-attendant handset.
- CAHC** The Canadian Aviation Heritage Centre [McGill university Macdonald Campus, Montreal H9X 3V9].
- CdHgTe** Cadmium mercury telluride.
- CAHI** Central Aerodynamics and Hydrodynamics Institute (Moscow, founded 1 December 1918).
- CAHS** Canadian Aviation Historical Society.
- CAI** 1 Civil Aeromedical Institute (FAA).  
 2 Computer-aided instruction (see *CMI*).  
 3 Close approach indicator (STOVL carrier landing).  
 4 Czech Astronomical Institute.  
 5 Caution annunciator/indicator.  
 6 Component analysis and integration.  
 7 Composites affordability initiative (USAF).
- CAIG** Cost analysis improvement group (DoD).
- CAIMS** Central aircraft information management, or maintenance, system.
- Cains** Carrier aircraft (since 1982, also aligned) inertial navigation system.
- CAIP** Civil aircraft inspection procedure[s].
- CAIR** Confidential aviation incident reporting [P adds programme].
- Cair** System for humidifying First and Business on long-haul (CTT).
- CAIRA** See *IAARC*.
- CAIS** 1 Common Ada [or APSE] interface set.  
 2 Common airborne instrument, or instrumentation, system.
- CAIV** Cost as an independent variable [each decision taken on basis f (cost of program)].
- cAk** Continental Arctic air mass, very cold.
- cal** Calorie.
- CALCM** Conventional [i.e., not nuclear] air-launched cruise missile.
- calculated altitude** Celestial altitude calculated but not observed.
- Calda** Canadian Airline Dispatchers Association [Milton, ON].
- Calea** Canadian Airline Employees Association [Mississauga, ON].
- Cale gear** Shock-absorbing system in carrier arrester wire anchors.
- CALF, calf** Common affordable lightweight fighter.
- Calfab** Computer-aided layout and fabrication.
- Calfax** Patented quick-release panel fastener, latch opened or closed by 540° rotation.
- calf-garters** Automatic leg-restraint straps in certain ejection seats.
- caliber** US unit of length, =  $10^{-2}$ in.
- calibrated airspeed** IAS corrected for ASI system errors; ‘true indicated airspeed’, but see *airspeed*.
- calibrated altitude** Not normally used, but signifies pressure altitude or radar height corrected for instrument errors.
- calibrated club propeller** Club propeller whose drive torque has been measured and plotted against rpm; thus, can serve as dynamometer.
- calibrated focal length** Equivalent focal length adjusted to equalise positive and negative distortion over view field.
- calibration card** Graphical or tabular plot of instrument errors (other than compass); usually displayed near instrument.
- calibration test** Static run of bipropellant rocket engine to check propellant mixture ratio and performance.
- calibrator** Device for measuring instrument errors.
- calibre** Bore (ID) of tube, esp. diameter of largest cylinder that fits inside (thus, in rifled barrel, touches highest points of opposing lands).
- caliper** Instrument for measuring or checking thickness, diameter or gap; with internal or external measuring points on tips of pivoted or sliding arms.
- calipher** Caliper.
- Calipso** Cloud aerosol lidar and IR pathfinder satellite observation[s].
- Callback** Confidential reporting system to attempt to record civil (especially air carrier) incidents caused by human failures (FAA via NASA).
- call fire** Fire against specific target delivered as requested.
- call for fire** Request, by FAC or other observer, for fire on specific target and containing target data.
- calling** See next.
- calling out** Spoken data readout by crew member or ground observer to assist pilot or other crew member; thus, co-pilot’s speed/altitude checks on instrument approach.
- call mission** CAS (3) mission at short notice by pre-briefed pilot with pre-armed aircraft, target assigned after take-off.
- call number** 1 In EDP, number code identifying subroutine and containing data relevant to it.  
 2 Aircraft serial number, its identity on radio [general usage] (US).
- callout notes** On engineering drawing, written notification of special features (eg material, process, tolerance or equipment installation).
- Calls** Computer-aided language learning system.
- callsign, call sign** Pronounceable word(s), sometimes with suffix number, serving to identify a communications station (such as an aircraft). Civil aircraft \*\* are ICAO phonetic letters and numbers derived from international registration; ground station \*\* are name of airport followed by type of station (tower, departure, clearance delivery, etc).
- calm** No sensible wind.
- CALNS, Calns** Common air-launched navigation system.
- calorie** Unit of quantity of heat, contrary to SI; International \*,  $\text{cal}_{\text{IT}} = 4.1868 \text{ J}$  by definition,  $15^\circ$  \* =  $4.1855 \text{ J}$ , thermochemical \* =  $4.184 \text{ J}$ .
- calorific value** Quantity of heat released by burning unit mass of fuel;  $\text{kJ/kg} = 0.429923 \text{ Btu/lb}$ ;  $\text{kJ/m}^3 = 0.200784 \text{ Btu/Imp. gal}$ .
- Calorizing** Heating steel part surrounded by aluminium

- (liquid or granules); gives protection in high-temperature use.
- Calow** Contingency and limited objective warfare.
- Calpa** Canadian Air Line Pilots' Association [office, Brampton, ON].
- Calrod** Electric heater [many types] fitting inside shafts of FCS or other mechanisms.
- Cals, CALS** 1 Computer-aided logistics support.  
2 Computer-aided acquisition and logistic [or lifetime] support.  
3 Continuous acquisition and life-cycle support.  
4 Carrier aircraft-landing system.
- Calsel** Proposed *Selcal* modification in which signal is combined with a gating tone to produce automatic receiver function.
- CALT** China Academy of Launch-vehicle Technology, Beijing.
- Caltech** California Institute of Technology, Pasadena, name since 1920, founded 1891 as Throop Polytechnic Institute.
- Calthrop** Patented designs of aircrew parachute, c1917–.
- CalVer** Calibration verification.
- Calvert lighting** Original system of crossbar approach lighting.
- CAM** 1 Cockpit angle measure (flight deck vision limitations expressed as angles).  
2 Catapult armed merchantman (UK ships, 1941–43).  
3 Chemical-agent munition (or monitor).  
4 Circulation aérienne militaire (F).  
5 Computer-assisted manufacture, or computer-aided manufacturing.  
6 Conventional attack missile.  
7 Content-addressable memory.  
8 Counter-air missile.  
9 Centre of Aviation Medicine (RAF).  
10 Commercial, or Contract, Air Mail routes (US, from 1926).  
11 Cockpit audio monitoring.  
12 Cabin assignment module (CIDS, later FAP).  
13 Civil Aeronautics Manual (US).  
14 Control-actuator mechanism.  
15 Continued airworthiness management.
- cam** Rotating or oscillating member having profiled surface to impart linear motion to second member in contact with it.
- CAMA** Civil Aviation Medical Association (US, office Oklahoma City).
- CAMAA** Commercial application of military airlift aircraft (USAF).
- camber** 1 Generally, curvature of surface in airflow.  
2 Curvature of aerofoil section, locus of points measured along centreline or upper or lower surface at 90° to camber line itself, positive when centreline is arched in direction of lift force (see *upper* \*, *lower* \*, *centreline* \*, *conical* \*, *reflex* \*, *mean* \*, *local*\*).  
3 Centreline of aerofoil.  
4 Inclination of landing wheels away from vertical plane.
- cambered blade** Helicopter main-rotor blade incorporating camber, instead of having symmetric profile.
- cambered Krüger** Krüger having flexible profile to increase camber when open.

- cambered wing** Wing section whose centreline is not coincident with chord.
- CAMBS** Command active multi-beam sonobuoy.
- Camden** Co-operative air and missile defense exercise network.
- CAMDS** Chemical agent munitions disposal system.
- CAME** Continuing airworthiness management exposition.
- CAMEA** Canadian Aircraft Maintenance Engineers' Association.
- Camel** Cartridge-activated miniature electromagnetic
- Camera axis** Perpendicular to film plane through optical centre of lens system.
- camera gun** Camera, usually colour ciné, aimed at target with aircraft gun and operated by gun-firing circuit; used to provide combat confirmation, intelligence information and, with unloaded gun(s), as training aid.
- camera obscura** Dark room equipped with lens projecting image of external scene on to wall or floor (formerly used as bombing target with roof lens for recording of bomb release position).
- camera recorder** One or more cameras arranged to provide continuous film of instrument panel or similar data source.
- camera tube** TV converter of optical scan into electrical video signals (Orthicon etc.).
- CAMF** Christian Airmen's Missionary Fellowship, became MAF).
- camfax** Camera facsimile, especially for synoptic charts.
- cam follower** Driven member in sliding or rolling contact with cam.
- CAMI** 1 Computer-aided (or -assisted) manufacturing and inspection.  
2 Civil Aerospace Medical Institute [originally CARI], Oklahoma City (US).
- Camic, CAMIC** Civil Aviation Management Institute of China.
- Camir** Centre for Aviation Maintenance and Inspection Reliability (US).
- CAML** Cargo-aircraft minelayer.
- cam lobe** Profiled projection from straight or circular baseline.
- Camloc handle** Patented self-tightening latch for cowlings and skin access panels.
- CAMMS** Co-operative aggregate mission-management system, for multiple UAVs.
- CAMM2** Computer-aided maintenance-management system, Version 2.
- CAMOA** Continued airworthiness management organisation approval.
- Camos** Computer-aided meteorological observing system.
- camouflage** Attempt to change appearance to mislead enemy, esp. by concealment with portable material or painting to reduce visual contrast with background.
- camouflage detection photography** Use of film whose spectral response differs from that of human eye (eg IR-sensitive).
- campaign fire** An enormous forest or other fire calling for the assembly of large resources.
- Campbell diagram** Plot of natural frequencies against rpm for rotating part.
- Camps** Civil-aircraft missile protection system, [i.e., protection against missiles].

**cam ring** Ring inside crankcase of radial piston engine geared to crankshaft and having sequence of lobes to operate inlet and exhaust valves of all cylinders in that row.

**CAMS** 1 Combat aviation management system (USA).

2 Control and monitoring system.

**camshaft** Shaft equipped with cams aligned with valve gear of cylinders of in-line piston engine.

**Camsim** Canadian airspace management simulator.

**CAMU** Central avionics management unit (databus).

**CAN** 1 Committee on Aircraft Noise (ICAO).

2 Correio Aereo Nacional [national air mail] (Brazil).

can 1 Individual flame tube of can-annular combustion chamber.

2 Complete combustion chamber of multi-combustor engine.

3 Five-sided box projecting into integral wing tank to accommodate slat track.

4 Controlled-environment weapon container.

**Canadian break** Max-rate 360° turn.

**can-annular** See *cannular*.

**canard** 1 Tail-first aerodyne, usually with auxiliary horizontal surface at front (foreplane) but vertical surface (fin, rudder) at rear.

2 Foreplane or nose yaw control fitted to \* (1).

**cancel** 1 To terminate complete R&D or hardware programme.

2 To countermand order.

3 To deactivate activity (eg, \* reverse thrust).

**C&C** 1 Command and control.

2 Cross & Cockade International [society; Bristol BS16 2TL, but founded in US in 1959] (UK).

**C&DH** Communications and data-handling.

**candela** SI unit of luminous intensity 1/683 W/sr [monochromatic at 5.4 x 10<sup>14</sup> Hz], abb. cd; [in US sometimes called candle].

**candle** 1 Former unit of luminous intensity (based on Harcourt pentane lamp).

2 Of parachute canopy, to become so constrained by rigging lines as to fail to deploy.

**candlepower** Former measure of rate of emission of light by source, usually in given direction, abb. cp; see *candela*, *luminous flux/intensity*.

**C&M** Care and maintenance.

**C&W** Control, or caution, and warning.

**CANES** Codes addresses numériquement à nombre d'entrées sélectionnable, = PCM (F).

**CAN 5** Committee on Aircraft Noise, rules for new aircraft types (ICAO).

**canister** Preferred term for tubular TEL(4) for SAMs.

**canned cycle** Complete routine for particular computerised process, such as drilling and reaming a hole in NC machining.

**cannibalise** To dismantle aircraft or other hardware to provide spare parts.

**cannibalisation rate** Actual number of item in given period.

**canning** Loading gun ammunition into magazine tank, box or drum.

**cannon** Generally, gun of calibre 20 mm [0.7874 in] or greater.

**Cannon plug** Vast range of electrical connectors (trade name, ITT Industries).

**cannular** Annular combustion chamber containing

separate flame tubes, each of which may have a ring of burners.

**canoe fairing** Boat-shaped covering over tracks for area-increasing flaps and other wing movables.

**canoe radar** Aircraft radar whose radome has canoe-like shape.

**canonical time unit** Time required for hypothetical satellite in geocentric equatorial orbit, with centre of satellite coincident with surface of Earth, to move distance subtending 1 radian at centre: 13.447 minutes.

**canopy** 1 Fairing, usually transparent, over flight crew or, in lightplane, all occupants, which does not form part of airframe and slides or pivots for entry and exit.

2 Rarely, transparent fairing over flight crew which does form part of airframe and is not used for entry/exit.

3 Main deployable body of parachute.

4 Another name for the envelope of a balloon.

**CANP** 1 Collision-avoidance notification procedure.

2 Civil air [or aircraft or aviation] notification procedure, tells military of low-level [ $\leq 305\text{m}$ , 1,000ft] civil activity (UK).

**CANS** Civil air navigation school.

**Canso** Civil Air-Navigation Services Organization (Int., based Netherlands).

**cant angle** 1 Angle between centreline of winglet and local vertical [OZ axis], seen from head-on.

2 Angle between biplane interplane strut and local vertical, seen from head-on.

**Cantass** Canadian towed-array sonar system.

**canted deck** Angled deck.

**canted nozzle** Nozzle of jet engine, usually turbojet or rocket, whose axis is fixed and not parallel to centreline of engine or motor or to line of flight, but passes close to vehicle c.g.

**cantilever** Structural member, such as beam, rigidly attached at one end only. Thus \* wing is monoplane without external struts or bracing wires.

**cantilever ratio** Semi-span divided by maximum root depth.

**Canukus** Standards agreed by Canada, Australia, New Zealand, UK, US.

**CAO** Combined Air [now Air and Space] Operations [C adds Center, CC Command Centre, CS Center for Space].

**CAOOA** Civil Air Operation Officers Association of Australia [office, Melbourne].

**CAP** 1 Civil Air Patrol (US, from 1941, office at Maxwell AFB).

2 Combat air patrol or carrier air patrol.

3 Continuing Airworthiness Panel, and study group on \*\* problems (ICAO).

4 Chloroacetophenone (tear gas, also called CN).

5 Civil Air Publication (various countries).

6 Contractor assessment program (US).

7 Consolidation by atmospheric pressure, an advanced powder metallurgy process (Cyclops).

8 Combat ammunition production (USAF).

9 Crew alert[ing] panel.

10 Control anticipation parameter [which see].

11 Capacity.

12 Contact approach.

13 Club Aviazione Popolare [homebuilders, office, Varese] (Italy).

**cap** 1 Extreme nose structure of aerostat (see *bow* \*).

2 See *flight* \*.

## CAPA

3 Various portions of parachute system (see *petal* \*, *tear-off* \*, *vent* \*).

4 Tension boom in form of flat strip attached along top or bottom edge or spar or around rib.

5 Upper limit on a proposed budget.

**CAPA** 1 Central airborne performance analyser.

2 Coalition of Airline Pilots' Associations (US).

**capability insertion** Improvement.

**Capac** Canadian Association of Primary Air Carriers [office, Winnipeg].

**Capa cartridge** Rocket-propelled explosive bird-scatter.

**capacitance** In electrical system, ratio of charge to related change in potential. Basis of fuel measurement system which gives readout of fuel mass irrespective of aircraft attitude. SI unit is farad.

**capacity** In an EDP installation, number of bits storable in all cores, registers and other memories.

**capacity payload** Payload limited by volume, number of seats or other factor apart from mass.

**capacity safety valve** Device on carrier catapult (dial-to-aircraft weight) to prevent overloading cylinder or strap/tow bridle.

**capacity ton-mile, CTM** Unit of work performed by transport aircraft with capacity payload.

**Capas, CAPAS** Computer-assisted performance-analysis system.

**cap cloud** Forms above, or enshrouding, a peak or ridge-line.

**Capdi, CAPDI** China Aeronautical Project and Design Institute [100001 Beijing] (China).

**CAPE, Cape** 1 Convective available potential energy.

2 Computer-aided parametric engineering.

**Cape Canaveral** On E Florida coast (US), at one time called Cape Kennedy; site of KSC.

**Cape Town treaty** First international agreement on financing of purchases of aircraft and engines [ratified 2006] (Int.)

**capillary drilling** ECM technique using nitric acid fed through glass tube containing platinum cathode; can rapidly etch precision holes as small as 0.19 mm (0.0075 in).

**CAPP** Computer-aided programme planning, or planning project.

**capped** Subjected to legal upper limit (slot[3] allocation).

**capping membrane** Flexible sheet hastily placed over filled bomb crater.

**capping strip** See cap (4).

**CAPPS, Caps** Computer-assisted passenger pre-screening system. CAPPS-2, or -II was new-generation replacement, in turn replaced by Secure Flight (TSA).

**Capre** Capability reconnaissance.

**Capri** Compact all-purpose range instrument, made by RCA.

**CAPRS** Community air-passenger reporting system (EC7).

**CAPS, Caps** 1 Computer antenna pointing system (Satcom).

2 Conventional armaments planning system (NATO).

3 Computer-assisted passenger screening.

4 Civil-aviation purchasing service.

5 Civil, or commercial, airliner protection system, against terrorist SAM.

**Capsin** Civil-aviation packet-switching integrated network.

## Carad

**Cap/strike** Mission is primary CAP (2), secondary strike; strike ordnance jettisoned to engage in air combat.

**capstrip** See cap (4).

**capsule** 1 Small hermetically sealed compartment (eg aneroid).

2 Sealed compartment or container for instrumentation in space or other adverse environment.

3 Small manned spacecraft.

**CAPT** Coverage analysis and planning tool (Eurocontrol).

**capt.** Captain.

**captain** 1 Very loosely, any PIC.

2 More correctly, officer in charge of military, naval or commercial aircraft having flight crew numbering more than one; not normally used with two-seat combat aircraft. Usually \* is PIC but in RAF in WW2 could have any aircrew trade, in today's MR [e.g. Nimrod] \* is Tac Nav, and in AAC helo \* is Gunner [missile operator] regardless of rank. Airline \* has status of rank with four gold stripes.

**captain's bars** Parallel lights under tanker fuselage to assist receiver's station-keeping (USAF).

**captain's discretion** Undefinable. Most airline captains are permitted to ignore some rules, such as number of hours on duty, or limitations on flight time.

**caption** Small rectangular display bearing name of airborne system or device, visible when lit from behind.

**caption panel** Array of 20–60 captions, usually serving as CWP or alerting device giving indication of failure on broad system basis.

**captive balloon** Balloon secured by cable to surface object or vehicle.

**captive firing** Firing of complete vehicle, normally unmanned rocket, while secured to test stand.

**CAPTS** Co-operative area passive tracking system, provides air and surface surveillance with target ident and precise position (with ASDE, ASTA, ATCRBS, TCAS).

**capture** 1 In flying aircraft or space vehicle, to control trajectory to acquire and hold given instrument reading.

2 In flying aircraft, to control trajectory to intercept and then follow external radio beam (eg ILS, radio range).

3 In ATC or air-defence system, to acquire and lock-on to target.

4 In interplanetary (eg Earth-Moon) flight, eventual dominant gravitational pull of destination body.

5 In automatic or self-governing system not always operative (eg yaw damper), limits of aircraft attitude and angular velocity within which its authority is complete.

**capture rate** Data rate in kb/s or Mbit/s.

**CAR** 1 Civil Air Regulations (FAA, US).

2 Civil Airworthiness Regulations (CAA, UK etc).

3 Caribbean (ICAO).

4 Conformal-array radar.

5 Crew/aircraft ratio.

**car** 1 Nacelle housing crew and/or engines suspended beneath aerostat.

2 Loosely, payload container attached to or within aerostat, esp. airship.

**CARA** 1 Computer-aided requirements analysis.

2 Combined-altitude radar altimeter.

3 Cargo and rescue aircraft.

**Carabas** Coherent all-radio-band sensing.

**carabiner** Karabiner.

**Carad** 1 Civil aerospace R & D.

## CARAM

2 Civil aircraft research and demonstration programme (UK).

**CA RAM** Circuit analog radar absorbent material.

**carangifoil** Corrupted from carangiform [fish-like] and aerofoil to describe airships whose envelope is a vertical two-dimensional shape with this cross-section.

**Carat** Cargo agents reservation airway-bill insurance and tracking system.

**carat** Non SI unit of mass, = 0.2g.

**carb air** See carburettor air.

**carboblast** Lignocellulose blasting abrasive (BGS); used to clean gas path of running gas turbine and made from crushed apricot stones.

**carbonbronze** Copper alloys containing 8 per cent tin (and trace of phosphorus).

**carbon** Possibly most important element in aerospace, primary constituent of hydrocarbons [e.g., fuels], carbon/graphite fibre and even diamond [heat sink], symbol C, density [graphite] 2.3, MPt various to 3,600°C.

**carbon/carbon** Composite material: pyrolysed carbon fibres in pyrolysed carbon matrix.

**carbon fibre** Range of fine fibres pyrolysed from various precursor materials (eg PAN) and exhibiting outstanding specific strength and modulus. Used as reinforcement in CFRP.

**carbonising, carbonitriding** See *Nitriding*.

**carbon microphone** Contains packed carbon granules whose resistance, and hence output signal, is modulated by variable pressure from vibration of sound diaphragm.

**carbon oxides** Gases produced upon combustion of carbon-containing fuel: principally carbon monoxide CO, carbon dioxide CO<sub>2</sub> and wide range of valence bond variations. CO<sub>2</sub> present in Earth atmosphere (3 parts in 10<sup>4</sup>); percentage much higher in exhaled breath.

**carbon seal** Sliding seal between moving machinery (eg turbine disc) and fixed structure; oil removes heat.

**carbon tetrachloride** CCl<sub>4</sub>, liquid, BPt 24.89°C, s.g. at 20°C 1.595.

**carburetor** See *carburettor*.

**carburetion** Mixing of liquid fuel with air to form optimum mixture for combustion.

**carburettor** Device for continuously supplying engine, esp. Otto-cycle piston engine, with optimum combustible mixture. Many forms exist, some with choke tube and others injecting liquid fuel direct into cylinders (in which case injection pump can assume \* function). Not fitted to most steady-burning devices such as gas turbines and heaters.

**carburettor air** Induced, usually via ram intake, along separate duct; intake normally anti-iced. If fitted, a \* control provides a choice of cold air, or air heated by various means.

**carburettor icing** Caused by depression in venturi of choke tube giving local reduction in temperature.

**carburising** Prolonged heating of fully machined steel part in atmosphere rich in CO or hydrocarbon gases to give hard, tough outer layer.

**carburising flame** Oxy-acetylene flame having excess acetylene.

**Carcinotron** Backward wave oscillator; TWT for generating microwaves in which electron beam opposes direction of travel of a wave guided by a slow-wave structure.

## CARNF

**CARD** Civil aviation research and development (NASA, DoT).

**Card** Aerobatic-team formation resembling 4 (\* 4) or 5 (\* 5) playing cards.

**card compass** Simple compass with magnets attached to pivoted card on which bearings are marked.

**CARDE** Canadian Armament Research and Development Establishment.

**Cardec** Civil-Aviation R & D Executive Committee.

**cardinal altitudes, cardinal FLs** Altitudes or FLs forming an odd or even multiple of 1,000 ft.

**cardinal point effect** Increased intensity of radar returns when target surface is most nearly perpendicular to LOS, esp. in case of surface features.

**cardinal points** Bearings 09 (E), 18 (S), 27 (W) and 36/0 (N).

**cardioid** Heart-shaped; profile of cam or plot of radio signal strength against bearing.

**cardioid reception** Obtained by combining dipole and reflector or vertical aerial with loop in correct phase.

**CARDP** Civil-Aviation R & D Program Board.

**Cards, CARDS** 1 Computer-assisted radar-display system.

2 Computer-aided reporting and diagnosis system.

**Cardsharp** Capabilities and requirements demo *CBASS* ['sea bass'] high-alt. recon. program.

**CARE** Center for Aviation Research and Education (US).

**Caree** China Aviation Radar and Electrical Equipment Institute.

**carefree handling** AFCS provides reliable protection against stall, departure or overstress.

**Careri** China Aeronautical Radio Engineering Research Institute.

**Cares** Cratering and related effects simulation.

**caret inlet** Left and right engine inlets each in front view having form of parallelogram with centrelines meeting below a/c.

**CARF** Central altitude reservation facility; ATC facility for special users under altitude reservation concept (FAA, from 1956).

**cargo** Useful load other than passengers or baggage, but including live animals. In military aircraft, all load other than human beings and personal kit and weapons.

**cargo conversion** Passenger or other non-cargo aircraft permanently converted to carry freight (see QC [2]).

**cargo net** Webbing or rope net for restraining cargo on pallet or igloo.

**CARI** Civil Aeromedical Research Institute (FAA 1959, became CAMI 1965).

**Carlack** Proprietary range of cleaner, waxes and polishes.

**car launch** Use of towing motor vehicle to launch glider.

**car lines** Steel wires or multistrand cables passing from hot-air-balloon load ring down and under basket and back up to load ring.

**CARMS** Civil Aviation Radio Measuring Station (DoT, UK).

**carnet** Document facilitating crossing frontier by air without customs dues on aircraft; credit card valid for aviation fuel and certain services; sometimes includes medical certificates.

**CARNF** Charges for airports and route navigation facilities (ICAO).

## Carnot cycle

case-bonded

**Carnot cycle** Ideal reversible thermodynamic cycle: isothermal compression, adiabatic compression, isothermal expansion, adiabatic expansion.

**Carousel** Pioneer family of civil INS.

**carousel** 1 Circulatory conveyor system to which baggage is delivered in arrival terminal.

2 Large structural ring on which rotating wing of tilt-rotor aircraft is mounted.

**CARP** Computed air release point.

**carpet** 1 Graphical plot of three variables having appearance of flexible two-dimensional surface viewed obliquely.

2 Strip of Earth's surface subjected to sonic boom.

**carpet bombing** Level bombing, using one or more aircraft, to distribute bombs uniformly over target area.

**Carquals** Carrier qualification tests (USN).

**carrel** Computer-based pilot-training aid: cockpit, keyboard interface and instructor system displays.

**carrier** 1 Aircraft carrier.

2 EM wave, usually continuous and constant amplitude and frequency, capable of being modulated to transmit intelligence.

3 Electronic charge \*, either so-called hole or mobile electron.

4 Substance chosen to carry trace element or trace of radioactive material too small to handle conveniently.

5 Operator of commercial aircraft engaged in transport of passengers and/or freight for hire or reward.

**carrier air group** Two or more aircraft squadrons operating from same carrier (1) under unified command.

**carrier-on-board delivery** Air delivery of personnel, mail and supplies to carrier (1) at sea.

**carrier suppression** Communications system in which intelligence is transmitted by sidebands, carrier being almost suppressed.

**carrier task force** One or more carriers (1) and supporting ships intended to be self-sufficient in prolonged campaign.

**carrier vehicle** Parent body or bus of SBI, can be equipped with mid-course sensors independent of SBI (SDI).

**carry-on baggage** Brought on board by passenger. Some airlines [eg, Aeroflot] make passenger carry all baggage.

**carry the can** Accept, or be awarded, blame for something (RAF).

**carry through** Wing spars and other linking structure inside fuselage (esp. of mid-wing aircraft).

**carry trials** Programme intended to prove carriage and release of fired, dropped or jettisoned stores.

**CARS** 1 Coherent antistokes Raman spectroscopy.

2 Crew-awareness rating scale.

3 Community aerodrome radio station.

4 Contingency airborne reconnaissance system [MISU adds as in *Carsmisu*].

5 Common automatic recovery system.

**Carsmisu** Contingency airborne reconnaissance systems [and] mission intelligence systems upgrade.

**CART** Combat aircraft repair team.

**Cartesian co-ordinates** System of three mutually perpendicular planes to describe any position in rectilinear space.

**cartridge** Portable container of solid fuel or propellant, with self-ignition system, for propulsion of projectile or supplying pressure to one-shot system.

**cartridge starter** Main-engine starting system energised by reloadable cartridges.

**cartwheel** 1 Aerobatic manoeuvre involving rotation about Z (yaw) axis, at very low airspeed, with that axis approximately horizontal.

2 Crash on ground involving rotation with wings near vertical plane.

**carve-out** Removal of black or otherwise classified program from oversight by security or contract-oversight organization (DoD).

**CAS** 1 Chief of the Air Staff.

2 Collision avoidance system.

3 Close air support.

4 Calibrated, or computed, airspeed (see *airspeed*).

5 Corrected airspeed (obs.).

6 Control [or command] augmentation system (or sub-system).

7 Controlled airspace (CAA).

8 Commission for Atmospheric Sciences.

9 Crisis action system (US JCS).

10 Cockpit avionics system (FSA[3]/CAS).

11 Control actuation section (missiles).

12 Contract Administration Service (or standard[s]).

13 Cost allocation schedule.

14 Combined antenna system.

15 Controlled-access service (satnav).

16 Crashworthy armoured seat.

17 Ceramic abradable seal.

18 Computer-aided software, or support.

19 Cable arresting system.

20 Control actuation system (Goodrich).

21 Crew alerting system.

22 The Croydon Airport Society [1978–] (UK).

23 Co-operative applications satellite.

**CASA, Casa** Civil-Aviation Safety Authority (Australia).

**CASB** Canadian Aviation Safety Board.

**CASC** Combined acceleration and speed control.

**Cascad** Close air support cargo dispenser.

**Cascade** 1 Combat air surveillance correlation and display equipment.

2 Contribution for assessment of common ATM(7) development in Europe (Euret).

**cascade** Array of numerous (eg six or more) sharply cambered aerofoils superimposed to handle large gas flow (eg to turn flow round corner of tunnel circuit). \* theory is also relevant in the design of rotating machines with numerous radial stator and rotor blades.

**cascade reverser** Thrust reverser incorporating one or more cascades to direct efflux diagonally forwards.

**cascading failure** Mechanical failure in which each break triggers the next.

**CASCC** Close air support coordination and control.

**Case, CASE** 1 Computer-assisted, or aided, software engineering.

2 Controlled-airspace synthetic environment.

3 Close air support enhancement.

**case** 1 Outer layer of carburised, nitrided or otherwise case-hardened steel part.

2 Cartridge or shell case housing propellant.

3 Envelope containing solid rocket propellant and withstanding structural and combustion loads.

**case-bonded** Solid propellant poured as a liquid into motor case (3) and cast in situ.

**case chute** See *case ejection*.

**case ejection** Method of disposing of non-consumable case (2), usually stored on board or discharged through chute under assumed positive acceleration.

**case hardening** Heat treatment, usually in a controlled atmosphere, to increase hardness in and near surface of a workpiece, e.g. bearing balls.

**casein** Cold-water glue manufactured from dehydrated milk curd.

**caseless ammunition** Gun ammunition in which case (2) is consumed upon firing.

**casevac** Casualty evacuation.

**CASEX** Combined anti-submarine exercise.

**CASF** 1 Composite Air Strike Force (TAC).

2 Contingency aeromedical staging facility.

**CASI** 1 Canadian Aeronautics and Space Institute (Ottawa).

2 Commission Aéronautique Sportive Internationale (Int.).

**CASID** Committee for Aviation and Space Industry Development [1991–; office Taipei] (Int. for Taiwan).

**Casits** Close air support integrated targeting system[s].

**cask** Container for transport and storage of nuclear fuel or radioactive material.

**CASM** Cost per a/c, or available, seat-mile.

**Casom** Conventionally armed stand-off missile.

**Casp** 1 Canada/Atlantic storms program.

2 Commercial airborne security patrol[s] (at KSC).

**Casper** Composite-aircraft spare parts with enhanced reliability.

**CASS** 1 Command active sonobuoy system.

2 Crab-angle sensing system.

3 Consolidated automated support system (USN).

4 Commercial air service standards.

5 Close air support system.

6 Continuing analysis and surveillance system (FAA).

7 Cargo accounts settlement system (IATA).

8 Cockpit access security system.

**Cassegrain** Optical telescope using two parabolic mirrors in series.

**cassette** Standard tape container, eg for recording mission data.

**CASST** Civil aviation safety strategic team.

**CAST, Cast** 1 Civil Aircraft Study Team.

2 Commercial Aviation Safety Team (FAA).

3 Chinese Academy of Space Technology (People's Republic).

4 Complete aircraft static test.

5 Command and staff trainer.

6 Conformal-array seeker technology.

7 Cyclic auto self-test.

8 Commercial Aviation Safety Team (US).

9 Centre for Analysis of Strategies and Technologies (Moscow, R.).

10 Centre for Aviation Safety Technology (CAAC, China).

**CAS-T** Controlled airspace (temporary) (CAA).

**cast-block engine** Piston engine with each linear row of cylinders arranged in a single cast block.

**castellated nut** Typically, hexagon nut with six radial slots for split-pin or other lock.

**Castigliano** Fundamental structural theorems relating loads, deflections and deformation energy.

**casting** Forming material by pouring molten into shaped mould.

**Castor** Corps airborne stand-off radar (UK).

**cast propellant** Solid rocket propellant formed into grain by casting.

**CASU** Compact air-supply unit.

**casual pay parade** One-time payment to a group of personnel for a specific purpose (RAF).

**casualty** Aircraft which suffers damage or sudden severe unserviceability, hence \* action, \* maintenance.

**CASWS** Close air support weapon system.

**CAT** 1 Clear-air turbulence.

2 Comité de l'Assistance Technique.

3 Combat aircraft technology.

4 Computer automatic [or aided] testing.

5 Crisis action team.

6 Cockpit automation technology.

7 Compressed-air [wind] tunnel.

8 Computerized axial tomography (baggage screen).

9 Commercial air transport (category).

**Cat** 1 Aircraft-carrier catapult (colloq.).

2 See *Categories*.

**CATA** 1 Canadian Air Transportation Administration.

2 Control automation and task allocation.

**Catac** Commande Aérienne Tactique (F fighter command).

**Catalin** Cast phenolic thermosetting plastic.

**catalyst** Substance whose presence permits or accelerates chemical reaction, itself not taking part.

**catalyst bed** Porous structure through which fluid passes and undergoes chemical reaction (eg HTP motor).

**cat & trap** Catapult launch and arrested landing.

**Cataphos** Chlorinated phosphate rubber-based paint for marking taxiways, aprons, etc, yellow or white.

**catapult** Device for externally accelerating aeroplane or other vehicle to safe flying speed in short distance. Those on ships, especially surface warships, were originally operated by compressed air, then hydraulic, and now by steam pressure from main ship propulsion. See *LEM(3)*.

**catastrophic instability** Irrecoverably divergent loss of stability at dynamic head sufficient to break primary structure.

**Cat-bird** Co-operative avionics, or airborne, testbed aircraft.

**CATC** 1 College of Air Traffic Control (Hurn, UK).

2 Commonwealth Air Transport Council (UK/Int., office London SW1P).

3 Canadian Aviation Training Centre [primary flying training for Canadian Forces, Southport, Manitoba] (Canada).

**Cat-C** Carrier air-traffic control officer.

**Catca** Canadian Air Traffic Control Association [office, Ottawa].

**CATCC** Carrier air traffic control centre.

**catcher** Small fence-like strips around leading edge of sharply swept or delta-wing naval aircraft; designed to engage barrier.

**CATCS** Central Air Traffic Control School (RAF Shawbury).

**CATE** Conference on Co-ordination of Air Transport in Europe.

**Cat E** 1 Category E for an aircraft, a write-off [now Cat 5].

**categories**

2 For repaired runway crater, profile allows 4.5 in (114 mm) rise in first 12 ft (3.66 m).

**categories** 1 For flight crew, licence authorisation to qualify on all aircraft within broad groups (eg light aircraft, glider, rotary-wing).

2 For certification of aircraft, grouping based on usage (eg transport, experimental, aerobatic).

3 In bad-weather landings, operational performance \* are defined by runway visible range and decision height:

Cat 1 or I: DH 60 m [200 ft], RVR 800 m [2,600 ft].

Cat 2 or II: DH 30 m [100 ft], RVR 400 m [1,300 ft].

Cat 3a or IIIa: DH 0, RVR 200 m [700 ft but 650 ft is closer conversion].

Cat 3b or IIIb: DH 0, RVR 50 m [150 or 165 ft].

Cat 3c or IIIc: DH 0, RVR 0.

4 For aircraft damage and repairability: Cat 1, undamaged; Cat 2, repairable on unit; Cat 3, repairable by 2<sup>nd</sup> echelon or MU; Cat 4, by manufacturer; Cat 5, a write-off.

5 For runway repairs, see *rough field*.

6 For airfield conflicts, A = near-collision demanding extreme action, B = significant potential of collision; C = ample time to avoid collision (FAA).

7 For runway/taxiway dimensions and bearing strength, coded A to F (ascending order).

**Category 2 box** Rectangular box or window in HUD defining permissible Cat 2 deviation of localiser and G/S.

**catenary** Curve described by filament supported at two points not on same local vertical.

**catering vehicle** Removes and replenishes galley; conventional truck with scissor lift, elevating body usually not including cab.

**Caterpillar Club** Private club formed by Irvin Air Chute Co and open to all who have saved their lives by using parachute of any kind.

**CAT-EVS** CAT(1) enhanced vision system.

**CATH, Cath** Compact air-transportable hospital.

**cathedral** Anhedral (pronounced cat-hedral).

**cathode** 1 Positive terminal of source of EMF (eg battery).

2 Electrode at which “positive current” leaves solid circuit.

3 Negative terminal of electroplating cell.

4 In CRT and similar tube, source of electron stream.

**cathode-ray oscilloscope, cathode-ray oscilloscope, CRO** CRT built into device including amplifier, power pack and controls for graphic examination of waveforms and other research.

**cathode-ray tube, CRT** Vacuum tube along which electrons (cathode rays) are projected, deflected by pairs of plates creating electric field (deflected toward positive) and impact on screen coated with electroluminescent phosphor.

**cathode tuning indicator** Triode amplifier and miniature CRT giving visual indication, by closure of well-defined shadow area, of changes in carrier amplitude too small to detect aurally. Also called Magic Eye.

**CATIA, Catia** Computer-aided 3-D interactive analysis [anglicized from next].

**Catia** Conception assistée tridimensionnelle interactive d'applications (F).

**Catic** (CATIC) China National Aero Technology Industrial Corporation.

**cation** Positively charged ion, travelling in nominal direction of current (pronounced cat-ion).

**CATM** Captive air training missile.

**CATO** Civil air traffic operations (or officer).

**catoptric beam** Visible light concentrated into parallel beam by accurate reflector.

**CATP** Commonwealth Air Training Plan, originally *BCATP*.

**Cats, CATS** 1 Combined Aerial Target Services (MoD, UK).

2 Corporate air travel survey.

3 Contracted Airborne Training Services (Canada).

4 Consequence assessment tool set.

5 Computer assistance tools (Phare).

**Catsa, CATSA** Canadian Air Transport Security Authority

**CATSE** Capacity of the air-transport system in Europe (ECAC).

**cat shot** Launch of naval aircraft by catapult.

**cat's whisker** Delicate current pickoff, eg from gyro.

**CATT** Combined arms tactical trainer (giant installation at Warminster, UK).

**CATTS** Central Air Traffic Training School (RAF Shawbury, UK).

**catwalk** Narrow footway along keel of airship.

**CAU** 1 Cold-air unit.

2 Canard actuation unit.

3 Communication[s] access unit.

**CAUFN** Caution advised until further notice.

**Caul** Thin sheet defining surface of composite structure during ATP(8).

**caution note** Written on approach chart, usually warning of high ground.

**caution speeds** Speeds published in Flight Manual as limit for each configuration.

**Cautra, CAUTRA** Co-ordinateur automatique du trafic aérien Français.

**CAUWG** Commercial Ada users working group.

**CAV** Common aero vehicle.

**cavalry charge** Aural-warning clarion call usually signifying autopilot disconnect.

**cavitation** Transient formation and shedding of vapour-pressure bubbles at surface of body moving through non-degassed liquid, or of vacuum cavities at surface of body moving through other fluid. Collapse of cavities is violent, causing extreme implosive pressures.

**cavity magnetron** Magnetron having resonant cavities within cylindrical anode encircling central cathode.

**cavity resonator** Precisely shaped volume bounded by conducting surface within which EM energy is stored at resonant frequency.

**Cav-OK** Ceiling and visibility OK (for VFR), or better than predicted [said as written].

**CAVU** Ceiling and visibility unlimited [ $\geq 10$  km].

**CAW** 1 Canadian Auto Workers [major aerospace union].

2 Circle of Aviation Writers.

**cAw** Continental Arctic air mass, warmer than land surface.

**CAWC** Combined air-warfare course.

**CAWDSC** Combat-aircraft wing-design steering group.

**CAWP** 1 Central annunciator warning panel.

2 Cockpit assessment working party.

- CB** 1 Circuit breaker.  
 2 Chlorobromo-type fire extinguishants.  
 3 Citizens' band radio.  
 4 Centre of balance (or c.b., C-B).  
 5 Chemical/biological.  
 6 Centre/center barrel (major portion of fuselage).  
 7 Construction Battalion (USMC 'Seabees', USN).  
 8 Chaff block.
- C<sub>B</sub>** Lift proportionality constant for circulation-controlled wing.
- C<sub>b</sub>** Cumulonimbus.
- CBA** Capabilities-based assessment.
- CBAA** Canadian Business Aircraft Association [office, Mississauga, ON].
- CBACS** C-band airborne communications system.
- CBASS** Common broadband advanced sonar system ['sea bass'].
- CBAST** Computer-based advanced skills, or systems, trainer.
- CBC** 1 Carbon/BMI composite.  
 2 Common booster core.
- CBD** 1 Central business district of city.  
 2 Chemical/biological defence.
- CBDC** Chemical and Biological Defence Centre (Porton Down, UK).
- CBDP** Chemical and Biological Defense Program (DoD).
- CBDS** Chemical and biological detection system.
- CBE** CAIS(2) bus emulator.
- CBERS** China/Brazil Earth-resources satellite programme.
- CBF** Coalition Blue Force; SA adds situational awareness (US).
- CBG** Carrier Battle Group (USN).
- CBH** Chemical/biological hardening.
- CBI** 1 Computer-based instruction.  
 2 Component burn-in.  
 3 Confederation of British Industries.  
 4 China/Burma/India (theatre WW2).  
 5 Chemical/biological incident; RF adds Response Force (USMC).
- CBIM** Cloudbase information manager.
- C-BIT** Continuous built-in test.
- C-bit** Continuous built-in test equipment.
- CBL** 1 Control by light [registered name].  
 2 Conveyor-belt loader (cargo).  
 3 Crowd barrier line.
- CBLS** Carrier, bomb, light store.
- CBM** 1 Chlorobromomethane.  
 2 Confidence-building measure[s].  
 3 Chronological bus monitor[ing].
- C<sub>b</sub>M, C<sub>b</sub>MAM** Cumulonimbus mammatus.
- CBMS** Chemical and biological mass spectrometer.
- CBN** Cubic boron nitride.
- CBO** Congressional Budget Office (US).
- CBOM** Common bill of material.
- CBP** 1 Contact-burst preclusion.  
 2 Customs and Border Protection, merger of US Customs Service and Border Patrol as part of DHS2 (2003-).  
 3 Code of Best Practice.
- CBR** 1 California Bearing Ratio; system for assessing ability of soft (ie unpaved) surfaces to support aircraft operations; contains terms for aircraft weight, tyre characteristics, landing gear configuration and rutting after given numbers of sorties.
- 2 Chemical, biological, radiological warfare.
- 3 Common bomb rack.
- 4 Center-barrel [3] replacement.
- 5 Cloud-base recorder.
- CBRN** Chemical, bioogical, radiological and nuclear; E adds explosive.
- CBS** 1 Cavity-backed spiral.  
 2 Central Bulletin Service (NATS AIS).
- CBSF** Common baggage service facilities.
- CBSIFTCB** Common preflight cockpit check for glider: controls, ballast, straps, instruments, flaps, trim, canopy, brake [airbrakes].
- CBSS** Coarse-beam steering system.
- CBT** Computer-based training.
- CBTE** Carrier, (or conventional) bomb triple ejector.
- CBU** Cluster bomb unit.
- CBW** 1 Chemical and biological (or bacteriological) warfare.  
 2 Combat Bombardment Wing (USAAF).
- CBX** Control, or copilot control, box (UAV).
- C by C** Correctness by instruction (ATC).
- CC** 1 Central or countermeasures, computer.  
 2 Critical crack.  
 3 Coastal Command (RAF).  
 4 Communications (UK role prefix).  
 5 Composite command (USAF).  
 6 Circulation controlled (wing or rotor).  
 7 Compass course.  
 8 Co-ordinating committee.  
 9 Counterclockwise.  
 10 C-check.  
 11 Cape Canaveral.  
 12 Component command (DoD).
- C/C** Carbon/carbon [also rendered as C-C].
- C<sub>c</sub>** 1 Equivalent centreline chord.
- CC<sup>3</sup>** Counter-C<sup>3</sup>.
- CCA** 1 Cooled cooling air.  
 2 Current cost accounting.  
 3 Carrier-controlled approach.  
 4 Continental Control Area (US + Alaska at 14,500+ ft AMSL).  
 5 Close-combat attack [helos] (US).  
 6 Common-cause analysis.
- CCAA** Camara de Comercio de la Aeronautica y Afines [Montevideo, Uruguay].
- CCAFS** Cape Canaveral Air Force Station.
- CCAM** Centre of excellence for Composites and Advanced Materials (NIAR).
- CC&D** 1 Camouflage, concealment and deception.  
 2 Common command and decision.
- CCAOU** Central Counties Air Operations Unit (UK).
- CCAQ** Consultative Committee on Administrative Questions (ICAO).
- CCAS** Centralised crew-alerting system.
- CCAT** Carrier control approach trainer.
- CCATE** Common-core automatic test equipment.
- CCB** 1 Configuration-change, or -control, board (software).  
 2 Converter circuit-breaker, or [Boeing usage] control breaker.  
 3 Common-core booster.

- CCC** 1 See **C<sup>3</sup>** with suffixes.  
 2 Customs Co-operation Council (ICAO).  
 3 Combat Control Centre.  
 4 Central command control.
- CCCA** Conference of city-centre airports (UK, 1996-; office, London).
- CCCD, C<sup>3</sup>D** 1 Cross-cockpit collimated display.  
 2 Counter-C<sup>3</sup> (Italy).
- CCD** 1 Camouflage, concealment and deception.  
 2 Charge-coupled device, or diode.  
 3 Cursor-control device.  
 4 Computerised current density.
- CCDA** Cockpit-control driver actuator.
- CCDP** Code of Conduct on Defence Procurement.
- CCDTV** Charge-coupled device television.
- CCDR** Contractor cost data report (US).
- CCE** 1 Communications control equipment.  
 2 Commission des Communautés Européennes (Int.).  
 3 Cryogenically cooled electronics.  
 4 Change composite explorer.
- CC89** Cabin Crew 89 (trade union, UK, office, Slough).
- CCF** 1 Central control function.  
 2 Combined Cadet Force (UK).  
 3 Chopped carbon fibre.
- CCFG** Compact constant-frequency generator.
- CCFL** Cold-cathode fluorescent lamp.
- CCFP** Collaborative convective forecast product, from Aviation Weather Center, esp. concerned with severe weather (US).
- CCG** 1 C-code generator.  
 2 Computer control and guidance.  
 3 Communications control group.  
 4 Computer control group (Paveway).
- CCH** Close-combat helicopter.
- CCI** 1 Commission for Climatology (WMO).  
 2 Chambre de Commerce Internationale (Int.). See **ICC**.  
 3 Continuous capability improvement.
- CCIA** Comitato Coordinazione Industria Aerospaziale (I).
- CCID** Composite combat identification (JIADS).
- CCIG** Cold-cathode ion gauge.
- CCII** Command, control and information infrastructure (UK).
- CCIL** Continuously computed impact line; HUD snapshoot presentation with fully predicted bullet flight profile with various range assessments.
- CCIP** 1 Continuously computed impact point; HUD display for air-to-ground weapon delivery with impact point indicated for any manual release from laydown to steep dive. See also *Delayed\**.  
 2 Critical-component improvement program.  
 3 Common-configuration implementation program (USAF).
- CCIP/IP** With preliminary designation of an initial point.
- CCIR** 1 Comité Consultatif International des Radiocommunications (UIT), assigns wavebands, frequencies.  
 2 Commission Consultatif Internationale pour la Radio.
- CCIRM** Collection, co-ordination and intelligence requirements management.
- CCIS** Command and control information system[s].
- CCISR** Command and control intelligence, surveillance and reconnaissance.
- CCITT** Comité Consultantif International pour Télégraphie et Téléphone.
- CCL** Climate-change levy.
- CCLR** Council for the Central Laboratory of the Research Councils (UK, by Royal Charter 1995-).
- CCM** 1 Conventional cruise missile.  
 2 Counter-countermeasures.
- CCMA** Comite de Compradores de Material Aeronautico de America Latina (Int.).
- CCMS** 1 Communication control and management system (Scope Command).  
 2 Content compilation management system.
- CCN** Contract change notice.
- CCO** 1 Chief corporate officer.  
 2 Chief of Combined Operations.  
 3 Catapult control officer.
- CCOA** Centre de Conduite des Operations Aériennes (Taverny, F).
- CCOC** Combustion-chamber outer casing.
- CCP** 1 Cutter-centre path (machining).  
 2 Coherent countermeasures processor.  
 3 Combat correlation parameter (simulator).  
 4 Corrosion-control programme.  
 5 Control and correlation processor.  
 6 Common cockpit processor.
- CCPC** 1 Civil Communications Planning Conference (NATO).  
 2 Command and control personal computer (USA/USMC).
- CCPDS** Command and control processing and display system.
- CCPR** Cruise compressor pressure ratio.
- CCQ** Cross-crew qualification.
- CCR** 1 See **ACC**. (1).  
 2 Circulation-controlled rotor.  
 3 Configuration-change report, required each time a Part or Data-base No. changes.  
 4 Constant-current regulator.
- CCRA** Canadian Customs and Revenue Agency.
- CCRI** Climate Change Research Initiative (NOAA).
- CCRP** Continuously computed release point; HUD display for air-to-ground weapon delivery with steering command and auto weapon release in any attitude from laydown to OTS, system controlling entire firing sequence and triggering release or firing mechanism automatically.
- CCS** 1 Communications control system (aircraft R/T and i/c selection and audio routeing).  
 2 Conformal countermeasures system.  
 3 Computer and computation subsystem (ACMI).  
 4 Combat Control Squadron (USAF).  
 5 Cargo community system, electronically links shippers, airports, forwarders and carriers.  
 6 Cabin-communication system.  
 7 Common carriage system [external weapons].  
 8 Communications countermeasures set.  
 9 Common-core system.  
 10 See next.
- CCS-C** Command and control system, consolidated.
- CCSL** Cirrocumulus, standing lenticular wave.
- CCSS** Command and control switching system.
- Cct** Airfield circuit.

**CCTS** 1 Co-ordinating Committee for Telecommunications by Satellite.  
 2 Cabin cordless-telephone system.  
 3 Combat Crew Training Squadron (USAF).  
**CCTV** 1 Closed-circuit TV.  
 2 Colour cockpit TV; S adds sensor.  
 3 Crew/cargo transfer vehicle.  
**CCTW** Combat Crew Training Wing (USAF).  
**CCTWT** Coupled-cavity travelling-wave tube.  
**CCU** 1 Cockpit, communications, central, cursor or common control unit; TSD adds tactical-situation display.  
 2 Control and compensation unit.  
**CCV** 1 Control-configured vehicle.  
 2 Command and control vehicle.  
 3 Chamber coolant valve.  
**CCW** 1 Counter-clockwise.  
 2 Circulation-controlled wing.  
**CCWS** Common controller workstation (CAATS/MAATS).  
**CD** 1 Certification demonstration.  
 2 Concept demonstration.  
 3 Clearance delivery (US, not UK).  
 4 Controlled-diffusion.  
 5 Convergent/divergent.  
 6 Cycle-dependent.  
 7 Capacitor-discharge.  
 8 Cold.  
 9 Compact disk.  
 10 Circular dispersion.  
 11 Civil Defence (UK, WW2).  
 12 Chrominance difference.  
 13 Carrier detect.  
 14 Coast Defence (RAF 1926 - c40).  
**Cd** Cadmium.  
**cd** Candela(s).  
**Cd**, **C<sub>d</sub>** Total drag coefficient.  
**Cd<sub>0</sub>** Zero-lift drag coefficient.  
**CD-2** Common digitiser 2 (FAA).  
**CDA** 1 Centre for Defence Analyses (UK).  
 2 Controlled-diffusion aerofoil.  
 3 Concept-demonstration aircraft.  
 4 Continuous-descent, or constant descending, approach, or arrival.  
 5 Cognitive decision-aiding.  
 6 Co-ordinating design authority.  
 7 Cruciform detector array.  
 8 Contrôle d'Aérodrome [international title of FSS1].  
**C/DA** Climb and dive angle.  
**CDAA** Circularly disposed aerial (antenna) array.  
**CDAI** Centre de Documentation Aéronautique Internationale.  
**CDAT** Critical-defect assessment technology.  
**CDB** 1 Cast double-base rocket propellant, allows case-bonding, varied formulation and charge configuration, low smoke emission etc.  
 2 Central [ATC] data bank, or base.  
 3 Common database [often preceded by CE4].  
**CDBP** Command Data Buffer Program (USAF).  
**CDBR** Cabin databus repeater.  
**CDC** 1 Course and distance calculator.  
 2 Concorde Directing Committee (Comité Direction Concorde).  
 3 Cour des Comptes [general accounting office] (F).

4 Cabin-display computer.  
 5 Centre[s] for Disease Control and Prevention (US).  
**CDCN** Controller of Defence Communications Network (UK).  
**CDD** Credible delicious decoy.  
**CDDT** Countdown demonstration test.  
**CDE** 1 Chemical Defence Establishment (UK).  
 2 Concept development effort.  
**CDF** 1 Clearance delivery frequency.  
 2 Core-driven fan [s adds stage].  
 3 Core-distributed interactive-simulation facility.  
**Cdf** Drag coefficient for zero lift.  
**Cdf** Fuselage drag coefficient.  
**CD5B** Colour-coded 5-bar approach light system.  
**CDFNT** Cold front.  
**Cd<sub>frie</sub>** Frictional drag coefficient, usually close to *CDF*.  
**CDFS** Core-driven fan stage.  
**CDG** Configuration-database generator.  
**CDH** Constant delta height.  
**CDI** 1 Course-deviation indicator.  
 2 Collector diffusion isolation.  
 3 Capacitor-discharge ignition.  
 4 Compass director indicator.  
 5 Collateral duty inspector (US).  
 6 Chief of Defence Intelligence (UK).  
 7 Classification, discrimination and identification.  
**Cbi** Coefficient of induced drag.  
**CDIP** Continuously displayed impact point (HUD).  
**CDIRRS** Cockpit display of IR reconnaissance system.  
**CDIS** Central control function display.  
**CDIU** Circuit-mode data interface unit.  
**CDL** 1 Configuration data list (JARs).  
 2 Chief of Defence Logistics (UK).  
 3 Common datalink.  
 4 Cabin-discrepancy log.  
**CDL**, **C<sub>dl</sub>** Lift-dependent drag coefficient, sub-critically equal to induced-drag coefficient.  
**CDM** 1 Collaborative decision-making.  
 2 Clean development mechanism.  
 3 Control display and management.  
**CDMA** Code-division multiple-access.  
**CDMATC** Collaborative decision-making ATC.  
**CDMC** Cranfield Disaster-Management Centre (UK).  
**Cd<sub>min</sub>**, **Cd<sub>min</sub>** Minimum drag-coefficient.  
**CDMLS** Commutated-Doppler microwave landing system.  
**CDMS** CDM1 and CDM3 system.  
**CDMT** Central design and management team.  
**CDMVT** 'Cadbury's Dairy Milk, very tasty', one of countless mnemonics, in this case meaning course→deviation→magnetic→variation→true (RAF WW2).  
**CDN** 1 Co-ordinating message (ICAO).  
 2 Certificat de Navigabilité (C of A, F).  
**CDNU** Control, display and navigation unit (helicopter).  
**Cdo** Commando (Unit).  
**CDOPS**, **C-dops** Coherent-Doppler scorer.  
**CDP** 1 Central data processor.  
 2 Countermeasures dispenser pod.  
 3 Critical decision point.  
 4 Chief of Defence Procurement (UK).  
 5 Contract-definition phase.  
 6 Concept-demonstration phase, or program[me].  
 7 Cockpit-display player (F-22).

<b>8</b> Continuous-data program.	<b>7</b>
<b>C<sub>Dp</sub></b> Coefficient of profile drag.	<b>CEAA</b> Commandement des Ecoles de l'Armée de l'Air (F).
<b>CDPI</b> Crash data position indicator.	<b>CEAC</b> 1 Commission Européenne de l'Aviation Civile (Int.).
<b>CDR</b> 1 Critical design review.	2 Committee for European Aerospace Cooperation (Int.).
2 Customer departure record[s].	<b>CEAM</b> Centre d'Expériences Aériennes Militaires (F, Mont de Marsan).
3 Conditional route.	<b>CEAS</b> Confederation of European Aeronautical Societies renamed Council of European Aerospace Societies [2007, Brussels] (Int.).
<b>CDRA</b> Carbon dioxide removal assembly.	<b>CEAT</b> Centre d'Essais Aéronautiques de Toulouse (F).
<b>CDRB</b> Canadian Defense Research Board.	<b>CEATS</b> Central European Air-Traffic Service[s] (Vienna).
<b>CDRL</b> Contract data requirements list.	<b>CEB</b> 1 Combined-effects bomblet.
<b>CD-ROM</b> Compact-disk read-only memory.	2 Curve of equal bearings, from NDB.
<b>CDRS</b> 1 Control and data retrieval system.	3 Commercial engine bulletin (FAA).
2 Container-design retrieval system (USAF).	<b>CEC</b> 1 Cooperative-engagement capability.
3 Cockpit display and recording system.	2 Communications and Electronics Command (USA).
<b>CDS</b> 1 Controls and displays, or control/display, subsystem.	3 Continental entry chart.
2 Chief of Defence Staff (UK).	4 Centre d'Entrainement au Combat (F).
3 Coefficient of slush drag, derived from spray impingement drag, basic precipitation drag and wheel geometry.	5 Crew ejectable cabin.
4 Container, or covert, delivery system (USAF).	<b>CECAI</b> Conference of European Corporate Aviation Interests (Int.).
5 Cabin distribution system (Satcom).	<b>CECC</b> Cenelec Electronic Components Committee (Int.).
6 Concept-definition study.	<b>Cecom</b> Communications and Electronics Command (USA).
7 Cockpit-design simulator.	<b>Conconite</b> Weatherproof fabrics for skinning light aircraft.
8 Component documentation status.	<b>CED</b> 1 Continued engineering development.
9 Common display system.	2 Competitive engineering definition.
10 Cockpit development station.	<b>Cedam</b> Combined electronic display and map; derived from Comed.
11 Countermeasure[s] dispensing system.	<b>Cedap</b> Cockpit-emergency directed-action program.
<b>CdS</b> Cadmium sulphide/sulfide, IR detector.	<b>CEDLE</b> Compact efficient direct-lift engine.
<b>CdSe</b> Cadmium selenide.	<b>Cedocar</b> Centre de Documentation de l'Armement [F-00460 Armées] (F).
<b>CDSS</b> Center for Defence/Defense and Security Studies (Univ. of Manitoba).	<b>CEE</b> 1 Cabin emergency evacuation.
<b>CDT</b> 1 Central [US] Daylight Time.	2 Commission on rules for Electrical Equipment (Int.).
2 Crew duty time.	3 Centro de Estudios Espaciales [Chile].
3 Controlled departure time.	<b>Ceesim</b> Combat electromagnetic-environment simulator.
<b>CDTC</b> Controlled descent through cloud.	<b>CEF</b> 1 Cost-effectiveness factor (materials).
<b>CDTF</b> Coast Defence Training Flight (RAF to 1935).	2 Contrast-enhanced filter.
<b>CDTI</b> Cockpit display of traffic (ATC) information.	3 California Engineering Foundation.
<b>CD trainer</b> Cockpit-drill trainer.	<b>CEFA</b> Cooperation for Environmentally Friendly Aviation (EU).
<b>CD-TR-TV</b> Con-di, thrust-reverser thrust vector.	<b>CEFH</b> Cumulative engine flight-hours.
<b>CDU</b> 1 Control and display unit.	<b>CEI</b> 1 Critical engine inoperative.
2 Cockpit, or console, or combined, display unit.	2 Council of Engineering Institutions (UK).
3 Has been interpreted as central display unit.	3 Commission Electrotechnique Internationale.
<b>C<sub>Dv</sub></b> 1 The speed-damping derivative.	4 Combat efficiency improvement.
2 Vertical damping derivative [helicopter].	5 Cabin equipment interface.
<b>CDVE</b> Commandement de vol électrique = fly by wire (F).	<b>ceil</b> Ceiling.
<b>CDVS</b> Cockpit-door video surveillance; S adds system.	<b>ceiling</b> 1 Of aircraft, greatest pressure height [density altitude] that can be reached (see <i>absolute</i> *, <i>absolute aero-dynamic</i> *, <i>service</i> *, <i>zoom</i> *).
<b>CDW</b> Community Development Worker (RAF).	2 Of cloud, height above nearest Earth's surface of lowest layer of clouds or obscuring phenomena that is reported as 'broken,' 'overcast' or 'obscuration' and not 'thin' or 'partial' (FAA).
<b>CDWS</b> Common defense weapon system (USN/USMC helicopters).	3 Height above nearest Earth's surface of cloud base
<b>C<sub>D0</sub></b> Drag coefficient at zero lift.	
<b>CE</b> 1 Concurrent engineering.	
2 Computing element.	
3 Chemical energy.	
4 Common environment.	
5 Communications electronics [engineer branch] (RAF).	
<b>C<sub>e</sub></b> Specific fuel consumption (R).	
<b>CEA</b> 1 Code of European Airworthiness.	
2 Commissariat à l'Energie Atomique (F).	
3 Circular-error average.	
4 Combined electronics assembly.	
5	
6	

## ceiling balloon

below 6000 m/20,000 ft covering 50+ per cent of sky (ICAO).

**4** Amount above which FFP contract cannot be implemented.

**ceiling balloon** Small free balloon, whose rate of ascent is known, timed from release to give measure of ceiling (2).

**ceiling climb** Aircraft flight authorised for express purpose of measuring ceiling (1).

**ceiling height indicator** Device for measuring height of spot produced by ceiling projector.

**ceiling light** See *ceiling projector*.

**ceiling projector** Source of powerful light beam projected vertically to form bright spot on underside of cloud.

**ceiling unlimited** Sky clear or scattered cloud, or base above given agreed height (in US 9,750 ft, 2,970 m).

**ceiling zero** Fog.

**ceilometer** Device for measuring ceiling (2), esp. ceiling projector, in later types a lidar, whose beam oscillates about horizontal axis like metronome, linked with photocell with readout in tower.

**CEL** 1 Centre d'Essais des Landes (F).

2 Capacitatively-enhanced logic, speed enhanced by incorporation on to chip of capacitor(s).

3 Component evolution list.

**Celar** Centre Electronique de l'Armement (F).

**celestial altitude** Altitude (2) of heavenly body or point on celestial sphere.

**celestial body** Meaning arguable, but normally all bodies visible or supposed other than Earth and man-made objects. Diffuse bodies (eg nebulae) often called 'structures'.

**celestial equator** Great circle formed by extending Earth equatorial plane to celestial sphere.

**celestial fix** See *astro fix*.

**celestial guidance** Guidance of unmanned vehicle by automatic star tracking.

**celestial horizon** Great circle formed on celestial sphere by plane passing through centre of Earth normal to straight line joining zenith and nadir.

**celestial mechanics** Science of motion of celestial bodies.

**celestial meridian** Meridian on celestial sphere.

**celestial navigation** See *astronavigation*.

**celestial pole** Terrestrial pole projected upon celestial sphere.

**celestial sphere** Imaginary hollow sphere of infinite radius centred at centre of Earth (for practical purposes, at eyes of anyone on Earth).

**celestial triangle** Spherical triangle on celestial sphere, esp. one used for navigation.

**cell** 1 Combination of electrodes and electrolyte generating EMF; basic element of battery.

2 Portion of structure having form of rigid box, not necessarily completely enclosed.

3 In biplane or other multi-wing aircraft, complete assembly of planes, struts and wires forming structural box.

4 Gasbag of aerostat, esp. in airship having multiple bags in outer envelope.

5 In EDP, elementary unit of storage.

6 Self-contained air mass of violent character (eg TRS).

7 In military operations, smallest tactical aircraft element flying together (often three); another definition is

## centimeter Hg

a small unit of airborne military aircraft which can if necessary operate independently.

**8** Compartment forming an element of large internal bomb bay.

**Cellophane** Early cellulose-base transparent plastics film.

**cell-textured** See *textured visuals*.

**cellular logic image processing** Each pixel has its own dedicated logic element to which are attached its eight adjacent pixels in parallel architecture. Thus each instruction is executed by all processing elements simultaneously.

**cellule** Cell (3) or assembly of two or more wings on either side of centreline.

**Celluloid** Early transparent plastics film from nitro-cellulose treated with camphor.

**cellulose** Carbohydrate forming major structural constituent of plants; precursor of many aeronautical materials.

**cellulose acetate** Thermoplastic from cellulose and acetic acid; used in rayon, film, lacquer, etc.

**cellulose dope** See *dope*.

**cellulose nitrate** Thermoplastic from cellulose and nitric acid; used in explosives, dopes and structural plastics.

**Celsius** Scale of temperature, symbol °C. Unit is same as SI scale K, but numbers are lower by 273. Until 1948 called Centigrade.

**CELT** Combined emitter location (or locator) testbed.

**CELV** Complementary expendable launch vehicle, ie in addition to Shuttle (US).

**CEM** 1 Centre d'Essais de la Méditerranée (F).

2 Combined-effects munition (cluster dispenser).

3 Conventional enhancement modification.

4 Concept evaluation model.

5 Core exhaust mixer.

6 Control-, or contract, equipment manufacturer.

7 Computational electromagnetics.

8 Controlled-emissivity material.

**Cementite** Iron carbide; carbon form in annealed steel.

**Ceminal** Cost/effective manufacturing in new aluminum (aluminium) alloys (US).

**CEMS** Centre d'Etudes de la Météorologie Spatiale (F).

**CEMT** Conférence Européenne des Ministres des Transports.

**CEN** 1 Centre d'Etudes Nucléaires (F).

2 Comité Européen Normalisation [Int. standards].

**CENA** Centre d'Etudes (formerly d'Expérimentation) de la Navigation Aérienne (F).

**CENC** China-Europe Global Navigation Satellite System Technical Training and Co-operation Centre (from September 2003).

**Cenelec** Comité Européen pour la standardisation de l'Électrotechnique (Int.).

**Cenipa** Centro de Investigaçao e Prevençao de Acidentes Aeronáuticos (Braz.).

**cenospheres** Microscopic hollow ceramic spheres.

**Cenrap** Center radar processing (terminal ATC).

**Centag** Centre Army Group (NATO, formerly).

**centi** Prefix,  $\times 10^{-2}$  (one hundredth), symbol c (non-SI).

**Centigrade** See *Celsius*.

**centilitre** Cl, 0.01 litre, measure of volume contrary to SI.

**centimetre, centimeter** 0.01 metre; measure of length contrary to SI.

**centimetre Hg** Used as unit of pressure = 1.33 kPa.

## centimetric radar

**centimetric radar** Radar operating on wavelengths around 0.01 m, with frequencies 3–30 GHz.

**centipoise** See *viscosity*.

**centistoke** See *viscosity*.

**CENTO, Centro** Central Treaty Organization (1955–80, Iran, Iraq, Pakistan, Turkey, UK, US).

**central altitude reservation** See *CARF*.

**centralised fault display system** Avionics system accessing all on-board BITE systems to extract and display data and initiate maintenance tests.

**centralised servicing** Establishment of one unit and site for all routine maintenance on station, breaking previous intimate relationship between crew chief and each aircraft (RAF).

**central warning panel** See *CWP (I)*.

**centrebody** Streamlined body in centre of circular, semi-circular or quasi-circular supersonic intake (inlet) to cause inclined shock.

**centre controls** To move primary flight controls from deflected to neutral position.

**centre engine** Engine on centreline of multi-engined aircraft.

**centreline** 1 Principal longitudinal axis; usually also axis of symmetry (eg of aircraft, missile, runway).

2 In aerofoil section, line joining leading and trailing edges and everywhere equidistant from upper and lower surfaces, all measures being normal to line itself.

**centreline aircraft** See *centreline engine[s]*.

**centreline camber** Ratio of maximum distance between chord and centreline (2) to chord.

**centreline closure** Compressor, or [more often] turbine-blade rub caused by slight radial displacement.

**centreline engine[s]** Any engine on longitudinal centreline of multi-engine aircraft [engines hung on side of fuselage or in wing roots are excluded]. The pilot does not need a multi-engine rating.

**centreline gear** Main landing gear on aircraft centreline.

**centreline lighting** On runway, flush lights at 50 ft (15 m) intervals terminating 75 ft (23 m) from each threshold.

**centreline noise plot** Plot of aircraft noise, usually EPNdB, along runway centreline extended (usually 6 st miles, 9.6 km) in each direction covering approach and climb-out.

**centreline tank** *Centre tank 1 [not 2]*.

**centre of area** See *centroid*.

**centre of buoyancy** Point through which upthrust of displaced fluid acts; e.g. in case of aerostats and marine aircraft afloat.

**centre of burst** Mean point of impact.

**centre of dynamic lift** In aerostat, point on centreline through which lift force due to motion through atmosphere acts.

**centre of gravity, c.g.** Point through which resultant force of gravity acts, irrespective of orientation; in uniform gravitational field, centre of mass. For two-dimensional forms, centroid.

**centre of gravity limits** In nearly all aircraft, esp. aerodynamics, published fore and aft limits for safe c.g. position; in case of aeroplanes expressed as percentages of MAC.

**centre of gravity margin**  $H_n$ , distance along aircraft major axis from c.g. to neutral point, expressed as % SMC.

**centre of gravity travel** Fore and aft wander of c.g. in

## centrifugal compressor

course of flight due to consumption of fuel, release of loads, etc.

**centre of gross lift** In aerostat, usually centre of buoyancy.

**centre of gyration** For solid rotating about axis, point at which all mass could be concentrated without changing moment of inertia about same axis.

**centre of lift** Resultant of all centres of pressure on a wing or other body.

**centre of mass** Point through which all mass of solid body could act without changing dynamics in translational motion; loosely, but not always correctly, called c.g. Alternative title, centre of inertia.

**centre of pressure, c.p.** On aerofoil, point at which line of action of resultant aerodynamic force intersects chord. Almost same as aerodynamic centre, but latter need not lie on chord. In general, c.p. is resultant of all aerodynamic forces on surface of body.

**centre of pressure coefficient** Ratio of distance of c.p. from leading edge to chord.

**centre of pressure moment** Product of resultant force on wing (or section) and distance from c.p. to leading edge (or leading edge produced at aircraft centreline). Inapplicable to very slender wings.

**centre of pressure moment coefficient** As above but divided by dynamic pressure; not same as coefficient of moment.

**centre of pressure travel** 1 Linear distance through which c.p. travels along chord over extreme negative to positive operating range of angles of attack, ignoring compressibility in subsonic flow.

2 Linear distance through which c.p. travels along chord over complete aircraft operating range of Mach numbers (supersonic aircraft only).

**centre of thrust** Thrust axis, for one or multiple engines.

**centre of twist** The axis about which a solid body rotates when under an applied torque.

**centre punch** Hand tool for making accurate conical depressions.

**centre section** In most winged aircraft, centre portion of wing extending symmetrically through or across fuselage and carrying left and right wings on its tips. Certain aircraft have wing in one piece, or in left and right halves joined at centreline; such have no \*\*, though some authorities suggest it is then wing inboard of main landing gear.

**centre tank** 1 Most commonly, a fuel tank inside the fuselage in a system having additional tanks in the wings.

2 A tank inside the inboard part of each wing, usually structurally part of the single main inter-spar box, and separated from the main tank by a rib.

**centrifugal breather** Centrifuge filter for removing oil from air vented overboard from interior of engine, often after passage through porous segments.

**centrifugal clearance** Radial clearance between rotating mass and surrounding fixed structure at peak rotating speed.

**centrifugal clutch** Freewheels at low speed, but takes up drive as speed is increased. At full power slip tends towards zero. Main purpose is to prevent excessive load on gearteeth.

**centrifugal compressor** Rotary compressor in form of disc carrying radial vanes to accelerate working fluid radially outward to leave periphery at very high speed, this being converted to pressure energy in fixed diffuser.

**centrifugal separator** See *centrifuge filter*.

**centrifugal twisting moment** Moment tending to rotate propeller blades towards zero pitch (opposing coarsening of pitch).

**centrifuge** 1 Device for whirling human and other subjects about vertical axis, mainly in aerospace medicine research.

2 Device for imparting high unidirectional acceleration to hardware under test.

3 Device for imparting high unidirectional acceleration to mixtures of fluids with or without particulate solids to separate constituent fractions.

**centrifuge filter** Action, inherent in turbofans and some other machines, which in rotating fluid flow causes unwanted particulate solids to be centrifuged outwards away from core.

**centring, centering** Radial and, usually, also axial constraint of floated gyro to run equidistant at all points from enclosure.

**centring control** System which, on demand, centres a variable in another system.

**centripetal** Acceleration toward axis around which body is rotated; usually equal and opposite to centrifugal (see *coriolis*).

**centrisep** Centrifugal separator (*centrifuge filter*).

**centroid** In geometrical figure (one, two or three dimensional), point whose co-ordinates are mean of all co-ordinates of all points in figure. In material body of uniform composition, centre of mass.

**Centrospas** [also rendered *Tsentro-*] Ministry for defence, emergencies and natural disasters (R).

**CEO** 1 Chief executive officer of corporation or company.

2 Crew Earth observation.

**CEOA** Central Europe Operating Agency (NATO pipelines).

**CEOEC** Colloque Européen des Organisations de Contrôle (Int.).

**CEOI** Common electronic operating instructions.

**CEOS** Committee on Earth Observation Satellites (Int.).

**CEP** 1 See *circle of equal probabilities*; also called circular error probable.

2 Concurrent evaluation phase.

3 Chromate-enriched pellet.

4 Common engine program.

**CEPA** 1 Commission d'Evaluation Pratique d'Aéronautique (F).

2 Common European Priority Area.

**Cepana** Commission d'Examen Permanent des Matériels Nouveaux d'Aéronautique (F).

**CEPME** College for Enlisted Professional Military Education (USAF AU).

**CEPr** Centre Essais de Propulseurs (Saclay, F).

**CEPS** Central European pipeline system (NATO).

**CEPT** 1 Conférence Européenne des Postes et Télécommunications (Int.).

2 Cockpit emergency procedures trainer.

**CER** 1 Cost-estimating relationship.

2 Certified emission reduction[s].

**ceramal** See *cermet* (from ceramic + alloy).

**ceramel** See *cernet* (from ceramic metal).

**Cerap** Combined Center Radar Approach Control.

**CERCA** Commonwealth and Empire conference on Radio for Civil Aviation.

**CerdeC** Communication-Electronics Research, Development and Engineering Center (USA).

**Ceres** 1 Clouds and Earth's radiant-energy system.

2 Computer-enhanced radio emission surveillance (UK).

**CERFP** Chemical, biological, radiological, nuclear or high-yield explosive enhanced response force package.

**ceria glass** Amorphous semiconductor glass doped with cerium dioxide.

**cerium** Reactive metal, Ce, density 8.2, MPt 799°C.

**Cerma, CERMA** Centre d'Etudes et de Recherches de Médecine Aéronautique (F).

**cermet** 1 Composite material attempting to combine mechanical toughness of metal with hardness and refractory qualities of ceramics. Early examples cemented carbides, eg tungsten carbide sintered with cobalt.

2 Incorrectly, part made of ceramic bonded to metal.

**CERNAI** Study Commission on international air navigation (Brazil).

**CERP** Centre-Ecole Régional de Parachutisme.

**Cerrobase** US lead-bismuth alloy, MPt 125°C.

**Cerrobend** US bismuth-tin-lead-cadmium alloy, MPt 68°C.

**Cerromatrix** US lead-tin-antimony alloy, MPt 105°C.

**CERS** 1 Centre Européen de Recherche Spatiale (see *ESRO*).

2 Carrier evaluation and reporting system.

**CERT** 1 Centre d'Etudes et de Recherches de Toulouse (ONERA).

2 Committee on Energy Research and Technology (European Community).

**Certico** Committee on Certification (ISO).

**Certificate of Airworthiness** Issued to confirm each individual aircraft is airworthy, renewed at intervals (CAA). Also issued for basic type of aircraft, called Type certificate in US.

**Certificate of Compliance** Issued to confirm functioning part of aircraft has been made/overhauled/repaired correctly (CAA).

**Certificate of Experience** Document required by private pilot showing flying as PIC in each preceding 13-month period (CAA UK).

**Certificate of Maintenance** Issued upon completion of major overhaul or other routine work affecting airworthiness (CAA).

**Certificate of Release [for Service]** Issued after heavy maintenance.

**Certificate of Test** Document issued on release of refurbished or overhauled item.

**categorisation** For aircraft, issue of ATC (4) for US, C of A for UK or equivalent by national certifying authority, stating type meets all authority's requirements on grounds of safety. Other aircraft certificates include Production and Registration.

**certification pilot** Test pilot employed by national certification authority to evaluate all types of aircraft proposed for use by operator in that country, from whatever source.

**certification test** Test conducted by certification authority prior to issue of certificate.

**CES** 1 Catapult-end speed.

2 Civil Engineering Squadron (USAF).

- 3** Consumables, expendables and standard hardware.  
**4** Combat environment simulation.
- Cesar** Computing environment StralCom architecture.
- CESE** Communications equipment support element.
- cesium, caesium** Extremely soft silver metal, highly reactive, used as working fluid as jet of charged ions in space thrusters.
- CESR** Centre d'Etude Spatiale des Rayonnements (space radiation).
- CEST** *1* Convertible-engine system technology.  
*2* Centre for the Exploitation of Science and Technology (UK).  
*3* Central European Summer Time.
- CESTA** *1* Continuous engineering services and technical assistance.  
*2* Centre d'Etudes des Systèmes et des Technologies Avancées (F).
- CET** *1* Combustor exit, or engine, temperature.  
*2* Core-engine test.  
*3* Calculated estimated time [surely tautological]; A adds arrival, D departure, O overflight.  
*4* Central European Time.
- CETA** Crew and equipment translation aid.
- cetane rating** Numerical scale for ignition quality of diesel fuels.
- CETO** Center for Emerging Threats & Operations (2002, USA).
- CETPS** Cooperative engagement transmission processing set.
- CETS** Contractor engineering technical services.
- CETT** Core engine to test (date).
- CEU** Checklist entry unit.
- CEV** *1* Centre d'Essais en Vol [Brétigny, Istres, Cazaux] (F).  
*2* Crew exploration vehicle, due for manned spaceflight 2014– (NASA).
- CEWI** Combat electronic warfare [and] intelligence.
- CF** *1* Centrifugal force.  
*2* Concept formulation.  
*3* Carbon-fibre.  
*4* Charge [or change] field.  
*5* Centrifuge filter.  
*6* Controlled fragmentation.  
*7* Change frequency, or constant frequency.  
*8* Course to selected fix.  
*9* Communications Flight.  
*10* Conversion Flight.
- Cf,  $c_f$**  *1* Measured thrust coefficient of rocket.  
*2* Skin friction coefficient (see  $C_{D_fric}$ ).
- Cf** Cubic feet.
- cf,  $c_f$**  Flap chord.
- f** Local skin-friction coefficient.
- C $^o$**  Theoretical thrust coefficient of rocket.
- CFA** *1* Cross- (or crossed-) field amplifier.  
*2* Chief flight attendant.  
*3* Caribbean Federation of Aeroclubs (Int.).
- CFAC** *1* Constant-frequency alternating current.  
*2* Combined-Forces Air Component [C adds Commander] (USAF).
- CFAO** Conception et fabrication assistée par ordinateur (F).
- CFAR** Constant false-alarm rate (ECM).
- CFAS** *1* Commandement des Forces Aériennes Stratégiques (F).
- 2** Federal office for space (Switzerland).
- C-Fast** Counter-force autonomous surveillance and targeting (USAF).
- CFAWC** Canadian Forces Aerospace Warfare Center [at CFB Trenton].
- CFB** *1* Cruise fuel burn.  
*2* Canadian Forces Base.
- CFC** *1* Cycles to first crack (structures).  
*2* Cold fog clearing.  
*3* Carbon-fibre composite.  
*4* Central fire control.  
*5* Core-failure clutch.  
*6* Centennial of Flight Commission (US).  
*7* Chlorofluorocarbon.
- CFCF** Central flow control facility (FAA 1).
- CFD** *1* Chaff/flare dispenser; C adds computer, CU control unit, IU interface unit, S system.  
*2* Centralized fault display (IU adds indicator or interface unit, S adds system).  
*3* Computational fluid dynamics.  
*4* Continuous fire detectors, or detection.
- CFE** *1* Contractor-furnished equipment.  
*2* Central Fighter Establishment (RAF).  
*3* Conventional Forces in Europe (Treaty).
- CFES** Continuous-flow electrophoresis in space.
- Cr<sub>ex</sub>** Excess-thrust coefficient.
- CFF** *1* Cost plus fixed fee, sometimes CPFF.  
*2* Critical flicker frequency (electronic displays).
- CFFT** *1* Critical flicker fusion threshold.  
*2* Cockpit and forward-fuselage trainer (F-22).
- CFFTS** Canadian Forces Flying Training School.
- CFG** Customer focus group.
- C<sub>fg</sub>** Gross thrust coefficient of a [usually subsonic] jet engine propulsive nozzle.
- CFI** *1* Chief flying instructor (UK).  
*2* Certificated flight instructor (US).  
*3* Call for improvement[s] (DoD).
- CFII** Civilian, or certificated, flight instrument instructor (US).
- C/FIMS** Contaminant and fluid-integrity measuring system.
- CFIT** Controlled flight into terrain.
- CFK, CfK** CFRP (G), usually KfK.
- CFL** Cleared flight level.
- CFM** Common functional module.
- cfm** Cubic feet per minute.
- CFMO** Command flight medical officer.
- CFMT, C/F/M/T** Celsius, fahrenheit, magnetic, true.
- CFMU** Central Flow, or Flight, Management Unit (Eurocontrol).
- CFO** *1* Coherent-fibre optics.  
*2* Chief Financial Officer.  
*3* Central Forecast Office.
- C433** Very strong al-alloy for lower wing skin (Alcoa).
- CFP** *1* Cost plus fixed price.  
*2* Communications-failure procedure.  
*3* Cold-front passage.
- CFPD** Command flight-path display.
- CFR** *1* Co-operative Fuel Research.  
*2* Crash fire rescue.  
*3* Code of Federal Regulations.  
*4* Contact flight rules.  
*5* Call for release.  
*6* Company-funded research.

<b>CFROI</b>	Cash-flow return on investment.	<b>2</b> Command generator tracker.
<b>CFRP</b>	Carbon-fibre reinforced plastics.	<b>CGV</b> Computer-generated voice.
<b>CFS</b>	<b>1</b> Central Flying School (RAF).	<b>CGW</b> Combat gross weight.
	<b>2</b> Cabin file server.	<b>CH</b> <b>1</b> Channel (ICAO).
	<b>3</b> Chlorofluorosulphonic acid, suppresses contrails.	<b>2</b> Compass, or course, heading.
	<b>4</b> Customer fleet service.	<b>3</b> Critical height.
<b>CFSO</b>	Command flight safety officer.	<b>4</b> Chain home.
<b>CFSP</b>	Common foreign and security policy (EU).	<b>Ch</b> <b>1</b> Hinge, or rotor drag force, coefficient.
<b>CFT</b>	<b>1</b> Conformal fuel tank.	<b>2</b> High cloud.
	<b>2</b> Contractor flight test.	<b>Ch</b> <b>1</b> Channel.
<b>CFTC</b>	Carbon-fibre thermoplastic composite[s].	<b>2</b> Hinge-moment coefficient, hinge moment divided by control-surface area and chord aft of hinge axis and by $q$ . $Ch\delta$ and $Ch\infty$ are derivatives with respect to control deflection and AOA of main surface.
<b>CFTR</b>	Cold-fan thrust reverser.	<b>ch</b> Cheval-vapeur, see cv.
<b>CFTS</b>	Contracted Flying Training and Support (Canadian DnD).	<b>CHA</b> Canadian Historic Aircraft Association [Windsor, PO].
<b>CFU</b>	<b>1</b> Colony-forming unit, measure of bacteria per cubic metre of cabin air.	<b>Chaals, CHAALS</b> Communications high-accuracy airborne location system (USAF).
	<b>2</b> Cartridge-firing unit (countermeasures).	<b>CHAD, Chad</b> Chart amendment document.
<b>CF weight</b>	Contractor-furnished.	<b>chaff</b> Radar-reflective particulate matter or dipoles sized to known or suspected enemy wavelengths (ECM).
<b>CFWS</b>	Central Flow Weather Service; U adds Unit.	<b>chaff dispenser</b> Tube, gun, projector or other system for releasing chaff either in discrete bursts or in measured stream, manually or upon command by RWS.
<b>CG</b>	<b>1</b> Cargo glider, USAAF 1941–47	<b>chafing patch</b> Local reinforcement of aerostat envelope where likely to suffer abrasion.
	<b>2</b> Lethal gas phosgene.	<b>Chag, CHAG</b> Chain arrester gear.
	<b>3</b> Guided-missile cruiser (USN).	<b>chain</b> <b>1</b> Geographical distribution of radio navaid stations linked together and emitting synchronised signals (eg Decca, Loran).
	<b>4</b> Commanding General.	<b>2</b> Obsolete unit of length = 22 yd = 20.1168 m.
	<b>5</b> Coast Guard.	<b>chain arrester</b> Aircraft hook picks up wire attached to heavy chain on each side of runway.
<b>C<sub>g</sub></b>	Ratio of actual/ideal propulsive thrust.	<b>chain gun</b> High-speed automatic cannon with external power supply and open rotating bolt.
<b>cg, c.g.</b>	Centre of gravity.	<b>Chain Home</b> The original string of interlinked radar stations constructed round east and south England from 1937. Chain Home Low added radars able to detect low-altitude targets.
<b>CGA</b>	Coevolutionary genetic algorithm[s].	<b>chain radar beacon</b> Beacon having fast recovery time, thus can be interrogated by many targets up to prf.
<b>CGAC</b>	Combination, or combined, generator and air-conditioner (trailer mounted).	<b>chain reaction</b> In fissile material or other reactant, process self-perpetuating as result of formation of materials necessary for reaction to occur. Nuclear chain reaction arranged in weapons to have optimum uncontrolled (accelerating) form.
<b>CGAO</b>	Conference of General-Aviation Organizations (UK).	<b>CHAIR, chair</b> Control handling aid for increased range (target aircraft).
<b>c.g. arm</b>	Arm (2) obtained by adding all individual moments and dividing sum by aircraft total mass.	<b>chairborne</b> Condemned to desk job (originally said of RAF pilots).
<b>CGAS</b>	Coast Guard Air Station (US).	<b>chair chute</b> Parachute permanently incorporated into seat (not necessarily ejection seat, but removable).
<b>CGASC</b>	Cornell-Guggenheim Aviation Safety Center (US).	<b>chalk</b> Loosely, one load, especially stick or squad of troops, often 6–10.
<b>CGB</b>	Central gearbox.	<b>chalk number</b> In military logistics, number assigned one complete load and carrier vehicle; hence chalk commander, chalk troops.
<b>CGC</b>	Complementary ground component [European counterpart of ATC 15].	<b>challenge and response</b> Basic method of working through any procedural cockpit check, nav (mil) or first officer (civil) reading each item after satisfactory response to previous item.
<b>CGCC</b>	Centre of gravity control computer.	<b>Chals</b> Communications high-accuracy locating system; -x adds exploitable.
<b>CGF</b>	Computer-generated [usually armed hostile] forces.	
<b>CGH</b>	Guided-missile/helicopter cruiser (USN).	
<b>CGI</b>	<b>1</b> Chief ground instructor.	
	<b>2</b> Computer-generated image, or imagery.	
<b>CGIVS</b>	CGI (2) visual system.	
<b>CGL</b>	Circle guidance light[s].	
<b>c.g. limits</b>	Forward and aft limits, usually expressed as percentage MAC, within which aircraft c.g. must fall for safe operation.	
<b>CGM</b>	Computer-graphics metafile[s] [sometimes CGMF].	
<b>CGM load</b>	Combined gust and manoeuvre load.	
<b>CGN</b>	Guided-missile cruiser, nuclear (USN).	
<b>CGP</b>	Coal-gasification plant, eg for jet fuel.	
<b>CGPM</b>	Conference Général Poids et Mesures [Int.].	
<b>CGRO</b>	Compton gamma-ray observatory.	
<b>CGS</b>	<b>1</b> Centimetre, gramme, second system of units, superseded by SI.	
	<b>2</b> Central Gunnery, or [later] Gliding, School (RAF).	
	<b>3</b> Computer-generated simulation.	
	<b>4</b> Common ground segment, or station.	
	<b>5</b> Chief of the General Staff (UK).	
<b>CGT</b>	<b>1</b> Consolidated ground terminal.	

## chamber

**chamber** In liquid rocket engine, enclosed space where combustion takes place, between injectors and throat. In solid rocket, enlarging volume in which combustion takes place, varying in form with design of motor.

**chamber pressure** See *burn time average, action time average, MEOP*.

**chamber volume** In liquid rocket, total volume as defined; solid motor varies during burn.

**chamfered** Bevelled (edge or corner, eg of sheet).

**champ** Cargo-handling and management planning [s adds system].

**Champs** Common helicopter aviation mission planning system (USN/USMC).

**Chan** Channel.

**Chance** Complete helicopter advanced computational environment.

**Chance light** Formerly, mobile airfield floodlight illuminating landing area and apron.

**chandelle** Flight manoeuvre (see *stall turn*); another definition, not necessarily synonymous with stall turn, is a manoeuvre in which speed is traded for altitude whilst reversing flight direction (see also *Immelmann*).

**changeover point** Ground position and time at which aircraft switches from using one ground-based navaid to another, not necessarily at midpoint of leg.

**channel** 1 Band of frequencies in EM spectrum, esp. at radio nav/com frequencies (thus 20 \* allotted to ILS in all countries, each with published frequency for loc and g/p).

2 Single end-to-end 'route' in dynamic system, esp. one exerting control authority (eg collective pitch in helicopter AFCS).

3 Structural member of channel form (eg top-hat or U).

4 In EDP, several meanings: any information or data highway, one or more parallel tracks treated as unit, portion of store accessible to given reading station.

5 In semiconductor device (eg transistor), flow bypassing base.

6 Pathways for energetic ions or atoms along crystal lattices.

7 In airport terminal, single routing for departing or arriving passengers.

8 Takeoff and alighting path at marine airport.

**channel nut** One forming integral part of channel (3).

**channel patch** Channel-shaped reinforcement to aero-stat envelope to anchor rigid spar.

**channel section** See *channel* (3).

**channel wing** Wing curved in front elevation to fit closely round lower half of propeller disc.

**Chapi, CHAPI** Carrier, colour or compact helicopter approach path indicator.

**char** Ablative material charred and eroded during re-entry (see *ablation*).

**characteristic** Sense (up or down) in which barometric pressure changes in preceding 3 h.

**characteristic curve** 1 Curve of atmospheric sounding results plotted on Rossby diagram.

2 Curve of primary characteristic of aerofoil when plotted (see *characteristics*).

**characteristic exhaust velocity, C\*** Measure of rocket performance, numerically  $g_e A_t / W_p$  multiplied by integral of chamber pressure over action time.

**characteristic length** 1 In rocket, ratio of chamber volume to nozzle throat area.

## chatter

**2** In rocket, length of cylindrical tube of same diameter as chamber, having same volume as chamber.

**3** Convenient reference length (eg chord).

**characteristics** 1 Of aerofoil, primary \* are: coefficients of lift and drag, L/D ratio, cp position and coefficient of moment, each plotted for all operating AOAs.

2 In electronics, relationships between basic variables (eg anode current/voltage, anode current/grid voltage) for valves (tubes) and correspondingly for transistors.

**characteristic velocity** 1 Sum of all changes in velocity, positive and negative all treated as positive, in course of space mission.

2 Velocity required for given planetary (esp. Earth) orbit.

**charge** 1 Total mass of propellant in solid rocket.

2 Propellant of semi-fixed or separate-loading ammunition.

3 To fill high-pressure gas or cryogenic (eg Lox) container.

4 Quantity of electricity, measured (SI) in Coulombs.

**chargeable** Malfunction (eg IFSD) clearly due to fault in design, workmanship, material or technique by supplier.

**charging point** Standard coupling through which aircraft fluid system is replenished or pressurized.

**Charles' law** Perfect gas at constant pressure has volume change roughly proportional to absolute temperature change.

**Charlie** Preplanned landing-on time in carrier operations.

**Charlière** Common term for a gas balloon (pre-c1850).

**charm** Composite high-altitude radiation model.

**Charme** Concept d'hélice pour avions rapides en vue d'une meilleure économie (12-blade single rotation propfan).

**Charpy** Destructive test of impact resistance of notched test bar.

**chart** Simplified map, typically showing coasts, certain contours, woods, water, and aeronautical information (symbols vary and not yet internationally agreed).

**chart board** Rigid board, suitably sized for chart or topographic map; often provided with protractor on parallel arms.

**charted approach** Visual flight to destination authorised to radar-controlled aircraft on IFR flight plan.

**charted delay** In Loran, published delay.

**charts** Compact hydrographic airborne rapid total survey.

**chart table** Chart board mounted in aircraft.

**Chase** Coronal helium abundance Spacelab experiment.

**chase** To accompany other aircraft, esp. one on test, to observe behaviour and warn of visible malfunction; hence \* plane, \* pilot.

**chassis** 1 Rigid base on which electronics are mounted; for airborne equipment, mates with racking.

2 Landing gear. In WW2 the accepted UK term was undercarriage, but the author recalls many cockpits where \* was used because there was no room for the longer word.

**Chats** Counter-intelligence Humint automated tool system.

**chatter** 1 Multiple conversations or signatures, most being of no interest, all heard on same frequency.

2 High-frequency vibration energised by intermeshing gear teeth.

**3** [also **chattering**] any small uncommanded repeated operations, e.g. by hydraulic jack.

**CHB** Common high band[width]; DL adds datalink.

**CHC** Chance, traditionally 30–40% likelihood of precipitation.

**CHD** Crutching heavy-duty (stores carrier).

**CHDO** Certificate-holding district office (FAA).

**cheatline** Bold line[s], usually horizontal, painted at artistically pleasing level along side of aircraft.

**check** **1** To verify flight progress (eg ETA \*).

**2** To examine pilot for proficiency.

**3** Examination conducted in (2).

**4** Programmed investigation of aircraft for malfunction (before-flight \*, after or post-flight \*, etc.).

**5** Programmed procedural routine from entering cockpit to start of flight (cockpit \*).

**6** To reduce in-flight trajectory variable (\* rate of descent).

**Checkered Flag** Provides designated bases and procedures for overseas training deployments (USAF, TAC).

**checker team** Responsible for maintenance of all runway/taxiway/apron markings.

**check finals!** Last brief vital actions before landing (items not standardized).

**check in** **1** Several meanings, esp. to call up tower to establish frequencies and procedures at start of cockpit check.

**2** For airline passenger, to report at designated \* desk, have page of flight coupon torn off, hand over hold baggage and be assigned seat.

**checking station** **1** Designated and marked location used in rigging airframe. Also called checking point.

**2** Reference station on propeller blade, typically at 42 in radius on lightplanes.

**checklist** Written list of sequenced actions taken in check (5), usually printed on plastics or laminated pages. Usually also includes emergency actions, V-speeds and short- or soft-field procedures.

**check-out** **1** Programmed test by user immediately before operational use of missile, radar or other system.

**2** Sequenced tasks to familiarise operator with new hardware.

**check point, checkpoint** **1** See *waypoint*.

**2** Geographical point happening to offer precise fix.

**3** Planned strategic review of major industrial programme for government customer, esp. collaborative.

**4** Predetermined geographical location serving as reference for fire adjustment or other purpose.

**5** Mean point of impact.

**check six!** Look astern for hostile fighters.

**check valve** One-way valve in fluid line.

**cheese aerial (antenna)** Shaped roughly like D in side elevation with quasi-circular or parabolic reflector and flat parallel sides nodding in elevation; propagates more than single mode.

**cheesed** Thwarted, disgruntled; occasionally \* off (RAF colloq., WW2).

**chemical fuel** Has ambiguous connotation excepting common fuels; hence, ‘exotic’ fuel, esp. for air-breathing engines.

**chemical laser** Strictly, one in which chemical reaction occurs, eg perfluoromethane/hydrogen.

**chemical milling** Use of acid or alkaline bath to etch metal workpiece in controlled manner.

**chemical munition** Non-explosive ordnance operating by chemical reaction: incendiary, smoke, irritant or lethal gas, defoliant, flare or flash, dye marker etc.

**chemical propulsion** Propulsion by energy released by chemical reaction, eg fuel + oxygen, with or without air breathing.

**chemical rocket** Rocket operating by chemical reaction; not ion, photon or nuclear.

**chemical warfare** Use of major chemical munitions, esp. irritant or lethal gases.

**chemosphere** Region of upper atmosphere (say 15–120 miles, 24–190 km) noted for photochemical reactivity.

**chequered flag** **1** Black/white, various meanings including race winner.

**2** Red/yellow, do not move off blocks until ATC permits.

**3** See *Checkered Flag*.

**cherl** Change in Earth’s rate (tangential velocity) of rotation with latitude.

**Cherry rivet** Tubular rivet inserted blind and closed by internal mandrel (shank) which then breaks and is removed.

**chest-type parachute** Pack stored in aircraft separate from harness, to which it is secured by quick clips on chest.

**cheval du bois** ‘Wooden horse’ = swing [1] (F).

**cheval vapeur** Metric horsepower, 1 cv = 0.98632 hp = 0.7355 kW; reciprocals 1.01387, 1.35962.

**chevron mixer** Sawtooth nozzle.

**Cheyenne Mountain** Location of USAF/Norad Space Command HQ.

**CHF** **1** Commando helicopter force.

**2** Swiss franc[s].

**CHG** **1** Change, ie modifying previous message; CHGD, changed.

**2** Charge.

**CHI** Computer/human interface.

**Chicken** See *State chicken*.

**chicken bolts** Temporary fasteners used in metal airframe assembly.

**chicks** **1** Fighters, especially airborne group under unified local command (USN).

**2** Fighters in group round air-refuelling tanker.

**chiefy** Flight sergeant in charge of erks (RAF, colloq.).

**Chili** Dry southerly wind (N. Africa).

**chilldown** Pre-cooling of tanks and system hardware before loading cryogenic propellant.

**chilled** Stage at which design is almost frozen [change accepted reluctantly].

**chilled casting** Made in mould of metal, usually ferrous, giving rapid cooling and thus surface hardness.

**chime** Melodious warning of imminent announcement to passengers, typical output 120 W.

**Chimp** Common-good high-grade Infosec module [programmable].**chin** Region under aircraft nose; hence \* blister, \* intake, \* radome, \* turret.

**china-clay** Technique for distinguishing regions of laminar and turbulent boundary layer from changed appearance of thin coating of \* suspension.

**China Lake** California desert home of NAWS.

**chine** In traditional marine aircraft hull or float, extreme side member running approximately parallel to keel in side elevation. In supersonic aircraft, sharp edge forming lateral extremity of fuselage, shedding strong vortex and

## chined tyre

merging into wing. On a landing-wheel tyre, a sharp-edge lip for shedding water.

**chined tyre** Tyre, esp. for nosewheels, with chines to depress trajectory of water or slush.

**chin fairing** On centreline on underside of leading edge [T-tail].

**chin fin** Fixed destabilizing fin under nose.

**Chinook** Warm dry westerly wind on E side of Rocky Mountains. In Europe, called Föhn.

**chin turret** A gun or sensor turret mounted under the nose of a pre-1950 bomber or an attack helicopter.

**chip** 1 Single completed device separated from slice, wafer or other substrate of single-crystal semiconductor.

2 Metal fragment, visible to eye, broken from engine or other machinery.

**chip chart** Rectangles of paint showing colours available.

**chip detector** Device, often permanent magnet, for gathering every chip (2), usually from lube oil.

**Chips** Cosmic hot interstellar plasma spectrometer.

**chips** Killed; from to have had one's \* (RAF colloq, WW2).

**chip width** Length of PN code bit,  $T_c$ .

**Chirp** Confidential human-factors incident reporting procedure (or programme) (CAA).

**chirp** 1 Radar/communications pulse compression or expansion (colloq.).

2 Particularly, pulse compression by linear FM.

**CHIS** Center hydraulic isolation system.

**chisel window** Small oblique nose window for LRMTS or camera.

**CHL** Chain Home Low.

**ch.lat.** Change of latitude (pronounced sh-lat).

**ChLCD** Cholesteric liquid-crystal display.

**ch.long.** Change of longitude (pronounced sh-long).

**chlorine** Cl, toxic green/yellow gas, density 3.2, MPt - 101°C, present in vast range of aerospace products.

**Chobert** Tubular rivet inserted blind and closed by withdrawal of re-usable mandrel.

**Choc** Combined hydrocarbon filter and catalytic ozone converter.

**chock** Portable obstruction placed in front of and/or behind landplane wheel(s) to prevent taxiing.

**chocks away** Traditional signal to ground crew to remove chocks [usually one arm waved over head side to side].

**chock-to-chock** See *block time*.

**choke** 1 Inductance used to offer high reactance at chosen frequency to pass d.c. or lower a.c. frequencies only.

2 In typical car (auto) engine, manual control for reducing inlet airflow to enrich mixture when cold, rare in aviation.

**choked flow** Flow of compressible fluid in duct [eg tunnel or jet-engine nozzle] in which local Mach number has reached 1 and velocity cannot be increased significantly by increasing upstream pressure.

**choked inlet** Containing normal shock and suffering choked flow.

**Chol, CHOL** Common [or Collins] high-order language.

**cholesteric** LCD with layers each aligned in preferred, different direction.

## chromate primer

**chomp** Changeover (from one waypoint VOR, NDB etc to next) at midpoint (of leg).

**Chop** Countermeasures hands-on program[me].

**chop** 1 Changeover point.

2 Change of operational control, precisely promulgated time.

3 To get the \*, sudden termination (of human life, project, place on flying-training course, etc. colloq.).

4 To close throttle(s) completely and suddenly.

5 Atmospheric turbulence, esp. CAT, categorised as mild (also called light), moderate (or medium) and severe (or heavy).

**chopped fibre** Reinforcing fibre chopped into short lengths.

**chopped random mat** Chopped fibre made into mat (two-dimensional sheet) with random orientation.

**chopper** 1 Rotary-wing aircraft, esp. helicopter (colloq.).

2 Mechanical device for periodically interrupting flow, esp. light beam, or switching it alternately between two sources.

3 Device for modulating signal by making and breaking contacts at frequency higher than frequencies in signal.

**chop rate** Rate of aircraft or crew loss on operations, or wastage rate in flying training (colloq.).

**chord** 1 Straight line parallel to longitudinal axis joining centres of curvature of leading and trailing edges of aerofoil section.

2 Some authorities prefer the line joining the trailing edge to the stagnation point on the leading edge.

3 Loosely, breadth of wing or other aerofoil from front to rear.

4 Boundary members of structural truss.

5 In the new century this is the preferred spelling of what was previously called miniature detonating cord.

**chord direction** In stress analysis, usually parallel to chord at aircraft centreline (of wing, or wing produced to centreline).

**chord length** Length of chord (1), not measured round profile.

**chord length ratio** At any radius, the total chord length of all the blades of a propeller divided by the diameter.

**chord line** See *chord* (1). Ambiguously, sometimes line tangent at two points to lower surface (see *geometric chord*).

**chord plane** Plane containing chord lines of all sections forming three-dimensional aerofoil (assuming no twist).

**chord position** Defined by location of quarter-chord point and inclination to aircraft x-y plane, point being defined on primary centreline co-ordinates.

**chord wire** Wire tying vertices of airship frame.

**chordwise** Parallel to chord (normally also to longitudinal axis).

**chosen instrument** Carrier selected as national monopoly [can be private company].

**CHP** Controlled-humidity preservation.

**CHR** Cooper-Harper rating.

**CHRG** Charges.

**Christmas tree** Aircraft temporarily set aside as source of spare parts, but to be eventually returned to service.

**chromate enriched pellet** Small source of antifungal chemical in integral-tank low point (possible water trap).

**chromate primer** Anti-corrosive, antimicrobiological surface treatment, esp. for water traps in airframe.

## chromatic aberration

**chromatic aberration** Rainbow effect caused by simple lens having different focal length for each wavelength.

**chrome steels** Steels containing chromium; often also with vanadium, molybdenum etc.

**chromic acid** Red crystalline solid, H<sub>2</sub> Cr O<sub>4</sub>, used in solution as cleaner and etchant, as electrolyte [eg, Alcrome] for Cr plating and anodising, and for crack detection.

**chromic paint** Coating which changes colour (usually white-grey-blue-black) as temperature increases.

**chromium** Cr, hard silvery metal taking brilliant polish, density 7.2, MPt 1,860°C.

**Chromoly** Alloy steels containing chromium and molybdenum.

**chromosphere** Thin (under 15,000 km) layer of gas surrounding Sun's photosphere.

**chronograph** Device for producing hard-copy readout of variable against time, with particular events recorded, typically by pen and disc or drum chart.

**chronometer** Accurate portable clock with spring drive and escapement.

**CHS, CH/S** Common hardware and software.

**CHT** Cylinder-head temperature. A \* instrument usually displays a reading taken from the cylinder thought to run hottest.

**chuck** Rotating vice (US "vise") for gripping tool or workpiece.

**chuck glider** Small model glider [not necessarily a toy] launched by hand.

**chuffing** Pulsating irregular rocket combustion.

**chum** Chart update module.

**chutai** Squadron (J).

**chute** 1 Parachute (colloq.).

2 Axial/radial ducts around engine periphery to guide fan air into afterburner or engine airflow through silenced nozzle.

3 Duct for ventral crew escape or discharge of ECM, leaflets etc. Not to be confused with *escape slide*.

**CI** 1 Chief instructor.

2 Compression, or continuous, ignition.

3 Catalytic ignition [see *CIS* (6)].

4 Certificate of Interest, signed by intending purchaser, unless rescinded becomes binding contract after stipulated period.

5 Cubic inches [strongly deprecated].

6 Configuration item.

7 Cabin interphone.

8 Counter-intelligence.

9 Chief inspector.

10 Competitive intelligence, primarily for multi-national corporations.

11 Control indicator.

12 Continuous improvement.

**Ci** 1 Cirrus.

2 Curie[s].

**ci** Cubic inches (not recommended).

**CIA** 1 Contractor interface agreement.

2 Central Intelligence Agency (US, 1947 on).

3 Commission Internationale d'Aérostation (FAI).

4 Captured in action.

**CIAA** 1 Consorzio Italiano di Assicurazioni Aeronautiche [aviation insurers] (office, Rome).

2 Centre International d'Aviation Agricole.

## Cigars

**CIACA** Commission International des Aéronefs de Construction Amateur (FAI).

**CIAM** 1 Computerised integrated and automated manufacturing.

2 Commission Internationale d'Aéromodélisme (FAI).

3 Central Institute of Aviation Motors (R).

**CIANA** Latin American commission for air navigation (office Madrid, from October 1926).

**CIAP** Climatic Impact Assessment Program (US DoT).

**CIARA** See *IAARC*.

**CIAS** Comitato Interministeriale Attività Spaziali (I).

**CIASE** China Institute of Aeronautic Systems Engineering.

**CIB** Controlled image base.

**CIC** 1 Combat information center (USA, USAF).

2 Commander-in-Chief [UK usage, C-in-C].

3 Corrosion-inhibiting compound.

**Cicas** Check-in counter allocation system, displays logo and flight details at each counter.

**C(I)CT** Completion of interim certification testing.

**CICU** Central interface control unit.

**CID** 1 Combat identification.

2 Check-in display.

3 Category-interaction.

**CIDA** Co-ordinating installation design authority.

**Cidef** Conseil des Industries de Défense Français [F-75782 Paris] (F).

**CIDIN, Cidin** Common ICAO data-interchange network (Int.).

**CIDS** 1 Cabin interface [previously intercommunication or interphone] data, or distribution, system, with microprocessor control for speakers, lamps, PA, entertainment systems, safety signs, crew intercom, etc, to facilitate changes in interior layout.

2 Check-in display system.

**CIE** 1 Commission Internationale de l'Eclairage (= ICI).

2 Centro de Investigaciones Espaciales (Arg.).

**CIEA** Commission Internationale d'Enseignement Aéronautique (FAI).

**CIEM** Computer-integrated engineering and manufacturing.

**CIF** Customs inspection fee (TSA).

**CI-F** Control indicator, front.

**CIFMS** Computer-integrated flexible manufacturing systems.

**CIFRR** Common IFR room (New York, civil/military).

**CIFS** 1 Computer-interactive flight simulation.

2 Close-in fire support.

**CIG** 1 Computer image-generation.

2 Control/indicator group.

3 Commission Internationale de Giravitation (FAI).

4 Ceiling.

**CIGAR** Many US mnemonics begin: Controls, instruments, gas, attitude [trim/flaps], run-up [mags., carb. heat, etc].

**Cigar** *Airborne Cigar*.

**cigar** Aeroplane from which wings have been removed (colloq.).

**cigarette-burning** Solid propellant ignited at one end across entire section and burning towards other end.

**Cigars** Mnemonic reminding pilot of vital actions before takeoff: controls, instruments, gas, attitude indicator, run up, seat belt (US, WW2).

## CIGFTPR

**circular milfoot**

**CIGFTPR** Controls-instruments-gas-flaps-trim-prop-run-up (US).

**CIGS** Chief of the Imperial General Staff [now CGS] (UK).

**CIGSS** Common imagery ground/surface standards.

**CIGTF** Central Inertial Guidance Test Facility (USAF).

**CIP** Critical information infrastructure protection.

**CIJ** Close-in jamming.

**CIL** 1 Candidate-items list.

2 Command Information Library (NIMA).

**CIM** Computer-integrated manufacturing.

**CIMA** 1 Chartered Institute of Management Accountants (UK).

2 Commission Internationale de Micro Aviation (FAI).

**Cimact, CIMACT** Civil/military air-traffic management co-ordination tool (Eurocontrol).

**CIME** Commission Intergouvernementale des Migrations Européennes (Int., arranges mass flights, eg for refugees).

**CIMT** Configuration integration management team.

**Cimtic** C<sup>4</sup>I and munitions test improvement contract.

**CIMTIG** Chartered Institute of Marketing Travel Industry Group (office Westerham, UK).

**CINA** Commission Internationale de la Navigation Aérienne (Int., office Paris, 1922–).

**Cincat** Capacity increase through controller assistance tools (Euret).

**Cinch** Compact inertial navigation combining HUD.

**CINS** Compact INS.

**CIO** 1 Central Imagery Office (US).

2 See *AFL-CIO*.

3 Chairman in office.

4 Chief information officer.

**CIOD** Counterspace and Information Operations Division (USAF).

**CIOS** Combined Intelligence Objectives Subcommittee (US/UK, WW2).

**CIP** 1 Cold iso-pressing (beryllium).

2 Component [or communications] improvement program(me).

3 Commission Internationale de Parachutisme (FAI).

4 Commercially important passenger.

5 Command input potentiometer.

6 Capital investment plan (FAA).

7 Critical infrastructure protection.

8 Common integrated processor.

9 Common imagery, or core-integrated, processor [see next].

**CIPM** Common integrated processor manager.

**CIPR** 1 Cubic inches per revolution.

2 Continuous in-flight performance recorder.

**CIR** 1 Constant, or continuous, infra-red (heat source on target).

2 Cockpit image recorder.

**CIRA** 1 Cospar International Reference Atmosphere.

2 Centro Italiane Ricerche Aerospaziali (I).

**CIRC** Central information reference and control.

**Circ, circ** Circling or circulating.

**circadian rhythm** Change in physiological activity on approximate 24 hour cycle.

**Circe** Cossor interrogation and reply cryptographic equipment, enabling all participating nations to have own secure cryptographic IFF.

**Circle** Circuit (US); can also be an instruction to join stack.

**circle marker** On unpaved airfield, white circle indicating centre of landing area.

**circle of confusion** Image of any distant point on lens focal plane (eg on film).

**circle of equal probabilities, CEP** Radius of circle within which half the strikes (eg bullet impacts on single aiming point) fall or within which probability is equal that one bullet, bomb or RV will fall inside or outside. Also called circular error probable.

**circle of latitude** On celestial sphere through ecliptic poles, perpendicular to ecliptic.

**circle of longitude** On celestial sphere parallel to ecliptic.

**circle of origin** Normally, Equator or Prime Meridian.

**circle of position** Circle on Earth's surface centred on line joining centre of Earth to heavenly body, from which altitude of body is everywhere equal. Sometimes called circle of equal altitude.

**circuit** 1 Basic element in pilot training, short flight comprising takeoff and precisely executed \* back to landing, if necessary ready for repeated \*. In US often circular, but in UK and most other countries rectilinear, comprising takeoff, straight climbout [upwind leg] to [typically] 300 m/1,000 ft, turn 90° [in either direction, but usually L] on to crosswind leg, second 90° turn on to downwind leg, passing airfield parallel to active runway, third 90° turn with power off on to descending second crosswind leg [often called base leg] followed by 90° turn on to finals. Depending on circumstances, \* may be followed by immediate takeoff called touch-and-go [if the aircraft is brought to rest, called stop-and-go] for second \* or by taxi back to downwind end of runway for next takeoff; \* can be L-hand or R-hand. US term pattern, circle or traffic circle.

2 List of airshows [usually annual] at which particular aircraft regularly appear.

3 Closed loop of electrical conductors.

**circuit analog absorber** Large family of RAM (2) in which outer resistive sheet is given an imaginary part to its admittance, by laying it down in form of many discrete elements such as dipoles, crosses and meshes. See *frequency-selective*.

**circuit breaker** Switch for opening circuit (3) while carrying large electrical load.

**circuit length** Length round closed-circuit wind tunnel traversed by streamline always equidistant from walls.

**circuits and bumps** Repeated circuits (1) with landing [or at least a touch-and-go] at end of each (colloq.).

**circular approach** Precision training manoeuvre, chiefly associated with carrier flying, where circuit (1) is circular.

**circular dispersion** Diameter of smallest circle within which 75 per cent of projectiles strike.

**circular error probable** See *bombing errors (1)*.

**circular isotropic** Aerial (antenna) radiation polar equal in all directions (normally in azimuth).

**circularisation** Refinement of satellite orbit to approach perfect circle, usually at given required height.

**circular mil** Area of circle of one mil ( $1/1,000$  inch) diameter =  $5.067 \times 10^{-10} \text{ m}^2$  ( $7.85 \times 10^{-7} \text{ in}^2$ ).

**circular mil foot** Unit of resistivity; resistance of one foot of wire of one circular mil section, equal to ohm-mm ×  $6.015 \times 10^5$ .

## circular milliradian

**circular milliradian** Conical beam or spread of fire having angle (not semi-angle) of one milliradian.

**circular nose** Control surface whose leading-edge section is semicircle about hinge axis.

**circular velocity** At given orbital height, velocity resulting in circular orbit,  $V_c = \sqrt{Rg}$  where R is radius from Earth centre.

**circulation** 1 Rotary motion of fluid about body or point; vortex.

2 Ideal flow around (not past) circular body, with streamlines concentric circles and velocity inversely proportional to radius (body needed to avoid infinite V at centre).

3 Streamline flow around body of any form, defined as integral of component of velocity along closed circuit with respect to distance travelled around it. Wing lift created by \* superimposed on rectilinear flow past surface (see *bound vortex*, *Magnus*, *Zhukovsky*).

4 Gross motions of planetary (eg Earth) atmosphere.

**circulation controlled** Wing, rotor blade or other aerofoil in which external power is used to enhance lift, typically by high-velocity tangential blowing of various kinds.

**circulator** Non-reciprocal device in microwave circuit to produce phase-shift as function of direction of wave flow (see *duplexer*).

**circulatory flow** Rectilinear flow past lifting body inducing circulation (3) (see *Zhukovsky*).

**circumaural** Fitting around the ear.

**Circus** Small formation of bombers with much larger fighter escort, objective being to lure enemy fighters to combat (RAF, WW2).

**circus** 1 Large loose formation of fighters, usually with distinctive individual markings, flown by aces (G, WW1).

2 Loosely, group of itinerant aircraft entertaining public and offering rides (1919–39).

**CIRF** Consolidated intermediate repair facility.

**CIRM** Comité International de Radio Maritime.

**CIRO** Centre Interarmée de Recherches Opérationnelles (F).

**Cirpas** Centre for interdisciplinary remotely-piloted aircraft studies (USN).

**Cirris** Cryogenic infrared radiance instrument for Shuttle.

**cirrocumulus** Cc, layer of globular cloud masses at about 6,000 m/20,000 ft. Also known as mackerel sky.

**cirrostratus** Cs, high milky-white or grey sheet cloud, 7,000 m/23,000 ft.

**cirrus** Ci, high white cloud; detached, fibrous, silky, 7,500–12,000 m/25,000–40,000 ft.

**Cirstel** Combined IR suppression and tail-rotor elimination.

**CIRTEVS, CIRTVS** Compact IR TV system.

**CIS** 1 Combat identification system.

2 Computer interface system.

3 Communications, or command, or combat, or corporate, information systems.

4 Co-operative independent surveillance.

5 Cluster ion spectrometer.

6 Chemical ignition system.

7 Control indicator set, or suite.

8 Commonwealth of Independent States, of former USSR; CST adds Collective Security Treaty.

9 Cargo-inspection system, usually PFNA or X-ray.

## Civil Reserve Air Fleet

10 Cycles in service (FAA).

11 Common Industry Standards (ADIAE).

**cislunar** Between Moon's orbit and Earth.

**CISPR** Comité International Spécial des Perturbations Radiophoniques [radio interference].

**CISS** Configurable integrated surveillance system.

**CIT** 1 Compressor inlet temperature (flight envelope limit).

2 Central integrated testing.

3 Cranfield Institute of Technology.

4 Control in turbulence [mode].

5 Critical-item test.

6 The Chartered Institute of Transport [1919–, received charter 1926; office, London W1N 4DP] (UK).

7 Near or over a city.

8 Combined interrogator and transponder.

9 Commission for Integrated Transport (UK think tank).

**CITA** 1 Commission Internationale de Tourisme Aérien.

2 Confederación Interamericana de Transportadores Aéreos.

**CITE** 1 Computer integrated test equipment (USAF).

2 Compression-ignition and turbine engine (fuel).

**CITEJA, Citeja** Comité International Technique d'Experts Juridiques Aériens (1925–47, now part of ICAO).

**Citeps** Central integrated test experimental parameter subsystem.

**CITES** Convention on International Trade in Endangered Species.

**CITIS** Contractor integrated technical information system.

**CITS** 1 Central integrated test system, or subsystem (eg Shuttle).

2 CAS (3) integrated targeting system.

3 Combat information transport system.

**city pair** Pair of cities studied from viewpoint of mutual passenger/cargo traffic.

**city pair ranking** Lists of \*\* in order of current or projected traffic generation.

**CIU** 1 Computer, central, cockpit, coupler, communications, or control interface unit.

2 Central Interpretation Unit (RAF, 1941–).

3 Control-information unit (cartridge dispensing).

**CIV** 1 Crossbleed isolation, or centre interconnect, valve.

2 Coannular inverted-velocity (nozzle).

3 Civil.

**CIVA** Commission International de Vol Aérobatic.

**Civil Aeronautics Administration** Since 1958 FAA (1).

**Civil Aeronautics Board, CAB** US Government (DoC) agency responsible for civil aviation, including CARs, licensing, routes and US mail rates.

**civil aircraft** Not in government [including military] service.

**Civil Air Patrol, CAP** US para-military organization using pilot and lightplane resources of general aviation for national ends.

**civil day** Day of constant 24 hours (sometimes counted as two periods of 12 hours); mean solar day.

**Civil Reserve Air Fleet** US airline transport aircraft and flight crews predesignated as available at any time for reasons of national emergency.

- civil time** See *mean solar time*.
- civil twilight** Period at sunrise or sunset when Sun's centre is between  $0^\circ 50'$  and  $6^\circ$  below horizon.
- CIVL** Commission International de Vol Libre (FAI hang-gliding organization).
- CIVRES** Congrès International des Techniques du Vide et de la Recherche Spatiale.
- Civs, Civils** CAA [1], (UK, colloq.).
- CIVV** Commission International de Vol à Voile (gliding).
- CIWS** Close-in weapon system.
- C<sub>j</sub>** Blowing coefficient, or thrust coefficient of jet engine.
- CJAA** Classic Jet Aircraft Association (US).
- CJAP** Commonwealth Joint Air Training Plan (1939–45).
- CJCS** Chairman of the Joint Chiefs of Staff.
- CJO** Chief of Joint Operations (UK MoD).
- CJS** 1 Canopy jetison system.  
2 Commerce, justice and science (US Senate).
- CJS** Combined joint statement of requirements.
- CJTF** Combined [or commanders] joint task force.
- CK** Cape Kennedy.
- CK, Ck** Check
- Ck** Theodorsen's function.
- CKD** Component knock-down, or completely knocked down, parts imported for assembly in importing country to avoid duty.
- CKEM** Compact kinetic-energy missile.
- CL** 1 Centreline of aircraft.  
2 Checklist.  
3 Chemical laser.  
4 Catapult-launched.  
5 Charge limit, ie limit payload (RAF).  
6 Creeping landing.  
7 Centre of lift.  
8 Compass locator.  
9 Centreline lights of runway, followed by number giving number of bars of approach lighting.
- Cl** 1 Coefficient of lift.  
2 Low cloud.
- C/L** Centreline.
- C<sub>I</sub>** Rolling-moment coefficient (BSI).
- C<sub>i</sub>** Main-rotor section lift coefficient  $L/\frac{1}{2} \rho V_c^2$
- cl** Centilitre.
- c<sub>l</sub>** Section lift coefficient.
- C<sub>L</sub>** Mean lift coefficient of helicopter rotor.
- CLA** 1 Clear ice formation.  
2 Centreline average (surface roughness).  
3 Collective labor agreement (US).  
4 Consortium of Lancashire Aerospace, Became NWAA.  
5 Creeping line ahead.
- CLAC** Comisión Latino Americana de Civil Aviación (Int.).
- clack, clacking** Aural warning, esp. of Mach limit.
- clack valve** Fluid one-way valve having freely hinged flap seated on one side.
- Cladosporium** See *Hormoconis*.
- Clads** Common large-area display set.
- CLAES** Cryogenic limb array etalon spectrometer.
- CLAEX** Air-force flight test centre (Spain).
- clag** Widespread low cloud, mist and/or rain (colloq.).
- Claire** Clean-air engine.
- CL/AL** Catapult-launched, arrested landing.
- C<sub>L</sub>α** Slope of lift curve.
- CLAMP** Closed-loop aeronautical management programme.
- clamp** Weather unfit for flight (colloq.) Hence airfield may be **clamped**.
- clamped** Of a structural member, fixed in space and also unable to rotate or pivot. Hence a beam can be \* at one end and free at the other.
- clamping** To hold either or both peaks of waveform or signal at desired reference potential (d.c. restoration). Increasingly used in processing sensor images; black-level \* references all black levels to darkest point of image.
- clamshell** 1 Cockpit canopy hinged at front or rear.  
2 Nose or tail of cargo aircraft hinged into lower and upper or left and right halves.
- 3 Reverser opening in upper and lower halves meeting on jet centreline behind nozzle [US = bucket].
- clandestine aircraft** Aircraft designed to overfly without detection, having minimal noise, IR and radar signatures.
- clang box** Jet-engine switch-in deflector for V/STOL comprising an internal valve and side nozzle with deflecting cascade.
- Clansman** Army tactical radio communication system (UK).
- CLAP** Centre Laïque d'Aviation Populaire (F).
- clapper** Part-span shroud.
- Clara** Carbon-dioxide-laser radar, for obstacle avoidance.
- Clas, CLAS** Conformal load-bearing-antenna structure (AFRL).
- CLASB** Citizens' League Against the Supersonic Boom (US).
- clash detection** See dynamic \*, static \*.
- Class** Coherent laser airborne shear sensor.
- class action** Litigation in US courts in which plaintiffs represent a class, eg airline passengers, or passengers of a particular carrier.
- classic** Term merited by aircraft produced for many years, esp. to distinguish from later versions of same type.
- classical aeroplane** Aeroplane having clearly defined fuselage, nacelles and aerodynamic surfaces, not necessarily with all tail surfaces at rear. Opposite of integrated aeroplane.
- classical flutter** Occurring because of coupling – aero-dynamic, inertial or elastic – between two degrees of freedom.
- classify** 1 To protect official information from unauthorised disclosure [UK and US have numerous classification grades].  
2 In ASW to sort sonar returns according to types of source.
- claw** 1 Accelerator hook.  
2 Operative part of arrester hook.
- Claws** Complementary low-altitude weapon system (USMC).
- CLB** 1 Crash locator beacon.  
2 Climb, helicopter autopilot mode.
- C<sub>Lβ</sub>** Dihedral effect, the rolling moment due to sideslip; also called dihedral derivative.
- C<sub>lρ</sub>** Rolling moment due to sideslip rate [US usage, small l].
- CLBR** Calibration.
- CLC** 1 Command launch computer.  
2 Course-line computer.

**CLD** 1 Cloud (ICAO).

2 Crutching light-duty (stores carrier).

**cld** Cloud.

**CLDP** Convertible laser-designation pod.

**CLDS** 1 Cockpit laser-designation system.

2 Clouds.

**CLE** Central Landing Establishment, RAF Ringway 1941, pioneer paratroop/glider school.

**Clean** Component validator for environmentally friendly aero engine (Europe).

**clean** 1 Of aircraft design: streamlined, devoid of struts and other excrescences.

2 Of aircraft condition: landing gear, high-lift systems and other extendible items retracted, and not carrying drop tanks, external ordnance or other drag-producing bodies.

3 Nuclear weapon designed for reduced, or minimal, residual radioactivity compared with normal weapon of same yield.

**cleaning** In prolonged glide with piston-engined aircraft, to open up engine briefly to high power to clear over-rich mixture and gummy or carbon deposits.

**clean room** Sealed airlock-entrance facility for manufacture [eg, of inertial gyro] or examination of space samples, with rigid rules on humans admitted.

**clean up** To retract gear and flaps, and other high-lift devices, after takeoff.

**clear** 1 To authorise hardware as fit for use.

2 To authorise person to receive classified information.

3 To rectify stoppage in automatic weapon.

4 To unload weapon and demonstrate no ammunition remains.

5 To empty core store, register or other memory device.

6 In flight operations, authorised to take off, land or make other manoeuvre under ground control.

7 En route, to pass over waypoint.

8 To destroy all hostile aircraft in given airspace.

9 Of local sky, devoid of clouds ("the \*"), but may be above or between cloud layers.

10 To clean piston engine; see *cleaning*.

11 To fly out of a local area, eg a flying display.

12 Not secure [communications].

**clear air turbulence, CAT** Significant turbulence in sky where no clouds present, normally at high altitude in high windshear near jetstream.

**clearance** 1 Authorisation by ATC (1), for purpose of preventing collision between known aircraft, for aircraft to proceed under specified conditions within controlled airspace (see *abbreviated* \*, *SIDS*, *STARs*, \* *delivery*, \* *items*, \* *limits*).

2 Minimum gap between portions of hardware in relative motion (eg fan blade and case).

3 Transport of troops and material from beach, port or airfield using available communications.

4 Approval for publication of written text, image or film concerning sensitive subject, after excision of offending parts.

**clearance amendment** Change in clearance (1) made by controller to avoid foreseeable conflict.

**clearance control** Precise control of the microscopic gap between the tip, or outer radius, of a rotating structure and the surrounding fixed casing. Also called tip\*.

**clearance delivery** ATC service, with assigned frequency, for issuing pre-taxi, taxi and certain other pre-flight clearances.

**clearance function** Clearance delivery (UK).

**clearance limit** Fix or waypoint to which outbound flight may be cleared, there to receive clearance to destination.

**clearance void** Automatic cancellation if takeoff not made by specified time.

**clearance volume** Minimum volume remaining in piston engine cylinder at TDC.

**cleared flight level** FL to which flight is cleared, though possibly not yet reached.

**cleared through** Valid to clearance limit, including intermediate stops.

**clear ice** Glossy, clear or translucent accretion from slow freezing of large supercooled water droplets.

**clearing manoeuvre** Change of aircraft attitude, on ground or in flight, to give better view of other traffic.

**clearing procedure** Clearing manoeuvre, often combined with vocal callouts (esp. when pupil under instruction) before takeoff or any other flight operation (eg scrutiny of airspace beneath prior to spin).

**clearing turn** Turn in which pilot checks local airspace, especially below, before stall or spin.

**clear-vision panel** See *DV panel*.

**clearway** 1 Rectangular area at upwind end of runway or other takeoff path devoid of obstructions and prepared as suitable for initial climbout.

2 Specif., area beyond runway, extending not less than 250 ft/76 m wide on each side of centreline, no part of which (other than threshold lights away from centreline and not over 26 in/660 mm high) projects above \* plane.

**clearway plane** Plane extending from upwind end of runway at slope positive and not exceeding 1.25 per cent.

**cleat** 1 In airframes, a triangular brace at a junction.

2 In an aircraft equipped for towing [large military] gliders, the attachment [usually with two pivoted jaws] for the towrope.

**clevis joint** Fork and tongue joint (eg between solid motor cases) secured by large-diameter pin.

**CLF** Carbon-loaded foam, common single-layer RAM.

**CLFA** Centre de Laser Franco-Allemagne.

**CLG** 1 Ceiling (ICAO).

2 Calling.

**CL<sub>y</sub>, Cl<sub>γ</sub> gamma** Circulation lift coefficient.

**CLGE** Cannon-launched guidance electronics.

**CLGP** Cannon-launched guided projectile.

**CLI** Common languages interactions.

**Climate Change Levy** Financial penalty imposed [in absence of precise numerical values] on users of energy from non-renewable sources (EC).

**climatic test** Static test in simulated adverse environments (rain, ice, temperature extremes, salt, sand, dust) to demonstrate compliance with requirements.

**climb** 1 Any gain in height by aircraft (verb or noun).

2 More commonly, deliberate and prolonged gain in height by appropriate trajectory and power setting (ie not zoom).

**climb corridor** Positive controlled military airspace of published dimensions extending from airfield.

**climb gradient** Vertical height gained expressed as percentage of horizontal distance travelled.

**climb indicator** See *VSI*.

## climbing cruise, climb cruise

**climbing cruise, climb cruise** Compromise between speed and range, typically at 1.15  $V_{md}$  planned from published tables for peak efficiency higher than attainable in constant-height cruise.

**climbing shaft** Access hatch and ladder leading from bottom to top of airship hull.

**climb out** 1 Loosely, flight from unstick to setting course (lightplane in VFR).

2 Specif., flight from screen height (35 ft/11 m) to 1,500 ft/460 m. Comprises six segments: 1, 35 ft to gear up ( $V_2$ ); 2, gear up to FRH ( $V_2$ ); 3, level (accelerate to FUSS); 4, FRH to 5-minute power point (FUSS); 5, level (accelerate to initial ERCS); 6, to 1,500 ft/460 m (ERCS) (see *NFP*).

**CLIN** Contract line-item number.

**clinker-built** Marine hull or float constructed from diagonal or longitudinal planks overlapping at edges.

**clinodromic** Holding constant lead angle.

**clinometer** 1 Instrument for measuring angle of elevation, used in some ceilometers.

2 Pre-1935, a lateral-level flight instrument.

3 Several authorities use \* as synonymous with *inclinometer*.

**clip, CLIP** 1 Cellular logic image processor.

2 Pack of air-launched missiles loaded as a unit.

**clipped wing** Aircraft having wing modified by removal of tips or outer portions (eg for racing).

**clipper** Clipping (1) circuit.

**clipping** 1 Limiting positive and/or negative parts of waveform to chosen level.

2 Mutilation of communications by cutting off or distorting beginnings and/or ends of words or syllables.

3 Limitation of frequency bandwidth.

4 Reduction of amplification below given frequency.

**CLIRCM, Clircm** Closed-loop IRCM.

**CLK** Clock, clock time.

**CLL** Centreline lighting provided.

**C<sub>1</sub>M** Centreline (major axis) of missile.

**CLMA** Contact localization and mission analysis (ASW).

**Cl<sub>max</sub>** Maximum attainable lift coefficient.

**Clnc, CLNC** Clearance (UK), hence Clnc Del, for delivery.

**CLNP** Connectionless network protocol.

**CLNS** Connectionless network service.

**CLNTS** China Lake Naval Testing Station (CA, USN).

**CLO** 1 Counter-LO (low-observables).

2 Logistics and training command (KL, RNethAF).

**CLOAR** Common low-observable[s] autorouter (AFMSS).

**clobber** To knock out a ground or air target (colloq.).

**clocking** Precisely aligning groups of rotating airfoils, especially of turbine stages.

**clock rate** Precise frequency at which pulses are generated to control computer arithmetic unit, digital chip or other device.

**CLOS** Command to line of sight; can be prefaced by A = automatic, M = manual or SA = semi-automatic.

**close air support, CAS** Air attack on targets close to friendly surface force, integrated with latter's fire and movement.

**close-controlled interception** One in which interceptor is under continuous ground control until target is within visual or AI radar range.

## cloud-cover satellite

**closed-circuit tunnel** Wind tunnel which recirculates given mass of working fluid.

**closed-circuit TV** Camera/microphone linked to TV receiver/speaker by wires.

**closed competition** Procurement competition in which prices, performances and design details are not disclosed to rival bidders.

**closed cycle** See *closed thermodynamic cycle*.

**closed-jet tunnel** Tunnel, not necessarily closed-circuit, in which working section is enclosed by walls.

**closed-loop system** Dynamic system in which controlled variables are constantly measured, compared with inputs or desired values and error signals generated to reduce difference to zero. Future aircraft will probably have \* cabin-air systems, significantly reducing fuel burn.

**closed thermodynamic cycle** Cycle which can transfer energy but not matter across its boundary. Thus, the working fluid recirculates endlessly, a system achieved in APUs but not for aircraft propulsion.

**close flight plan** To report safe arrival to appropriate ATC authority and thus terminate flight plan. (Failure to close may trigger emergency.)

**close hangar doors!** Stop talking shop (RAF, colloq.).

**close out** 1 To seal spacecraft, esp. manned; task performed by ad hoc \*\* crew who are last to leave pad area.

2 To complete manufacturing programme.

**close parallel operation** Runways less than 200 m [656 ft] apart.

**closest approach** 1 Time, location or separating distance at which two planets are closest.

2 Same for fly-by spacecraft.

**close support** See *close air support, CAS*.

**closet** Above-floor bay or compartment for carry-on baggage or folded wheelchairs.

**closure** Relative closing velocity between two air or space vehicles.

**clot** Idiot (RAF colloq.).

**cloud** Large agglomeration of liquid droplets (water in case of Earth) or ice crystals suspended in atmosphere.

**cloud absorption** Absorption of EM radiation by planetary cloud depends on cloud structure, size and EM wavelength, long waves reflected from planet surface being strongly absorbed even by thin layers.

**cloud amount** Estimated as apparent coverage of celestial dome, as seen by observer; originally estimated in tenths, now expressed in oktas and written in symbolic form on met chart.

**cloud attenuation** Reduction in strength of microwave or IR radiation by cloud, usually due to scattering rather than absorption.

**cloud banner** See *banner cloud*.

**cloud break approach** Final approach beginning in cloud and ending in visual contact (though possibly with precipitation).

**cloud chamber** Sealed chamber filled with saturated gas which, when cooled by sudden expansion, gives visible track of fog droplets upon passage of ionising radiation or particle.

**cloud/collision warning** See *weather radar*.

**cloud cover** See *cloud amount*.

**cloud-cover satellite** Satellite equipped to measure by spectral response cloud cover on Earth or planet below.

**cloud deck**

**cloud deck** Cloud layer, esp. visibly dense, seen from above.

**cloud droplet** Water or ice particle with diameter  $\leq 0.2$  mm.

**cloud height** Altitude of base.

**cloud 9** To be on \* = feeling of elation and/or haziness.

**cloud point** Temperature at which cooling liquid becomes cloudy.

**cloud seeding** Scattering finely divided particles into cloud to serve as nuclei for precipitation (rainmaking).

**cloud types** Each type has its own entry. They are classified by numbers giving an indication of danger: cirrus 0, cirrocumulus 1, cirrostratus 2, altocumulus 3, altostratus 4, nimbostratus 5, stratocumulus 6, stratus 7, cumulus 8, and cumulonimbus 9.

**clover leaf** 1 A search pattern in which the aircraft describes three or more radial leaf patterns, repeatedly overflying a central point.

2 Cross-section of a solid-propellant rocket motor grain in the form of a hollow drum with three inward-projecting radial ridges or walls.

**clovers** Common low-observables verification system (USAF).

**CLP** Club der Luftfaahrtpublizisten (Austria).

**C<sub>lp</sub>** The roll-damping derivative, introduced chiefly to correct for spanwise variation in  $\alpha$  in roll; positive except perhaps in a spin.

**CLR** 1 Clearance, or cleared to (given height).

2 Clear sky [ $\leq 10\%$  cloud].

3 Compact, long-range (Flir).

**CLRC** Central Laboratory of the Research Councils (UK).

**CLRS** Weather clear and smooth.

**CLS** 1 Contingency landing site.

2 Cargo loading system [M adds manual] (JARS).

3 Computer loading system.

4 Contractor [or co-operative] logistic system [or support].

5 Central logging system.

6 Capsule launch system.

**CL<sub>s</sub>** Lift coefficient at stall.

**C/LS** Cruising/loiter speed.

**CLSD, Clsd** Closed.

**CLSU** Culham Lightning Studies Unit.

**CLT** 1 Centreline tracking (ILS/ILM).

2 Customised lead time.

3 calculated landing time.

**CLTF** Closed-loop transfer function.

**CL<sub>to</sub>** Takeoff lift coefficient.

**CLTP** Connectionless mode transport protocol.

**CLTS** Combined life time support.

**CLU** Container/launch unit.

**CL<sub>u</sub>** Lift coefficient, unblown.

**club layout** Pairs of seats facing each other, often with table between.

**club propeller** Propeller having stubby coarse-pitch blades for bench-testing engine with suitable torque but reduced personnel danger and slipstream.

**clue** Piece of information, hence: clued up, well informed; clueless, ignorant (RAF colloq.).

**cluster** 1 A group of off-the-shelf computers linked together to create a high-performance (e.g. over 10 teraflops) computing system.

2 Two or more parachutes linked to support single load.

3 Several bombs or other stores dropped as group.

4 Several stars or other pyrotechnic devices fired simultaneously from single container.

5 Several engines forming group controlled by single throttle.

6 Several rocket motors fired simultaneously to propel single vehicle.

**cluster bomb unit** *cluster munition*.

**cluster joint** Structural joint of several members not all in same plane.

**cluster munition** Container which, after release from aircraft, opens to dispense numerous bomblets (rarely, ECM or other payloads).

**cluster weld** See *cluster joint*.

**clutter** Unwanted indications on display, esp. radar display, due to atmospheric interference, lightning, natural static, ground/sea returns or hostile ECM.

**CLV** Crew launch vehicle, partner of future CEV2 (NASA).

**C<sub>LW</sub>** Lift coefficient of the wing.

**CLX** Combat leadership exercise.

**CM** 1 Command module.

2 Configuration, or context, management (EDP, software).

3 Crew member, thus \*1, \*2, etc.

4 Cluster [or cratering] munition.

5 Cruise missile.

6 Comsec module.

7 Countermeasure[s].

8 Classified message.

9 Capability Manager (MoD UK).

10 Crew module.

**CM** Coefficient of pitching moment about half-chord. This and the next two terms are numerically pitching moment divided by  $qSb$  [dynamic pressure, wing area, wing span].

**C<sub>m</sub>** Coefficient of pitching moment about quarter-chord; also rendered  $C_{m^{1/4}}$  and  $C_{m0.25}$ .

**cm** 1 Centimetre[s].

2 Centre of mass of a body.

**CMA** 1 Central[ized] maintenance application.

2 Common-mode analysis.

3 *China Meteorological Administration*.

**C<sub>mac</sub>** Coefficient of pitching moment about aerodynamic centre; in US often  $C_{ma}$ .

**CMAG** Cruise-missile advanced guidance.

**CMAL** Continuously-moving assembly line.

**CMATZ** Combined military air, aerodrome, traffic zones.

**CMB** 1 Continuous monofilament, braided.

2 Concorde Management Board.

3 Cosmic microwave background.

4 Central Medical Board (RAF).

5 Ceiling-mounted bin.

6 Climb, climbing.

**CMBRE** Common munitions built-in test reprogramming equipment.

**CMC** 1 Cruise-missile carrier (A adds aircraft).

2 Ceramic-matrix composite(s).

3 Central maintenance computer [F adds function, S system].

4 Cheyenne Mountain Complex (USAF).

**C<sub>mcg</sub>**

**C<sub>mcg</sub>** Coefficient of pitching moment about c.g.  
**CMCS** Central maintenance computing system.  
**CMD** 1 Command, ie total autopilot authority.  
2 Countermeasures dispenser, or duties.  
3 Cruise-missile defense.  
4 Colour [or common] multipurpose [or multifunction] display [S adds system, U unit].  
**CMDA/H** Circling minimum descent altitude height.  
**CMDO** Coevolutionary multidisciplined optimisation.  
**CMDR** 1 Coherent monopulse Doppler radar.  
2 Card maintenance data recorder.  
**CMDS** Countermeasures dispensing system.  
**Cmdt** Commandant.  
**CME** 1 ECM (1) (F).  
2 Coronal mass ejection.  
3 Central Medical Establishment (RAF).  
**CMEA** Council for Mutual Economic Assistance.  
**CMF** 1 Conceptual military framework (NATO).  
2 Central maintenance function.  
3 Common message format.  
**CMFS** Chassis-mounted fuel system.  
**CMFT** Canadian Museum of Flight and Transportation, Surrey BC.  
**CMG** Control-moment gyro.  
**CMH** Center for Military History (US).  
**CMI** 1 Computer-managed instruction (see *CAI* [2]).  
2 Cruise-missile interface.  
3 Catia Metaphase Interface.  
**CMIK** Cruise-missile integration kit.  
**CMIS** 1 Command management information system.  
2 Conical microwave image[r]/sounder.  
**CMISE** Combat management integration support environment.  
**CMIT** Components management integrated team.  
**CMIV** Cabin management and interactive video.  
**CML** Consumable materials list.  
**C<sub>mle</sub>** Coefficient of pitching moment about the leading edge [usually of the wing].  
**CMLP** Cruise-missile launch point.  
**CMLS** Commercial microwave landing system [A adds avionics].  
**CMM** 1 Computerised modular monitoring (of health of hardware).  
2 Condition-monitored maintenance.  
3 Co-ordinate measuring machine.  
4 Common-mode monitor (AFCS).  
5 Component maintenance manual.  
6 Capability maturity model; I adds integration (SEI4).  
7 Common modular missile.  
8 Command memory management.  
**CMMI** See *CMM*(6).  
**CMMCA** Cruise-missile mission control aircraft.  
**CMMS** Congressionally mandated monthly study (US).  
**CMN** Control-motion noise (MLS).  
**CMO** Certificate Management Office (FAA).  
**C<sub>mo</sub>** Coefficient of pitching moment ( $\frac{1}{4}$ -chord) at zero lift.  
**CMOS** 1 Complementary metal-oxide silicon, or semiconductor.  
2 Cockpit maintenance operations simulation, or simulator.  
**CMP** 1 Countermeasures precursor (aircraft penetrating hostile airspace ahead of attacking force).

**CNATRA, Cnatra**

2 Counter-military potential (strategic balance).  
3 Central maintenance panel.  
4 Configuration management plan.  
**CMPL, cmpl** Completion, completed.  
**C<sub>mq</sub>** The pitch-damping stability derivative.  
**CMR** Central[ised] maintenance record.  
**CMRA** Cruise-missile radar altimeter.  
**CMRB** Composite main-rotor blade.  
**CMRS** 1 Countermeasures receiver system.  
2 Crash/maintenance recorder system.  
**CMS** 1 Continuous monofilament, spun.  
2 Commission de Météorologie Synoptique.  
3 Cockpit, cabin or circuit [electric/electronic, not ATC] management system.  
4 Constellation, or central, maintenance system.  
5 Common modular, or combat-mission, simulator.  
6 Computer module system.  
7 Cassette memory system.  
8 Component-management support.  
9 Content, or combat, management system.  
10 Combat mission simulator.  
11 Civil maritime surveillance.  
**CMSAF** Chief master sergeant of the Air Force (USAF).  
**CMT** 1 Cadmium mercury telluride (IR detector).  
2 Communications management terminal.  
3 Certificate management team (ATOS).  
**C<sub>mt</sub>** Coefficient of moment of the tailplane [horizontal stabilizer].  
**CMT** Committee for Military-Technical Co-operation.  
**C<sub>μ</sub>, C<sub>mu</sub>** Blowing coefficient of circulation-controlled aerofoil.  
**CMU** 1 Communications, or central, management unit.  
2 Control and monitor unit (Hums).  
**CMUP** Conventional-mission upgrade program.  
**C<sub>mv</sub>** The tuck derivative.  
**CMW** Compartmented mode workstation.  
**C<sub>mw</sub>** Coefficient of moment of the wing.  
**CMWS** Common missile warning system.  
**C<sub>Mx</sub>, C<sub>My</sub>** Helicopter roll moment coefficients, M<sub>x</sub>, M<sub>y</sub> divided by pAR [ $\Omega R$ ].  
**C<sub>M0</sub>, CM zero** Coefficient of pitching moment at zero lift.  
**C<sub>m0.25</sub>, C<sub>m1/4</sub>** See C<sub>m</sub>.  
**CN** 1 Crew's Notes [in large aircraft, can be a massive tome].  
2 Fleet carrier, nuclear [previously CVN] (USN).  
3 Consigne de Navigabilité [= AD(1)] (F).  
**C/N** Cadet Navigator (RAF rank).  
**C<sub>N</sub>** Coefficient of normal force,  $N/\frac{1}{2}\rho U^2 C$ .  
**C<sub>n</sub>** Directional stability, yawing moment coefficient due to sideslip, = yawing moment  $\div q$  bs [dynamic pressure, span, wing area].  
**c/n** Constructor's number.  
**CNA** 1 Computer network attack.  
2 Center for Naval Analyses.  
3 Common-nozzle assembly.  
4 Cast nickel alloy.  
**CNAD** Conference of National Armaments Directors (NATO).  
**C<sub>na</sub>** Slope of normal force plotted against  $\alpha$  curve.  
**CNATRA, Cnatra** Chief of Naval Air Training (USN).

**CNATS** Controller of National Air Traffic Services (UK).

**CNC** 1 Computer numerical control (NC machining).  
2 Com/nav controls.

**CNCE** Communications nodal control element.

**CNCS** Central Navigation and Control School (RAF).

**CNCT** Combat Network Communications Technology [adds AEHF] (USAF).

**CND** 1 Computer network, defense.  
2 Campaign for nuclear disarmament (UK).

**CNDB** Customised navigation database.

**CND/RTOK** Could not duplicate, retest OK.

**CNEIA** Comité National d'Expansion pour l'Industrie Aéronautique (F).

**CNEL** Community noise equivalent level.

**CNES** Centre National d'Etudes Spatiales (F Paris 75039).

**CNF** Central notice-to-airmen facility.

**CNG** 1 Compressed natural gas.  
2 Chief of [State] National Guard.

**CNH** Carbon Nomex honeycomb.

**CNI** 1 Communications, navigation, identification.  
2 Chief navigational instructor.  
3 Continuous nitrogen inerting.

**CNIE** Comision Nacional de Investigaciones Espaciales (Arg.).

**CNIEW** CNI (1) electronic warfare.

**CNII** Central research institute (R).

**CNIMS** CNI (1) management system.

**CNIR** Communication, navigation, identification and reconnaissance.

**CNITI** Central scientific institute for radiotechnical measurement; often rendered TsNITI (R).

**CNIU** CNI (2) unit.

**CNK** Cause not known.

**CNL** Cancel, cancelled.

**CNMA** Communications network for manufacturing applications, search for ISO standards complementary to MAP6 and TOP (EEC).

**CNO** 1 Chief of Naval Operations (USN).  
2 Computer network operations; JTF adds Joint Task Force.

**C/NO, C/No** Carrier-to-noise density ratio.

**C/N/P** Com./nav./pulse.

**CNPI** Communication(s), navigation and position(ing) integration.

**CNR** 1 Community noise rating.  
2 Consiglio Nazionale Ricerche (I).

**C<sub>nr</sub>** Yaw-damping derivative, contributor to C<sub>n</sub>.

**CNRA** Certificat de Navigabilité Restreint (homebuilt, F).

**CNRE** Centre National de Recherches de l'Espace (F).

**CNRI** Combat net radio interface.

**CNRS** Centre National de la Recherche Scientifique (F).

**CNS** 1 Continuous.  
2 Communications network simulator.  
3 Communications, navigation, surveillance; ATM adds air-traffic management (ICAO).  
4 Common nacelle system, able to accept different types of engine.  
5 Chief of Naval Staff [First Sea Lord] (UK).

**CNSA** China National Space Administration.

**CNSAC** Comité National de Sûreté de l'Aviation Civile (F).

**CNST** Center for NanoSpace Technologies.

**CNT** 1 Certificat de Navigabilité de Type (F).  
2 Carbon nano tube.

**CNTR** Centre.

**CN<sub>2</sub>D** Coefficient of usable lift (variable aerofoil profile).

**CN<sup>2</sup>H** Conduit nuit 2nd generation helicopters.

**CNVT** Convective.

**CNX** Cabin network accelerator (satcoms).

**CNX ratio** The percentage of passengers who are connecting with a second flight.

**CO** 1 Commanding officer.  
2 Crystal oscillator.  
3 Checkout.  
4 Aerodynamic mean chord.  
5 Corps observation (USA, 1919–24).  
6 Carbon monoxide.  
7 Controlling obstacle.  
8 Collaborative optimization.

**C<sub>O</sub>** 1 Company.  
2 County.

**c/o** Changeover [switch].

**COA** 1 Course of action.  
2 Corps observation, amphibian (USA 1919–24).  
3 Certificate of authorization (FAA).

**CoA** Circle of ambiguity

**coach** Formerly, US domestic high-density seating configuration.

**COAITA** Colegio Oficial y Asociación de Ingenieros Técnicos Aeronáuticos [E-28004 Madrid] (Spain).

**coalescing filter** Works by coalescing finely divided liquid droplets (eg water in fuel) into removable masses.

**coaming** 1 Edge of open-cockpit aperture, often padded.  
2 In flight deck, along top of main instrument panel.

**Coanda effect** Tendency of fluid jet to adhere to solid wall even if this curves away from jet axis.

**Coanda flap** Flap relying on Coanda effect for attachment of flow to upper surface even at extreme angles.

**coannular inverted nozzle** Nozzle of variable-cycle jet engine with low-velocity core and high-velocity surrounding jet.

**coarse pitch** Making large angle between blade chord and plane of disc, thus giving high forward speed for given rotational speed.

**coarse-pitch stop** Mechanical stop to prevent inefficient over-coarse setting (removed when feathering).

**coast** 1 Radar memory technique tending to slave to original target trajectory and avoid lock-on to stronger target passing same LOS.  
2 Unpowered phase of trajectory, esp. in atmosphere (usually verb).

**coastal refraction** Change in direction of EM radiation in crossing coast; also called shoreline effect, land effect.

**coast-boost** Period of coasting followed by rocket burn.

**coasted track** Continued on basis of previous characteristics in absence of surveillance data (TCAS).

**coastline refraction** See *coastal refraction*.

**COAT** Corrected outside air temperature (OAT minus TAS/100).

**co-axial** Propeller or rotor having two or more sets of

## co-axial cable

blades on same axis rotating in opposite senses independently. Not same as contra-rotating.

**co-axial cable** Comprises central conductor wire and conducting sheath separated by dielectric insulator.

**COB** 1 Co-located operating base.

2 Certificated operational base.

3 Catenary obstruction beacon, mounted on pylons supporting power cables.

**cob** The thick inner boundary around the centre of a compressor rotor stage or disc.

**cobalt** Hard, silver-white metal, density 8.9, MPt 1,495°C, important in steels and in high-temperature engine alloys. Co-60 is dangerous radioisotope theoretically producible in large amount by nuclear weapons.

**cobblestone turbulence** 1 High frequency \* due to large mass of randomly disturbed air without significant gross air movement.

2 Buffet experienced by jet V/STOL descending into ground effect.

**COBE** Cosmic-origin background explorer.

**Cobol** Common business-oriented language.

**cobonding** Manufacture of composite aerofoil, esp. wing, in which entire surface is assembled and cured, but with one skin (usually upper) separated by debonding agent. This skin is then attached by removable bolts.

**Cobra** 1 Manoeuvre in which from level flight at moderate airspeed pilot applies maximum symmetric nose-up command, reaching AOA 90° up to possibly 130°, when control neutralised for flip-down recovery to level flight about 5 s later. Modest gain in height, large loss in airspeed [energy], for dynamic braking.

2 Co-optimized booster for reusable applications.

3 Coastal battlefield reconnaissance and analysis (USMC).

4 Collection of broadcasts from remote assets.

**COBS** Canadian orbiter boom sensor; S adds system.

**COBY** Current operating budget year.

**COC** 1 Common (or combat) operations centre, for tactical control of all arms in theatre.

2 Catalytic ozone converter.

3 Copper on ceramic.

4 Chamber of Commerce.

5 Cash operating cost.

**COCC** Contractor's operational control centre.

**cockade** National insignia worn by military aircraft, esp. one of concentric rings.

**cocked** Aircraft, especially combat type, preflighted through all checklists to point of starting engines.

**cocked hat** Triangle formed by three position lines that do not meet at a point.

**cockpit** Space occupied by pilot or other occupants, esp. if open at top. Preferably restricted to small aircraft in which occupants cannot move from their seats; most \* contain only one seat. Term could arguably be applied to all aerodyne pilot stations, but flight deck preferred for large aircraft.

**cockpit alert** State of immediate readiness with combat aircrew fully suited, in \* and ready to start engine.

**cockpit audio monitoring** Activated by flight crew, continuously transmits live audio via satellite from aircraft [jet airliner] experiencing emergency.

**cockpit bag** Container, usually flexible fabric, designed to hold flight guides, charts, headset etc.

**cockpit check** Numbered list of investigations of status

## CODSIA, Codsia

[and if necessary of operability] of every functioning item according to meticulously followed schedule, printed on paper in a light aircraft and stored electronically in more complex aircraft, carried out on entering cockpit [after completing externals] by pilot, assisted by any other members of flight crew if necessary.

**cockpit cowling** Aircraft skin around cockpit aperture.

**cockpit television sensor** Solid-state CCD camera recording what the pilot sees during each flight.

**cockpit voice recorder** Automatic recycling recorder storing all crew radio and intercom traffic, plus background noise, during previous several missions.

**Coco exercise** Combat mission exercise called off when aircraft are lined up on runway.

**Cocom** Combat Commander (JBFSA).

**Cocomo** Constructive cost model (software).

**Cocraly** Anti-oxidation coating for hot metal, from Co, Cr, Al, Yttrium.

**COD** 1 See *carrier on-board delivery*.

2 Component operating data.

3 Cash on delivery.

4 Chemical oxygen demand.

**CODA, Coda** Centre Opérationnel de la Défense Aérienne (Taverny, F).

**Codamps** Coupled ocean/atmosphere mesoscale prediction system.

**Codan** Carrier-operated device anti-noise.

**Codar** Correlation detection and recording, or ranging (ASW).

**Code** 1 Two capital [upper-case] letters assigned to airline [any public carrier]; sometimes shared, thus Cronus aircraft operate on \* of Aegean. These letters preface the three- or four-digit number identifying a particular time-tabled flight.

2 See \* *letters*.

3 Another meaning is the series of pulses from a transponder.

**Code Bambini** Literally 'child's talk', multi-lingual tactical radio language (Switz.).

**code block** Standardised format of data identifying each frame in visual, IR or SLAR film, with provision for high-speed computer recall.

**Codec** Coder/decoder.

**code letters** Pairs of letters [from 1944 often letter + number] identifying unit of aircraft in WW2. Each aircraft also assigned individual letter (RAF, USAAF).

**code light** Surface light giving signal, usually Morse; if at airfield could be called beacon.

**codem** Coded modulator/demodulator.

**coder** Part of DME transponder which codes identity into responses.

**code rate** Ratio of actual data bits to total information digits transmitted in radar or communications system having deliberate redundancy. Symbol R.

**Coderm** Committee for Defence Equipment R & M (UK).

**Codes** Common digital exploitation system.

**codes** Numbers assigned to multiple-pulse reply signals transmitted by ATCRBS and SIF transponders.

**Codib** Controlled-diffusion blade (or blading).

**coding** Arrangement of problem-solving instructions in format and sequence to suit particular computer.

**CODSIA, Codsia** Council of Defense and Space Industry Associations [office, Arlington, VA 22201] (US).

**COE** 1 Certification of equivalency (USAF).

2 Co-operative emitter.

3 Common operating environment.

**COEA** Cost and operational effectiveness analysis.

**coefficients** Except for next four entries, see under appropriate characteristics.

**Coefficient A** In simple magnetic compass, deviations on cardinal and quadrantal points summed and divided by 8.

**Coefficient B** In simple magnetic compass, deviation E minus deviation W divided by 2.

**Coefficient C** In simple magnetic compass, deviation N minus deviation S divided by 2.

**coefficient conversion factor** Formerly, multiplier 0.00256 required to convert absolute to engineering coefficients.

**COEIA** Combined operational effectiveness and investment appraisal (UK 2001).

**COF** Centrifugal oil filter.

**C of A** Certificate of Airworthiness.

**COFAS** Centre d'Opérations des Forces Aériennes Stratégiques (Taverny, F).

**CoFAS** Commandement des FAS, same address.

**C of C** 1 Certificate of Compliance.

2 Change of control.

**COFDM** Code orthogonal frequency-division multiplexing (helicopters).

**C of E** Certificate of Experience

**C of F** Construction of facilities.

**coffin** 1 Missile (ICBM) launcher recessed into ground but not hardened.

2 Symbol which appears in place of a downed aircraft (ACMR).

**C of G** See *c.g.*

**C of M** Certificate of Maintenance.

**C of P** See *centre of pressure*.

**C of R** Certificate of Registration of aircraft.

**COG** Component Obsolescence Group [1937–, 160+ member organizations] (UK).

**C of T** Certificate of test.

**cogbelt** Flexible belt incorporating teeth to prevent slip.  
**cognitive model** An imagination of a future hardware item, including a complex system, in the brain of a design engineer. Software engineers have imagined thousands of lines of software code before anything has been created physically.

**COGT** Centre-of-gravity towing.

**coherent** Radiation in which, over any plane perpendicular to direction of propagation, all waves are linked by unvarying phase relationships (common simplified picture is of waves ‘marching in step’ with all peaks in exact alignment).

**coherent echo** Radar return whose amplitude and phase vary only very slowly (from fixed or slowly moving object).

**coherent pulse radar, coherent radar** Incorporates circuitry for comparing phases of successive echo pulses (one species of MTI).

**coherent transponder** Transmitted pulses are in phase with those received.

**coherer** RF detector in which conductance of imperfect part of circuit (eg iron filings) is improved by received signal.

**Cohoe** Computer-originated holographic optical elements.

**COI** Co-ordinator of Information (US, WW2).

**COI** Central Office of Information (UK).

**COIAE** Colegio Oficial de Ingenieros Aeronauticos de España [office, E-28041 Madrid] (Spain).

**Coil, COIL** 1 Chemical oxygen iodine laser.

2 Commercial overhaul information letter (FAA).

**coin, Co-In, CO-IN** Counter-insurgency; aircraft designed for guerilla war.

**Coincat** Community of Interests in Civil Air Transport (G).

**coincidence circuit** Gives output signal only when two or more inputs all receive signals simultaneously or within agreed time.

**COINS, Coins** Computer-operated instrument system.

**COIS** Coastal ocean imaging spectrometer.

**Cojas** Coherent jammer simulator.

**coke** Verb, to modify aircraft with Küchmann ‘Coke bottle’ fuselage.

**col** In atmosphere isobar field, saddle-shaped region separating two highs on opposite sides and two lows on remaining sides.

**colander** In some ramjet engines, perforated shell controlling secondary airflow into combustion chamber. Generally equivalent to gas-turbine flame tube.

**cold** 1 Without using afterburner.

2 Of a restricted area, not currently active.

**cold air mass** Colder than surrounding atmosphere.

**cold-air unit** Air-cycle machine, usually in an ECS, which greatly reduces temperature of working fluid by extracting mechanical energy in expansion through a turbine.

**Coldama** Co-ordination of loads data acquisition management.

**cold bucket** In aft fan with double-deck blades, outer blades handling cold air.

**cold cathode** Highly emissive coating and operating at ambient temperature.

**cold-cockpit alert** Combat aircraft has no ground power supplies and is ‘cold’ until pilot enters and initiates start sequence for engine, gyros and systems.

**cold cordite charge** Does not detonate but burns to give high-pressure flow of gas.

**cold drawing** Drawing workpiece at room temperature.

**cold flow test** Static test of liquid rocket propulsion system to verify propellant loading and feeding but without firing engine(s).

**cold front** Front of advancing cold air mass moving beneath and lifting warmer air, esp. intersection of this front with Earth’s surface.

**cold gas** Reaction-control jet or rocket using as working fluid gas released from pressure or monopropellant decomposed without combustion.

**cold launch** 1 Launch of missile or other ballistic vehicle under external impulse, usually from tube (in atmosphere, in silo or on sea bed) with vehicle’s propulsion fired later.

2 Takeoff of aircraft with INS not aligned.

**cold mission** Mission or test judged non-hazardous, thus not interfering with other activities.

**cold plate** In high-vacuum technology, refrigerated plate used to condense out last molecules of gas in chamber.

**cold plug** Spark plug having short insulated electrode

## cold rating

keeping relatively cool (because rate of carbon deposit from oil or fuel is very low).

**cold rating** Cold thrust; rated output of jet engine without afterburning. Can be MIL.

**cold rocket** Operating on pressurized gas or mono-propellant, without combustion.

**cold rolling** Performed on steels to harden and increase strength, at expense of ductility.

**cold round** Test missile launched without active propulsion.

**Colds** Common opto-electronic laser detection system (detects laser beams and measures angle of arrival).

**cold shut** Porosity due to premature surface freezing in casting, or formation of gas bubble in weld.

**cold soak** 1 Test of complete aircraft by prolonged exposure to lowest terrestrial temperature available before flying a mission.

2 Test of cryogenic propulsion system by prolonged passage of propellant.

**cold stream** Fan airflow; hence \* reverser, one not affecting core.

**cold test** Determines lowest temperature at which oil or other liquid will flow freely.

**cold thrust** Maximum without afterburner.

**cold wave** Sudden major fall in surface ambient temperature in winter.

**cold working** Forming metal workpiece at room temperature; increases hardness and often strength but reduces ductility (increases brittleness).

**Coleman theory** Derived by NACA's R. P. Coleman and A. M. Feingold, basic explanation of ground resonance of helicopters with articulated rotors; hence such resonance called Coleman instability.

**coleopter** Aircraft having annular wing with fuselage at centre; usually tail-standing VTOL.

**collaborative programme** Undertaken by industrial companies in two or more countries as result of legal agreements between those companies or between their national governments.

**collar** Impact-absorbing ring around bottom of balloon gondola (usually lightweight foamed polystyrene).

**collateral damage** 1 Refers esp. to injury to friendly eyes from clumsy use of powerful lasers in warfare.

2 Damage caused to anything other than the intended target.

**collation** Selection in correct sequence and stacking in exact register of pre-cut piles to make part in composite material.

**collective pitch** Pilot control in rotary-wing aircraft directly affecting pitch of all blades of lifting rotor(s) simultaneously, irrespective of azimuth position. Main control for vertical velocity. Colloq. = 'collective'.

**collective stick** Collective-pitch lever (colloq.).

**collector** 1 Bell-mouth intake downstream of working section of open-jet tunnel.

2 Region of transistor between \* junction and \* connection carrying electrons or holes from base.

**collector cell** Small compartment at the inboard end of a main wing fuel tank, or elsewhere in the tank system where fuel might collect when fuel nearly consumed, which will continue to feed even under negative-g.

**collector ring** Circular manifold collecting exhaust from cylinders of radial piston engine.

## combat load

**collimate** To adjust optical equipment to give parallel beam from point source or vice versa.

**collimating mark** A short line or cross at the mid-point of each edge of a reconnaissance photo.

**collimating tower** Carries visual and radio/radar target for establishing axes of aerials (antennas) with minimal interference from other electrical fields. Alternatively collimation tower.

**collision-avoidance system** Provides cockpit indication of all conflicting traffic, without latter carrying any helpful equipment or co-operating in any way, and increases intensity of warning as function of range and rate of closure.

**collision beacon** Powerful rotating visual light, normally flashing Xenon tube, carried by IFR-equipped aircraft (normally one dorsal, one ventral).

**collision-course interception** Aimed at point in space which target will occupy at a selected future time; interceptor may approach this point from any direction.

**collision-warning radar** See *weather radar*.

**collision-warning system** See *collision-avoidance*.

**colloidal propellant** Having colloidal structure, with particles never larger than  $5 \times 10^{-3}$  mm and apparently homogeneous to unaided eye.

**co-located** Two ground navaids, usually VOR and DME, at the same site.

**colours of the day** Particular combination, changed daily, of [usually two] Very [or similar] signal cartridges, fired to confirm aircraft as friendly to suspicious ground forces.

**colour stripping** Removal of all MES (6) colours except those indicating organic substances such as plastic explosives.

**Colpar** Confederacion Latino Americana de Paracaidismo (sport parachuting, office Argentina).

**COLT** CO<sub>2</sub> laser technology.

**COM** 1 Computer output on microfilm (direct recording).

2 Company operations manual.

3 Acronyms based on Command[er] or communications [over 50].

4 Cockpit operating manual.

**com** Communications (FAA = comm).

**Comac** Cockpit-management computer.

**ComAO, COMAO** 1 Composite air operation[s].

2 Combined air operations.

**comb** 1 Rake, usually linear, of pressure heads.

2 IFF aerial (antenna) with linear array of dipoles often sized to match spread of wavelengths.

**combat aircraft** Aircraft designed to use its own armament for destruction of enemy forces; thus includes ASW but not AEW or transport (definition controversial).

**combat air patrol, CAP** Maintained over designated area for purpose of destroying hostile aircraft before latter reach their targets.

**combat camera** Colour ciné camera aligned with fighter armament to film target.

**combat control team** Air force team tasked with establishing and operating navaids, communications, landing aids and ATC facilities in objective area of airborne operation.

**combat fuel tank** *Combat tank*.

**combat gross weight** See *weight*.

**combat load** Aggregate of warlike stores carried

## combat mission

(includes guns/ammunition but excludes radars, lasers/receivers and drop tanks carried for propulsion).

**combat mission** Mission flown by balloon, airship, kite, aeroplane, helicopter or other aircraft such that it may expect to encounter enemy land, sea or air forces.

**combat persistence** Ability of fighter aircraft to engage numerous successive targets, by virtue of large number of AAMs carried.

**combat plug** Manual control of fighter engine permitting TET limit to rise to new higher level for period of emergency (typically 30 sec to 3 min).

**combat radius** *Radius of action.*

**combat spread** Variable loose formation affording best visual lookout.

**combat tank** External jettisonable fuel tank used on combat missions; possibly smaller than ferry tank.

**combat thrust loading** Thrust loading assumed for fighter in typical combat.

**combat trail** Combat aircraft, usually interceptors, in loose trail formation, maintaining position visually or by radar.

**combat wing loading** Wing loading assumed for fighter in typical combat.

**combat zone** 1 Geographic area, including airspace, required by combat forces for conduct of operations.

2 Territory forward of army rear boundary.

**combi, Combi** Transport aircraft with main deck furnished for both passenger and freight (from 'combination'). Proportion devoted to freight usually variable.

**combination** Tug and glider, before separation.

**combination aircraft** Combi.

**combination propulsion** See *mixed-power aircraft*.

**combination slide** Escape slide designed for subsequent use as life raft.

**Combined** Involving armed forces of two or more allied nations. Thus \* common user item, \* forces, \* staff etc.

**combined arms gateway environment** Complete mission planning from a single laptop.

**combined display** Presents information from two or more sources, usually radar superimposed on moving-map display.

**combined-effects munition** One having anti-armour, anti-personnel and incendiary effects.

**combined sight** Weapon-aiming device able to operate in more than one mode, eg optical and thermal imaging.

**combined stresses** Two or more simple stresses acting simultaneously on same body.

**combiner** Optical element in HUD for aligning, collimating or focusing at infinity all displayed elements on single screen.

**combining gearbox** Reduction gearbox driven by two or more engines or [e.g.] surface power units, and driving single or contra-rotating propeller or lifting rotor.

**Combre** See *CMBRE*.

**COMBS** Contractor-operated and managed base supply, ie manufacturer of major system manages and maintains government-owned GSE and spare parts and carries out heavy maintenance.

**combustion** Chemical combination with oxygen (burning).

**combustion chamber** 1 In piston engine, space above piston(s) at TDC, arguably extended over part of stroke depending on progress of flame front.

2 In gas turbine, entire volume in which combustion

## command dot

takes place, including that outside flame tube(s) occupied by dilution air.

3 In liquid rocket or ramjet, entire volume in which combustion takes place, bounded by injector face, walls of chamber and plane of nozzle throat (not nozzle exit).

4 In solid or hybrid rocket, inapplicable.

**combustion efficiency** Ratio of energy released to potential chemical energy of fuel, both usually expressed as a rate.

**combustion ratio** Ratio of fuels or propellants actually achieved; in case of fuel/air usually termed mixture ratio.

**combustion ring** Combustion chamber of annular (eg Aerospike) liquid rocket engine.

**combustion space** See *combustion chamber* (1).

**combustion starter** Gas-turbine engine-start energised by burning fuel, either fuel/air, monopropellant (eg Avpin) or solid cartridge. Some purists add "within a cylinder".

**combustion test vehicle** Free-flight vehicle (RPV or missile) whose purpose is test or demonstration of propulsion performance.

**combustor** 1 See *combustion chamber* (2).

2 Combustion chamber (2) together with fuel manifolds, injectors, flameholders and igniters.

3 Rarely, afterburner burning region, with fuel spray bars, flameholders and ignition system.

**combustor loading** Expressed as a function of mass flow, and inversely of velocity, and total inlet pressure and temperature.

**Comdac** Command, display and control (USCG).

**Comecon** Council for Mutual Economic Assistance.

**Comed** Combined map and electronic display (pronounced co-med).

**Comeds** Conus meteorological data system (DoD).

**Comest** European colour-TV satellite management consortium.

**Comfile** Expandable network connecting ATC data, voice and radar to digital recorders.

**comfort chart** Plot of dry-bulb T° against humidity (sometimes modified to include effect of air motion).

**Comint** Communications intelligence.

**comlo** Compass locator.

**comm** Communication[s] (FAA).

**command** 1 Intentional control input by flight crew or remote pilot.

2 Electrical or radio signal used to start or stop action.

3 In EDP, portion of instruction word specifying operation to be performed.

4 Authority over precise flight trajectory exercised by ATC or military authority (hence \* altitude, \* height, \* heading, \* speed etc.).

**command airspeed** A target airspeed displayed as a *command parameter*.

**command augmentation system** Compares pilot demand with aircraft response, FCS receiving the difference; latest CAS have full authority and often high gain.

**command bars** Principal reference index on flight director instruments, giving attitude in pitch and roll.

**command destruct** System which, at range safety officer's discretion, can explode malfunctioning missile, RPV or other unmanned vehicle, or trigger BUS, thereby averting hazard to life or property.

**command dot** *Command marker* in form of bold dot or small disc.

**command ejection** Ordered [not necessarily triggered] by captain of aircraft.

**commander** Used only in military aviation, aircraft \* has authority over everyone on board even though he may not be a member of flight crew. Not synonymous with PIC or with civil term captain.

**command guidance** Steering by remote human operator.

**command lane** The principal channel in a primary flight-control system. It continuously outputs the incoming flight-control commands on the relevant A629 bus until, following a malfunction, it is over-ridden by the majority rule, or [in a more modern system] by the appropriate standby lane.

**command marker** Reference index (line, bug, arrow or other shape) indicating target value, set by pilot on tape (sometimes dial) instrument and then flown to centre reference line. (See *command reference symbol*.)

**command parameter** Variable subject to command (1), (2), (4) and thereafter displayed as target value on instrument or display.

**command reference symbol** HUD symbology in form of ring or other shape showing a point at which to aim ahead of aircraft, eg landing touchdown point or an aerial point for optimum AOA on overshoot (go-around).

**comma rudder** Rudder shaped like comma, with balance area ahead of hinge axis, used without a fixed fin.

**commendation** Official praise for skilful flying, written in personal log book, usually of pilot.

**commercial** In military use, purchasable from civilian source (eg aircraft rivet).

**commercial aircraft** Aircraft flown for hire or reward.

**commercial electrics** Electrical systems serving passenger functions only (eg steward call circuits, PA system, cabin lighting).

**commercial load** Not defined, but usually means payload.

**commercial support** Assistance to operator of civil aircraft given or sold by original manufacturer or dealer.

**com./met./ops.** Communications, meteorology, operations.

**commitment** Announced decision to purchase an aircraft type, usually commercial transport.

**committal height** See *decision height*.

**commodity loading** All cargo of one kind grouped together, without regard to destination.

**commodity rate** Price charged to fly specified kind of cargo, typically per kilogramme over particular route.

**common aero vehicle** 1 Originally this was a standard design of RV [to house different payloads] for ICBMs.

2 Today, a common vehicle structure for deploying a variety of customised payloads, including weapons, into the atmosphere (MSP).

3 Capitalized, “an unpowered, manoeuvrable hypersonic glide vehicle carrying c1,000lb of munitions” launched from space to hit within 10ft (USAF).

**commonality** 1 Hardware quality of being similar to, and to some degree interchangeable with, hardware of different design.

2 Objective of using one basic design of aircraft, or other major system, to meet needs of more than one user service in more than one role (with economies in training, spares and other areas).

**common automatic recovery system** To retrieve UAVs

on surface ship: electronic guidance to system of nets and cables on LPD quarterdeck.

**common-cause analysis** Procedure maintained through planning, design and operation of a system to identify common-mode failures of all kinds.

**common configuration** Numerous plans, mainly USAF, to bring as many aircraft of one type as possible to uniform standard, usually by upgrades.

**Common Criteria** The chief standard for certifying secure software [very like DO-178B], used by the US and 20 other countries. See EAL2.

**common display system** Standardised glass cockpit.

**common-flow afterburner** Augmented turbofan in which fan and core flows mix upstream of afterburner.

**common infrastructure** Financed by two or more allies, eg by all members of NATO.

**common mark** Marking assigned by ICAO to aircraft of international agency (eg UN) on other than national basis. Hence \*\* registering authority.

**common module(s)** Use of identical “black box” subsystems as building blocks for different major equipments, eg \* IR components to build night-vision, recon., weapon guidance and other systems for different armed forces or civilian customers.

**common route** Portion of N American route west of coastal beacon.

**common sensor** The principal meaning is a sensor that intercepts both communications and Elint.

**common servicing** Performed by one military service for another without reimbursement.

**common-user airlift** In US, provided on same basis for all DoD agencies and, as authorised, other Federal Government agencies.

**communication deception** Interference with hostile communications (including ATC and navaids) with intent to confuse or mislead.

**communication language** Complete language structure for linking otherwise completely separate (and possibly dissimilar) EDP (1) systems.

**communications intelligence** Gained by listening, by whatever means, to hostile communications.

**communications satellite** Vehicle, normally man-made, orbiting planetary body, usually Earth, for purpose of relaying intercontinental telecommunications (telephone, telex, radio, TV, online etc.) (see *active* \*\*, *passive* \*\*, *synchronous* \*\*).

**communications security** Made up of physical security of transmitter and receiver, emission security of transmitter, transmission security en route and cryptosecurity of message.

**community** Clearly defined group, usually of aircrew, eg all who fly particular aircraft type or particular type of mission.

**community boundary** Drawn around inhabited or urban areas surrounding airport or airfield.

**community noise level** Flyover, sideline and approach NLs measured at designated points on or beyond community boundary (see *noise*).

**commutated Doppler** Form of MLS in which beam is frequency-coded and/or linearly commutated instead of scanned in azimuth and elevation.

**commutation** 1 Repeated reversal of current flow in winding of electrical machine, esp. to change output from a.c. to d.c.

## commutator

2 Transfer of current between elements of polyphase rectifier to produce unidirectional output.

**commutator** Typically, radially separated series of conductors forming ring round rotating generator shaft, opposite pairs of which are touched by brushes in external circuit to give d.c. output by commutation (1).

**commuter aircraft** See *feederliner*.

**commuter airline** In theory, air carrier operating between outlying regions and major hub(s). In practice, applied to anything from air-taxi operator to – in undeveloped regions – national carrier (see *third-level*).

**com/nav** Communications and navigation aids; usually means complete avionic fit.

**Comlo** Compass locator (usually comlo).

**COMNA** Commodore Naval Aviation.

**Comos** Common Mode S (Eur ATC).

**comp** 1 Component of W/V along Tr (strictly, along flight-plan track between check points).

2 Compressor.

**compact airborne early warning** AEW platform without a rotodome.

**Compacta tyre** Landing wheel tyre of reduced diameter and greater than normal width (Dunlop).

**companion body** Hardware from launch system accompanying space vehicle or satellite on its final trajectory.

**comparative cover** Reconnaissance coverage of same scene at different times.

**comparative vacuum monitoring** Potentially very important method of detecting even the smallest cracking in structures by measuring any flow of air into a volume maintained as partial vacuum.

**compartment marking** Stencilled subdivisions of cargo aircraft interior to assist compliance with floor loading and c.g. position limits.

**Compas** Computer-oriented metering, planning and advising system.

**Compass** Compact multipurpose advanced stabilized system.

**compass acceleration error** See *acceleration errors*.

**compass base** Area on airfield, usually paved disc, on which aircraft can conveniently be swung.

**compass calibration pad** Compass base.

**compass compensation** See *compensating magnets*.

**compass course** See *heading*.

**compass deviation** Deviation (2).

**compass error** 1 Vector sum of variation E plus variation W.

2 Sum of deviation, variation and northerly turning error.

**compass heading** See *heading*.

**compass locator** Low-power beacon used with ILS, 2-letter ident.

**compass points** 32 named directions comprising cardinal points, quadrantal points and 24 intermediate points.

**compass rose** Disc divided into 360°, either on simple magnetic compass or on compass base.

**compass swing** See *swing*.

**compass testing platform** See *compass base*.

**compass variation** See *variation*.

**compatibility** Ability of materials (solids, liquids and gases) and dynamic operating systems to interface for prolonged periods without interference under prescribed environmental conditions.

## component efficiency

**compatible** 1 Colour TV transmission capable of being received as monochrome by monochrome receiver.

2 Language and software capable of being used in given computer.

**compensated gyro** Incorporates correction for apparent wander.

**compensating magnets** Two pairs of bar magnets carried on arms rotatable about axis of magnetic compass to correct or minimise deviation.

**compensation manoeuvres** Aircraft manoeuvres required for accurate use of compensator (2), always involving four orthogonal headings, and sometimes circle or cloverleaf.

**compensator** 1 Instrument for measuring phase difference between components of elliptically polarised light (Babinet \* has pair of quartz wedges with optical axes perpendicular).

2 Device, manually or computer-controlled, carried in ASW aircraft to eliminate false readings caused by permanent (airframe and equipment hardware), induced and eddy-current interference signals.

**Comglas** Low-density composite of graphite fibres in ceramic matrix, offering strength at very high temperatures (United Technologies).

**compiler** ECP (1) program more powerful than assembler for translating and expanding input instructions into correctly assembled sub-routines.

**complementary shear** Induced in tension field (eg aircraft skin) at right angles to applied shear, in plane of field.

**completion business** Process of taking green airframes from manufacturer and equipping and furnishing to each customer's specification (principally in field of executive or commuter transports). Hence, a completion = one aircraft ready for customer.

**complex** See *launch complex*.

**compliance** Demonstrated fulfilment of requirements or certifying authority.

**compliance limit** Time (usually GMT) by which compliance must be demonstrated.

**compliant member** Capable of substantial elastic or otherwise recoverable deflection.

**compliant volume** Trapped body of fluid, usually oil, having predetermined stiffness resulting from fluid's bulk modulus. Often sealed by diaphragm or piston having small bleed, to even out pressures over a period (see *stiffness*).

**component** 1 One of assemblage of structural members.

2 One of assemblage of parts used to build hardware system.

3 Major subdivision of prime mover, esp. gas turbine (eg fan, compressor, combustor, turbine, afterburner, nozzle); hence \* efficiency.

4 Force, velocity or other vector quantity along reference axis, such that components along two mutually perpendicular axes sum vectorially to actual vector. Thus, crosswind \* on landing.

5 Major portion of aircraft that can be separated in flight, esp. if this leaves two complete aircraft able to proceed independently.

**component efficiency** Measure of performance of part of machine, normally on basis of energy output × 100 divided by energy input. Thus overall efficiency of gas turbine is product of \*\* of each part, considered on both mechanical and thermodynamic basis.

## component life

**component life** Authorised period of usage without attention, as stipulated by manufacturer or other authority. At expiry may be discarded or overhauled. Period may be extended from time to time.

**components tree** Notional “tree” formed by interlinking of aircraft systems, highlighted in CBT by ability to strip aircraft layer by layer.

**composite aircraft** 1 Comprising two aircraft joined together at take-off [see *component* (5)] but separated later in flight.

2 Aircraft made principally of composite material(s).

**composite air picture** Fed from many sources to give giant hi-resolution monitor with many overlays controlled by keyboards, mice and trackballs.

**composite beam** Composed of dissimilar materials bonded together.

**composite cloud** Combination of, or intermediate between, basic forms, eg cirro-cumulus.

**composite construction** See *composite material*.

**composite cooling** Evaporative cooling.

**composite double-base** Solid rocket filling of combined double-base and composite types (eg AP (2) + AIP in matrix of NC + NG).

**composite flight plan** One specifying VFR for one or more portions and IFR for remainder.

**composite flying** Long-range navigation along great circle but modified (eg to avoid high mountains) by inserting sectors using other methods.

**composite launch** Single launch vehicle carrying two or more distinct payloads.

**composite material** Structural material made up of two or more contrasting components, normally fine fibres or whiskers in a bonding matrix. Unlike an alloy, usually anisotropic.

**composite power** See *mixed power*.

**composite propellant** Solid rocket filling comprising separate fuel and oxidiser intimately mixed.

**composite route** One where composite separation is authorised.

**composite separation** Reduction [usually to half normal] of lateral and vertical minima on oceanic routes meeting criteria.

**compound aerofoil** Not defined, but has been applied to wing whose trailing edge comprises separately hinged upper and lower sub-aerofoils leaving controllable gaps.

**compound aircraft** Having wing(s) and lifting rotor(s).

**compound balance** Compound shelf.

**compound curvature** Sheet or surface curved in more than one plane, thus not formable by simple bending.

**compound die** Performs two or more sheet-forming operations on single stroke of press.

**compound engine** Expands working fluid two or more times in two or more places, eg in HP and LP cylinders or in piston engine followed by gas turbine or blow-down exhaust turbine.

**compound helicopter** Having propulsion (usually turbofan or turbojet) in addition to thrust component of lifting rotor.

**compound shelf** Control surface comprising two [rarely, three] spanwise sections hinged together one behind the other and moving in opposition. LE of main [front] section normally has fabric seal to fixed surface.

**compound stress** Not simple tension/compression,

## compressor blade

torque, bending or shear but combination of two or more of these.

**compound taper** Outer wing is tapered more or less sharply than inboard.

**compound wing** Wing made up of major fixed portion and upper/lower rear foils, with or without blowing between them. Also called multi-foil section. T/c up to 30% has been achieved at high MD.

**compressed-air starter** Expands HP airflow through piston engine cylinders or ATM or turbine-blade impingement jet. In multi-engined aircraft cross-bleed can start second and subsequent engines.

**compressed-air tunnel** Closed-circuit tunnel filled with gas or air under pressure; can be smaller, and cheaper to run, than one at atmospheric pressure for given M and R.

**compressibility** In aerodynamics, phenomena manifest at speeds close to local sonic speed, when air can no longer be regarded as incompressible. Loosely, behaviour of airflow subject to pressure/density changes of 50 per cent or more of free-stream values.

**compressibility correction** From RAS to EAS (see *airspeed*).

**compressibility effects** Manifest as local speed, at peak suctions, exceeds that of sound in surrounding flow; include abnormally rapid increase in drag, rearward shift of CP (2) on lifting wings, appearance of shockwaves, tendency to boundary-layer breakaway and, in improperly designed aircraft, control buzz and other more severe losses of stability and control.

**compressibility error** Manifest in all instrument readings derived from simple pitot/static system at high subsonic Mach numbers; typically, progressive under-reading until pressure and static orifices have penetrated bow shock.

**compressibility factor** See Glauert.

**compressibility stall** Rapid and dramatic loss of lift of traditional [e.g., thick-section] wing when Mach numbers exceeds about 0.8. Also called shock stall. Not relevant to wings designed for supersonic flt.

**compression** Control of signal gain, esp. to increase it for small signal voltages and reduce it for large.

**compression ignition** Combustion of fuel/air mixture triggered by high temperature due to compression in diesel cylinder or in highly supersonic ramjet with suitable internal profile.

**compression lift** Lift gained at supersonic speed by favourable flow field by forcing flow to accelerate beneath wing (accentuated by down-turned wingtips).

**compression pressure** Gauge pressure in piston engine cylinder at TDC (in absence of combustion).

**compression ratio** Ratio of entrapped volume above piston at BDC to volume at TDC.

**compression rib** Provided inside fabric-covered wing to withstand tension of drag bracing.

**compression ring(s)** Top ring(s) on piston, of plain rectangular section, serving to seal mixture into combustion space on compression stroke.

**compression wave** See *blast wave*.

**compressor** Machine for compressing working fluid (see *axial* \*, *centrifugal* \*, *skew* \*, *Roots* \*, *positive-displacement* \*). In general, term used for device handling large mass flow at moderate pressure (say, up to 40 ata, 400 kPa); small flow at high pressure = pump.

**compressor blade** 1 Loosely, rotor blade or stator vane in axial compressor.

## compressor casing

2 Precisely, operative aerofoil from axial compressor rotor.

**compressor casing** Fixed casing closely surrounding compressor rotor.

**compressor characteristic** Plot of fundamental compressor performance,  $P_2/P_1$  (pressure ratio) as ordinate and  $W\sqrt{T}/p$  (corrected mass flow) as abscissa.

**compressor diffuser** Passage for working fluid immediately downstream of compressor wherein pressure is increased at expense of flow velocity.

**compressor efficiency** Useful work done in delivering fluid at higher pressure, in assumed adiabatic operation, expressed as percentage of power expended in driving rotor.

**compressor map** Fundamental graphical plot of compressor performance showing variation of pressure ratio (ordinate) against mass flow (abscissa) for each rpm band.

**compressor pressure ratio** Ratio of total-head pressure at delivery to that at inlet (if ratio is 24:1, conveniently written as 24, for example).

**compressor rotor** Main moving part in compressor of rotary form (ie, not reciprocating type).

**compressor stator** Stationary part of axial compressor carrying fixed vanes.

**compressor vane** Stationary blade attached to stator (case), one row of such vanes preceding each row of rotor blades.

**compromised** 1 Classified information known or suspected to have been disclosed to unauthorised persons.

2 Of serial number or civil registration, one inadvertently applied to two aircraft.

**Compton wavelength** Defined as  $h/m_e c = 2.42631 \times 10^{-12} \text{ m}$ .

**Comptux** Composite training unit exercise (USN).

**Compu-Scene** Add-on visual system for existing simulators (General Electric).

**computational fluid dynamics** Representation of a surface by a fine grid, enabling program to determine fluid flow over it in terms of velocity, pressure, force, moment, temperature and possibly other variables. Impossible before powerful computers.

**computed air release point** Air position at which first paratrooper or cargo item is released to land on objective.

**computed approach** MLS approach to a runway not aligned with an MLS radial.

**computer** 1 Machine capable of accepting, storing and processing information and providing results in usable form; function may be direct control of one or more operating systems.

2 Simple mechanical device for solving problems (eg Dalton \*).

**computer acceleration control** Use of airborne computer linked to AFCS to limit (close to zero) unwanted flight accelerations, esp. in vertical plane, on aeroplanes and helicopters.

**computer-assisted approach sequencing** Use of one, or several interlinked, computers in ATC system to solve problem of feeding arrivals automatically into optimised trajectories so that each arrives at destination runway at correct spacing and with minimal delay.

**computer board** Component part of a computer or similar device, each being a driver, RAM, EPROM, A/D converter, video interface or similar self-contained unit

## condensation shock

which can be assembled with others on to a bus (eg, back-plane) to form a purpose-designed EDP system.

**computer-programmable** Capable of being controlled by digital computer without additional interfacing (typical item would be microwave signal generator for radar testing).

**computing gunsight** Automatically compensates for most predictable or measurable variables in weapon aiming.

**COMR** Civil[ian]-owned, military registered [initially helicopters] (UK).

**comsat** See *communications satellite*.

**Comsec** Office of Communications Security (US, NSA).

**comsnd** Commissioned (of facilities on airfield charts).

**COMSS** Coastal/oceans monitoring satellite system.

**CON, Con** 1 Consol beacon.

2 Continuous.

3 Console.

4 Control.

**Conac** Continental Air Command (1 December 1948, became part of ADC).

**Conaero** Consorzio Italiano Compagnie Lavoro Aereo (1).

**Conar** Continental Norad Region (US).

**Conc** Concrete surfaced runway (ICAO).

**concentrated force, load** See *point force, load*.

**concentration ring** 1 In balloon, ring, usually rigid, attached to envelope or (if applicable) surrounding net, and from which basket is suspended.

2 In airship, ring to which several mooring lines may be secured (sometimes also helping support car, if this is suspended below hull).

**concentric** Having common centre or central axis.

**concession** 1 Allowable departure from drawing or other design authority in manufacture of part (eg on material spec., surface finish or manufacturing tolerance).

2 Allowable non-compliance with certification or other requirement, esp. in emergency (eg take-off permitted with one engine or one altimeter inoperative).

**concrete cloche** HAS1 (colloq., UK).

**concurrence** Policy adopted for reasons of national emergency in which most, or all, parts of major system programme are implemented simultaneously, even though several large portions may need to be grossly modified or updated (eg Atlas ICBM hurriedly deployed above ground, then in surface shelters and finally in silos).

**concurrent engineering** 1 Consideration of market, design, manufacture [and tooling], test and life support, from outset.

2 Automatic storage in every design database for all parts of new vehicle of each new technique for reducing RC2 (2).

**concurrent forces** Acting through common point.

**Cond, Conds** Condition[s].

**condensation** Physical change from gaseous or vapour state to liquid.

**condensation level** Height at which rising parcel of air reaches saturation; cools at DALR and reached 100% RH at \*\* at intersection of DALR and DPL.

**condensation nuclei** Minute particles, solid or liquid, upon which nucleation begins in process of condensation; most effective \*\* are hygroscopic.

**condensation shock** Sudden condensation of super-saturated air in passage through normal or inclined shock,

rendering shock field visible, often showing elliptic lift distribution around transonic aircraft.

**condensation trail** Visible trail, usually white but sometimes darker than sky background, left by winged or propelled vehicle when flying above condensation level. May be due to reduced pressure (eg in tip vortices), but nearly all persistent \*\* due to condensation (and probable freezing) of water vapour formed by combustion of fuel.

**condenser** 1 Capacitor.

2 Device for changing flow of vapour to liquid by removing latent heat of evaporation. Essential feature of closed-cycle space power systems in which working fluid must be used repeatedly.

**condenser-discharge light** Gives very short flashes of great intensity caused by capacitor discharge through low-pressure gas tube (eg collision beacon).

**con-di nozzle** Jet-engine nozzle having cross section which converges to throat and then diverges; subsonic flow accelerates to throat, becomes supersonic and then accelerates in divergent portion.

**conditionally unstable** Unsaturated air above or through which temperature falls with height faster than SALR but less than DALR; thus if air becomes saturated it will be unstable.

**condition monitoring** Health inspection of operative hardware, eg engine, using intrascope, X-ray photography, oil sampling and BITE.

**Condo** Contractors on deployed operations.

**Condor** 1 Confidential direct occurrence reporting, system for non-attributably ensuring that nothing having a direct bearing on flight safety is kept hidden (RAF, CAB, etc.).

2 Electronic 'sniffer' which by mass spectrometry identifies traces of vapour or particles emitted by explosives and drugs (from contraband detector, British Aerospace).

3 Covert night and day operations for rotorcraft.

**conductance** 1 Real part of admittance in electric circuit; symbol  $\Lambda$ .

2 In circuit having no reactance, ratio of current to potential difference, ie reciprocal of resistance. Symbol G, unit siemens,  $= \frac{1}{\Omega}$ .

3 In vacuum system, throughput Q divided by difference in p between two specified cross-sections in pumping system.

4 Several meanings in electrolytes (little aerospace relevance).

5 See *thermal* \*.

**conduction** Transfer of heat from hotter to colder material or of electrons from higher to lower potential.

**conduction band** Band of electron energies corresponding to free electrons able to act as carriers of negative charges.

**conductivity** Measure of ability of material to transmit energy, eg heat or electricity. Thermal \*, symbol k or  $\lambda$ , measured in  $\text{Jm/M}^2\text{s}^\circ\text{C}$ . Electrical \*, symbol  $\delta$ , measured in mhos/m (per cube); reciprocal of resistivity.

**conductor** Material having very low electrical resistivity, esp. such material fashioned in form useful for electric circuits.

**cone** 1 Drag and stabilizing member trailed on end of HF aerial wire (trailing \*) or on end of air-refuelling hose.

2 Drag and stabilizing member incorporating pressure and/or static heads trailed beneath aircraft under test in supposed undisturbed air.

**cone angle** Semi-angle of right circular cone having same increase in surface area per unit length as diffuser; hence diffuser \*\*.

**CONECT, Conect** Combat network communications technology.

**coned** Caught in beams of two or more searchlights.

**cone of confusion** Inverted cone of airspace with vertical axis centred on VOR or other point navaid.

**cone of escape** Volume in exosphere with vertex pointing directly to Earth centre through which atom or molecule could theoretically escape to space without collision. Opens out in angle to infinity at critical level of escape.

**cone of silence** Inverted cone of airspace with vertical axis centred on certain marker beacons, NDBs and other point navaids within which signal strength reduces close to zero.

**cone passage** Flight through cone (of confusion or of silence) above point navaid.

**cone yawmeter** Cone flying point-first, with pitot holes spaced at  $90^\circ$  intervals, to obtain yaw indication at supersonic speeds (avoids averaging effect of wing-type yawmeter).

**confidence level** Used in statistical sense, eg as percentage probability that an actual MTBF will exceed estimated or published MTBF. Value of \*\* increases with number of samples. Sometimes called confidence limit.

**confidence manoeuvres** Set pattern of ground and air tasks easily mastered by new and inexperienced pupil pilot (eg, swinging propeller, letting aircraft recover from unnatural flight attitude hands-off); devised to ease problem of apprehension and tension. Sometimes called confidence actions.

**Confidential human factors incident – reporting programme** Procedure whereby professional pilots and controllers may confidentially report incidents caused by human error for analysis by IAM(2).

**configuration** 1 Gross spatial arrangement of major elements, eg in case of aircraft disposition of wings, bodies, engines and control surfaces.

2 Aerodynamic shape of aircraft where variable by pilot command, eg position of landing gear, leading/trailing-edge devices and external stores. Thus high-lift \*, clean \*.

3 Standard of build or equipment for task. Thus helicopter in dunking ASW \*, passenger transport converted to all-cargo \*.

4 Apparent positions of heavenly bodies, esp. in solar system, as seen from Earth at particular time.

5 A new (1990– ) usage: the number of seats in a passenger airliner, thus \*\*220.

6 Used, incorrectly, to mean 'application', eg 'Chaparral is the Sidewinder missile in ground-to-air \*'. This would be correct if hardware was physically changed in \*.

**configuration bias** Channel or subsystem in stall protection or stick-pusher system allowing for changes in configuration (2).

**configuration deviation list** Comprehensive schedule of all variable parts of a/c, such as door panels and seals.

**configuration management** Combining the management and traceability of software and hardware in a single solution.

**conflict** In ATC (1), two aircraft proceeding towards

## conflicting traffic

potentially dangerous future situation. Hence, \* alert, \* resolution, \* situation.

**conflicting traffic** With respect to one aircraft, other traffic at or near same FL heading towards future conflict.

**conformal airborne early warning** This usually means a large planar side-looking array radar on either or both sides of the fuselage.

**conformal-array aerial** Electronically scanned, fits exterior surface of vehicle.

**conformal-array radar** Having plurality of small or light ES aerials covered by radomes fitting vehicle shape (eg wing or rotor leading and trailing edges, etc).

**conformal gears** Having teeth whose mating profiles conform, both sets having instantaneous centres of curvature on same side of contact. Usually applied to W-N gears.

**conformal projection** Having all angles and distances correct at any point, but with scale changing with distance from point.

**conformal tank** Removable [not necessarily jettisonable] fuel tank shaped to fit precisely against skin of aircraft.

**confusion reflector** Designed to reflect strong echo to confuse radar, proximity fuze, etc. Form of passive ECM.

**conical camber** 1 Applied to wing leading edge so that, from root or intermediate station to tip, it is progressively drooped, centreline of profile following surface of cone with vertex at root (or at start of \*\* if this is some distance along semi-span).

2 The term is also loosely applied to down-curved wingtips.

**conical flow** Theory for supersonic flow over thin flat plate having corner (apex), with flow perpendicular to rear edge: constant pressure, velocity, density and temperature along any radius (to infinity) from apex.

**conical scanning** Common search mode for radar, esp. AI radar, in which beam is mechanically or electronically scanned in cone extending ahead of aerial, often using beam-switching to give az/el data.

**conical sleeve** Cone-shaped flexible sleeve extending inwards into gas cell of airship from aperture for line, providing near gas-tightness with freedom for line to move axially through envelope.

**conic apogee** Apogee of satellite if all mass of primary were at its centre.

**conic perigee** Perigee of satellite if all mass of primary were at its centre.

**conic sections** Perpendicular to axis = circle; parallel to axis = parabola (eccentricity 1); eccentricity less than 1 = ellipse; eccentricity greater than 1 = hyperbola. All are found in trajectories of bodies moving in space.

**Conie** Comision Nacional de Investigacion de Espacio (Spain).

**coning** 1 Tunnel test in which model is rotated whilst held at constant AOA and sideslip by rotary balance.

2 Capturing hostile aircraft in beams of several search-lights.

**coning angle** 1 Angle between longitudinal axis of blade of lifting rotor and tip-path plane (assuming no blade bending). Symbol  $\beta$ .

2 Incorrectly, sometimes given as average angle between blade and plane perpendicular to axis of rotation.

3 Upward angular displacement of blades of lifting rotor of helicopter or autogyro; caused by their lift.

**conjugate** Many specialised meanings in theory of

## constant duty cycle

groups, complex numbers and geometry of curved surfaces.

**conjugate beam** Hypothetical beam whose bending moment assists determination of deflection of real beam.

**conjugate foci** In optics, interdependent distances object/lens and lens/image.

**conjunction** Alignment of two heavenly bodies sharing same celestial longitude or sidereal hour angle.

**connecting rod** Joins reciprocating piston to rotary crank in piston engine, reciprocating pump, etc.

**connector** Standard mating end-fitting for fluid lines, multi-core cables, co-ax. cables and similar transmission hardware, providing automatic coupling of all circuits. Term preferred for multipin electric \*, with fluid systems prefer "pipe coupling".

**Conops** Concept[s] of operations (USN, now all-US).

**conplan** Contingency plan.

**Conradson** Standard test apparatus and procedure for determining carbon residue left after combustion of hydrocarbon oils, especially lubricating oils.

**Con Rep** Connective replenishment [carrier] (USN).

**conrod** Piston-engine connecting rod (colloq.).

**consensus** Majority vote concept in logic systems, multi-channel redundant systems etc; thus, \* can command landing flare against presumed failed channel.

**Consequence assessment tool set** Central program used by Federal and local agencies in responding to domestic emergencies, now part of ECHO (DoD).

**Consol** Simple long-range navaid providing PLs (within range of two \* stations, a fix) over N Atlantic. LF/MF receiver is tuned to identified \* station and operator counts dots and dashes in repeated 'sweep' lasting about 30 seconds; PL is then obtained by reading off \* chart.

**Consolan** Consol-type system radiating daisy pattern at c300 kHz, formerly based at Nantucket (US).

**console** 1 Control station for major device or system, normally arranged for seated operator.

2 Control and instrument installation for pupil navigator, esp. when such \* repeated along fuselage (but not used for pilot station on flight deck).

3 Single bank of controls and/or instruments on flight deck, eg roof \*, left side \*.

4 Station for manual input/output interface with large system, eg air defence, ATC, EDP (1).

5 Tailored box for storage of maps, cameras and other items, eg 'The Cessna 210 has centre-aisle \* as an option'; misleading and ambiguous.

**consolidation** Period between first solo and issue of PPI or other ab initio licence; hence \* exercise, \* flight.

**consolute** Of two or more liquids, miscible in any ratio.

**constantan** Alloy of copper with 10–55 per cent nickel; resistivity essentially unchanged over wide range of temperature.

**constant-colour** Philosophy for cockpit warning systems, usually: no caption illuminated = no fault, all buttons normal; blue = normal-temperature operation; white = button abnormal, either from mis-select or to rectify/suppress fault; red or amber = fault.

**constant-descending approach** Self-explanatory, adopted to minimise noise over urban areas. Same as *continuous-descent*.

**constant duty cycle** Device or system whose rate of operation is unvarying despite variable demand; eg DME

## constant-energy line

## container

ground transponder beacon has \*\*\* behaving as though continuously interrogated by 100 aircraft.

**constant-energy line** Plots taken in steep dive at terminal velocity, when increase in dive angle has no effect on V.

**constant-flow oxygen** Crew-breathing system in which gox is fed at steady rate, in contrast to demand-type supply.

**constant-g re-entry** RV uses aerodynamic lift in skip trajectory to impose constant total acceleration down to relatively low velocity.

**constant-heading square** Helicopter pilot training manoeuvre: large square described at low level with helicopter constantly facing into wind (so one leg forwards, one backwards and two sideways).

**constant-incidence cruise** Transport aircraft flight plan calculated on basis of constant angle of attack over major portion, angle being chosen for best L/D or other optimised point between time and fuel consumption.

**constant-level balloon** Designed to float at constant pressure level.

**constant of gravitation** See *gravitational constant*.

**constant-pressure chart** Plot of contours showing height above MSL of selected isobaric surfaces.

**constant-speed drive** CSD, infinitely-variable-ratio gear between two rotating systems, esp. variable speed aircraft engine and constant-frequency alternator; output maintained invariant despite variation in input speed and output torque.

**constant-speed propeller, c/s propeller** Propeller whose control system incorporates governor and feedback which automatically adjusts pitch to maintain selected rpm.

**constant speed unit** CSU, engine-driven governor controlling c/s propeller, maintaining rotational speed by varying pitch according to airspeed and engine power.

**constant torque on takeoff** Turboprop electronic unit which modifies DECU voltage according to pilot's torque command.

**constant-volume combustion** Super-rapid burning of stoichiometric mixture [i.e. detonation] in one or more aft-facing tubes. Also called pulse detonation, Humphrey cycle.

**constant wind** 1 W/V assumed for navigational purposes, until updated or refined.

2 Used in contradistinction to gust (2).

**constellation** 1 Traditional conspicuous group of fixed stars having supposed resemblance to Earth object.

2 Arbitrary portion of celestial sphere containing a \*(1) bounded by straight lines, whole sphere being thus divided for use as reference index.

**constituent day** Period of Earth rotation with respect to hypothetical fixed star.

**constrictor** 1 Obstruction in pipe or other fluid flow constraint pierced by small hole giving precisely known mass flow per unit pressure difference.

2 Annular or distributed constriction in nozzle of air-breathing jet engine, esp. ramjet or pulsejet.

**consumables** Materials aboard spacecraft which must undergo once-only irreversible change during mission, eg propellants, foods (in present state of art) and some other chemicals such as in SPS.

**consumables update** Regular housekeeping chore, reporting to Earth mission control exact quantities (usually masses) remaining.

**Consuta** Method of making boat, later marine-aircraft,

hulls from mahogany ply sewn with copper wire (S.E. Saunders, 1898–).

**cont** Continuous, continuously, continued or continue.

**contact** 1 Visual link between pilot (rarely, other aircrew) and ground or other external body. Thus, in \* = seen, \* flying = by reference to ground.

2 Unambiguous radar link (radar \*).

3 Single positive mechanical hook-up between FR tanker and receiver aircraft (dry \* if no fuel to be transferred).

4 Shouted by pilot of simple aircraft to person swinging propeller of piston engine, indicating ignition about to be switched on.

5 Unidentified target appearing on radar or other surveillance system (rarely, seen visually).

**contact altimeter** See *contacting altimeter*.

**contact approach** Visual approach to airfield requested by, and granted to, pilot making IFR flight.

**contact-burst preclusion** Nuclear-weapon fuzing system which, in the event of failure of desired air burst, prohibits unwanted surface burst.

**contact car** Front-line vehicle, usually AFV, housing local tactical air controller and army liaison officer, plus multiservice radio (1943–).

**contact flying** Aircraft attitude and navigation controlled by pilot looking at Earth's surface. (Certain authorities, questionably, include clouds as source of visual cues.)

**contact height** That at which runway is first glimpsed during landing approach.

**contacting altimeter** Makes or breaks electrical circuit (eg warning or radio transmission) at chosen reading(s).

**contact ion engine** Space thruster stripping electrons from caesium or other supply material infiltrated in substrate (eg tungsten). Bombardment ion engine more common.

**Contact Judy** AAM firing mode: target is within correct parameters.

**contact lights** White lights on either side of runway in use, parallel to centreline (obsolete, see *runway edge lights*).

**contact lost** Situation in which contact (5) can no longer be seen, though target believed still present.

**contactor** Electric switch having remote (usually electromagnetic) control.

**contact patrol** Patrol beyond front line with intention of encountering hostile a/c (WW1).

**contact point** In CAS (3), geographical or time point at which leader established R/T contact with FAC or ground ATC.

**contact print** Photograph made from negative or diapositive in contact with sensitised material; optical, radar or IR.

**contact race** Competitors are required to land at several intermediate points where their logbooks are signed by a marshal.

**contact ratio** The number of points or lines at which intermeshing gearteeth touch each other.

**contagious failure** One likely to transmit to an adjacent item.

**container** 1 Standard rigid box for baggage or cargo: maindeck \*, ISO 96 in × 96 in × 10, 20, 30 or 40 ft; SAE 10, 96 in × 96 in × 125 in; SAE 20, 96 in × 96 in × 238.5 in;

## container delivery

underfloor \*, IATA A1 (LD3) 92 in × 60.4 in × 64 in; A2 (LD1) 79 in × 60.4 in × 64 in.

2 Standard ASR package dropped to aircrew in dinghy.  
**container delivery** Standard military airdrop supply of from one to 16 bundles of 1,000 kg (2,200 lb) each.

**containment** Demonstrated ability to retain every part within machine, following mechanical breakup of portion or whole of moving machinery. Applies particularly to gas-turbine engines, certification of which usually prohibits ejection of fragments even through inlet or nozzle.

**containment casing** Specially designed ring structure surrounding a fan or other rotating part.

**contaminate** Aerospace meanings include transfer of terrestrial germs and other organisms to spacecraft sterilized for mission, transfer of unwanted atoms to single-crystal (eg semi-conductor) materials, and deposit and/or absorption and/or adsorption of any NBC material on friendly surfaces.

**contaminated fuel** Fuel containing any unwanted material, including water or ice.

**contaminated runway** Surface all or partly covered with water, snow, slush, blown sand or foreign objects capable of causing damage.

**Contap** Consol Technical Advisory Panel.

**Conticell** Proprietary low-density sandwich structure.

**contingency air terminal** Mobile air-transportable unit providing all necessary functions to handle air transport at combat airfield.

**contingency plan** Drawn up and implemented by military commander or civil manager in event of failure of original plan, for anticipated reasons.

**contingency power** Exceptional power available from engine[s] of multi-engined aircraft after failure of another; in Concorde \* was 5 per cent above normal reheat T-O rating. See next.

**contingency rating** Power levels required of helicopter and VTOL engines in emergency conditions, time-limited [usually to from 1.5 to 30 min] and normally requiring subsequent special inspection (see *maximum \*\**, *intermediate \*\**).

**contingency retention item** Surplus to requirements but authorised for retention to meet unpredicted contingency.  
**contingent effects** Those of nuclear detonation other than primary effects.

**continuation trainer** Trainer aircraft for experienced pilots, esp. those in desk jobs.

**continued airworthiness** Maintaining [old] aircraft to ensure that they always comply with whatever requirements are in force and are in a condition for safe flight.

**continuity line** Portion of line system diagram in cockpit or other human interface superimposed on push-button or magnetic indicator.

**continuous airborne deterrent** Maintenance of bombers armed with live NW at high altitude round the clock, to ensure capability of MAD 3.

**continuous beam** Single structural member having more than two supports.

**continuous-descent approach** Especially important at night, philosophy of eliminating stacking and enabling every arrival to avoid power settings for level flight.

**continuous-element system** Fire-detection system comprising either electrical circuit or gas-filled tube; heating any part sends signal.

## contractor-furnished equipment, CFE

**continuous-flow system** See *constant-flow oxygen*.

**continuous half rolls** Display/competition manoeuvre in which numerous half rolls are made, marking being on accuracy of intermediate wings-level positions, which are held very briefly.

**continuous ignition** In a gas-turbine engine flying through hazardous conditions [tropical rain or severe hailstorm], continuous operation of the igniter[s].

**continuous-path machining** Shaping of workpiece by cutter traversing unbroken path, esp. this form of NC control and machine program.

**continuous strip** Film produced by \*\* photography, using \*\* camera, in which \*\* film passes at constant speed, related to speed of aircraft, past slit in optical focal plane.

**continuous wave, CW, c.w.** EM waves repeated without breaks indefinitely, usually with constant amplitude and length (frequency); ie, not pulsed.

**continuum** Spectral region in which absorption or emission is continuous, with no discrete lines.

**continuum flow** See *free-molecule flow*.

**Contour** Comet-nucleus tour (NASA).

**contour** 1 On topographic map or chart, line joining all points of equal surface elevation above datum (eg MSL).

2 On \* chart, line joining all points of equal elevation (height above or below datum, eg MSL, and above or below ground or sea surface) of selected pressure surfaces. Thus can plot \* of 1,000 mb surface at -120 ft, MSL and +120 ft.

3 On weather radar, area blanked out in centre of display of storm cell, or whenever return level exceeds given threshold.

**contour capability** 1 Of mapping radar, ability to display all ground above selected height above MSL or other datum.

2 Of weather radar, ability to make contour display.

**contour display** Radar display in which all echoes above given strength are cancelled. Normally used in viewing storm clouds. With CONTOUR operative cloud echo has black centre showing region of greatest precipitation (and assumed greatest gust severity). With colour radar each contour has distinctive hue.

**contour flying** Normally denotes holding constant small height AGL, ie not following contours (1) but terrain profile (see NOE).

**contour interval** Difference in height between adjacent contours (1, 2).

**contour template** Hard copy of profile of 2-D or 3-D shape, eg for tunnel throat, press tool, form block.

**contract definition phase** Important process in procurement linking end of feasibility study and other conceptual phases with full hardware development. CDP involves collaboration with one or more industrial contractors and can involve detailed computer study and hardware test to establish what is to be bought and on what terms.

**Contracting State** Sovereign country party to an international agreement.

**contraction** Duct of diminishing cross-section through which fluid is flowing; eg front part of venturi.

**contraction ratio** 1 In subsonic tunnel, ratio of maximum cross-section to that at working section.

2 In supersonic tunnel, ratio of cross-sectional area just ahead of contraction to that at throat (can be variable).

**contractor-furnished equipment, CFE** Hardware, software or, rarely, specialist knowledge or experience,

## **contractor-furnished weight, CF weight**

supplied by contractor to support programme; esp. items normally GFE, bought-out or supplied from other source.

**contractor-furnished weight, CF weight** Total mass of aircraft in precise state in which ownership is transferred to customer.

**contract oversight** Ongoing monitoring of contracts, with particular attention to finance and national security (DoD). Does not mean to fail to notice an irregularity.

**Contrafan** Registered name for studies of advanced direct-drive shrouded propeller engines in Mach 0.9 class (Rolls-Royce).

**contra-flow engine** Loosely, any engine involving fluid flow in opposite directions; specif., gas turbine having compressor and turbine back-to-back, with flows (1) axially towards each other and radially out together, (2) radially out from compressor and radially in through turbine, or (3) forward through compressor and back through ducts to turbine.

**contrail** *Condensation trail* (abbr. not admitted by NATO).

**contra-injection** Upstream injection of fuel droplets into airflow or of one liquid rocket propellant against another.

**contra-orbit defence** Supposed technique of defending area by launching missile along predicted trajectory or orbit of hostile weapon.

**contraprop** Contra-rotating propeller.

**contra-rotating** 1 Two or more propellers rotating at equal speed in opposite directions on common shaft axis, and sharing common drive.

2 Installation of similar tandem piston engine/propeller combinations back-to-back on opposite ends of common nacelle. (Not to be used for propellers rotating in opposite directions but not on common axis. See *counter-rotating, handed*.)

3 Of any rotating assembly, turning in opposite directions, possibly at different speeds.

**contrast** Difference in luminous intensity between different parts of picture (photograph, radar display, synthetic display or TV).

**control** 1 Exercise of civil or military authority, eg over air traffic.

2 In hardware system, device governing system operation.

3 In man/machine system, device through which human command is transmitted across interface.

4 In photogrammetry, points of known position and elevation.

5 In research experiment, unmodified test subject used as yardstick.

**control airport** See *tower airport*.

**control and reporting centre** Subordinate air-control element of tactical air control centre from which radar control and warning operations are conducted within its area of responsibility (USAF, NATO etc).

**control and reporting system** Organisation set up for (1) early warning, tracking and identification of all air and sea traffic, and (2) control of all active air defence.

**control anticipation parameter** In a sudden large nose-up command, ratio of initial to steady-state normal acceleration [in simple manual aircraft].

**control area** Controlled airspace extending upwards from specified height (ICAO prefers 'limits') above Earth (NATO adds 'without upper limit unless specified').

## **control line**

**control augmentation system** See *command augmentation*.

**control bar** Main pilot's input to hang glider.

**control cable** Physical connection between human control (3) and operating system, esp. between pilot's flying controls and control surfaces.

**control car** Housing pilot or coxswain of airship.

**control centre** See *launch* \*\*.

**control column** Aerodyne trajectory control (flight control input) normally exercising authority in pitch and roll. May be stick, wheel, miniature sidestick or spectacles (see *yoke*).

**control-configured vehicle** See *CCV*.

**contrôle auto généralisé** Voice + computer (F).

**control feel** See *feel*.

**control-force gradient** Increase in hinge moment with indicated airspeed.

**control jet** See *reaction control jet*.

**controllable-pitch propeller** Capable of having blade pitch manually altered in flight, either to set positions or over infinite range (but not c/s).

**controllable rocket** Having rate of combustion of liquid, solid or hybrid propellants capable of being varied at will during burn.

**controllable twist** Helicopter rotor blade capable of changing angle of incidence in predetermined manner from root to tip in course of flight.

**controlled aerodrome** One at which ATC service is supplied to aerodrome traffic (does not imply existence of control zone).

**controlled airspace** Airspace of defined dimensions within which ATC service is provided (ICAO adds 'to controlled flights'). Can be IFR only, IFR/VFR or visual exempted [no control provided].

**controlled attack** Bombing target with Master Bomber in attendance (RAF WW2).

**controlled-emissivity material** Substrate or surface coating designed to reduce IR signature.

**controlled environment** One in which such variables as temperature, pressure, atmospheric composition, ionising radiation and humidity are maintained at levels suitable for life or hardware.

**controlled flight** Provided with ATC service.

**controlled flight into terrain** Unexpectedly encountering terra firma (land or water, but usually hills or mountains), the No 1 killer in commercial aviation. The flight need not be controlled (see previous); definition means PIC has not lost control.

**controlled interception** One in which interceptors are under positive control (from ground, ship or AWACS).

**controlled leakage** Environment for life or hardware in which harmful products (eg carbon dioxide) are allowed to leak away and be replaced by fresh oxygen or other material.

**controlled mosaic** One in which distances and directions are accurate.

**controlled response** Chosen from range of options as being that giving best all-round result.

**controlled torque tightening** Use of special adjustable tool to tighten bolts/nuts etc according to material, diameter, plating and lubricant.

**control line** 1 Connection between operator and \*\* aircraft.

## control-line aircraft

2 Connection between control car of airship and controlled item.

**control-line aircraft** Model aircraft whose trajectory is controlled by varying tensions or signals in two or more filaments linking it with ground operator.

**control lock** Physical lock preventing movement of control surface, either built into aircraft or brought to it and fastened in place.

**control-motion noise** Sufficient to cause small surface movement in coupled ILS, but not affecting trajectory.

**control panel** Self-contained group of controls, indicators, test connections and other devices serving whole or portion of aircraft system, either accessible in flight or only during ground maintenance.

**control pattern** In SSR/IFF, governs reply code for each mode selected.

**control plane** CP, in a helicopter, the plane commanded by cyclic pitch, also called the swashplate plane.

**control point** Fixed position, marked by geographic feature, electronic device, buoy, aircraft or other object, used as designated aid to navigation or traffic control (NATO, USAF).

**control reversal** In aircraft flight control system, dangerous state in which pilot demand causes response in opposite sense. Normally caused by either mechanical malfunction (eg crossed controls) or aeroelastic distortion of airframe.

**control rocket** Usually small and intermittently fired thruster for changing spacecraft attitude and refining velocity.

**controls** As 'the \*', primary flight control input devices, esp. in aerodyne; typically stick and rudder pedals.

**control sector** Defined block of airspace within which one controller, or group of controllers, has authority [normally feature of civil ATC].

**control stick** Control column (colloq.).

**control-stick steering** Control of aircraft trajectory by input to AFCS by means of primary flight controls. Not same as \* -wheel \*.

**control surface** Aerofoil or part thereof hinged near extremities of airframe so that, when deflected from streamwise neutral position, imparts force tending to change aircraft attitude and thus trajectory.

**control surface angle** Measured between reference datum on control surface and chord of fixed surface or aircraft longitudinal axis.

**control system** In missile, RPV or aircraft flying on AFCS, serves to maintain attitude stability and correct deflections (NATO, USAF). Also, not included in this definition, translates guidance demands into changes in trajectory.

**control tower** ATC organization, normally located on tower or near airfield, providing ATC service for airfield traffic and possibly within other airspace.

**control vane** Refractory surface, usually small, pivoted in jet of rocket or other propulsion system to control attitude, and hence trajectory, of vehicle when deflected from neutral setting.

**control warfare** Information warfare.

**control-wheel steering** Autopilot mode giving manual control of heading while holding velocity and/or attitude.

**control zone** Controlled airspace extending upwards from Earth's surface (NATO, USAF). SEATO has long and involved definition including 'and including one or

## convertor

more airdromes' (*sic*). ICAO adds 'to a specified upper limit'.

**Conus** Continental US, ie US and its territorial waters between Mexico and Canada plus Alaska, but excluding overseas states.

**Conv** Convergent, convergence.

**convection** 1 In fluid dynamics, transfer of fluid property by virtue of gross fluid motion.

2 In atmosphere, transfer of properties by vertical motion, normally thermally induced.

**convection cooling** Method of cooling hot hardware, esp. gas turbine rotor blades, by removing heat from within bulk of material by flow of cooler air passing through system of holes or passages (see *film cooling, transpiration cooling*).

**convective cloud** Cumuliform, CuF, triggered by convection; normal vertical development fair-weather cumulus; extreme form is cumulonimbus. Bottom lies at condensation level; top can be in stratosphere.

**Convective Sigmet** Issued for convective weather posing potential danger.

**convenience bag** Sick bag [despite name, not for urine, though some are marketed for both purposes].

**conventional** Not nuclear, ie HE.

**conventional enhancement** Modifies B-52H for electrical and software interfaces for future weapons, using MIL-STD-1760.

**conventional stores** Free-fall HE devices.

**conventional take-off and landing, CTOL** Aeroplanes other than STOL, VTOL and other short-field forms.

**convergence** 1 Condition in which, at least reckoned on surface winds, there is net inflow of air into region.

2 Of mathematical series, one having a limit.

3 Of vector field, contraction.

4 Of terrestrial meridians, angular difference between adjacent pair at particular position.

**convergence factor** Ratio of convergence (4) and change of latitude (zero at Equator, max. at poles).

**convergent** Of oscillation – eg sinusoidal motion, phugoid or structural vibration – tending to die out to zero within finite (possibly small) number of cycles.

**convergent/divergent** See *con-di nozzle*.

**converging flight rule** Aircraft approaching from right has right of way.

**conversion angle** That between great-circle and rhumb-line bearings.

**Convertible** Fighter-type aircraft missing canopy / canopies, for whatever reason (US colloq.).

**convertible aircraft** 1 Transport aircraft designed for rapid conversion from passenger to all-cargo configuration or vice versa.

2 Aircraft which can change its configuration [eg. from rotor to fixed wing] in flight.

**convertible brake** Able to make quick change anywhere between carbon/compo/steel.

**convertible engine** One capable of giving either fan thrust or shaft power.

**convertible laser designation pod** Any 'convertible' pod usually offers a choice of LWIR or TV.

**converticar** One term for a roadable VTOL.

**convertiplane** Aerodyne capable of flight in at least two distinct modes, eg vertical flight supported by lifting rotor and forward translational flight supported by wing.

**convertor** Among many other meanings;

**1** Rotary machine for changing alternating into direct current.

**2** Self-regulating boiler for drawing on Lox storage and supplying flow of Gox.

**Convl** Conventional.

**convø** Convolution response algorithm.

**COO** *1* Chief operating officer of company or corporation.

*2* Cost of ownership.

**cookie** HC bomb 4,000 lb or over (RAF colloq.).

**cook-off** Inadvertent firing of automatic weapon due to round being detonated by residual heat in breech.

**Coolanol** Inert liquid of high heat capacity used as a thermal transport medium.

**coolant** Liquid circulated through closed circuit to remove excess heat, eg from piston engine.

**cooldown** See *chilldown*.

**cooled cooling air** Use of a fuel/air heat exchanger to cool [hot] compressor-bleed air used to cool the turbine and nozzle, permitting higher TGT.

**cooling drag** That due to need to dump excess heat to atmosphere (with skill can be made negative).

**cooling effectiveness** Expressed as  $\frac{T_{\text{gas}} - T_{\text{metal}}}{T_{\text{gas}} - T_{\text{coolant}}}$ .

**cooling gills** Hinged flaps forming partial or complete ring around rear edge of cowling of air-cooled piston engine to control airflow.

**co-operative aircraft** In ATC, one carrying transponder for SSR.

**co-operative emitter** Any friendly emitter, esp. those provided for surveillance and tracking of hostile targets.

**Co-operative Fuel Research** Permanent committee of SAE including fuel and engine representatives with special brief to measure and improve anti-knock ratings.

**co-operative independent surveillance** Monitoring aircraft position, beyond radar range, by satellite tracking; co-operative because aircraft emits a signal, and independent because aircraft's navaids are not used.

**Cooper-Harper** Refined scale of flying qualities, broad bands being: up to 3.5 satisfactory, 3.5–6.5 adequate, improvement warranted, over 6.5 inadequate, improvement required.

**Cooper scale** Scale for quantified Pilot Opinion Rating; see above.

**Co-ops** CO<sub>2</sub> observational platform system.

**co-ordinated-turn** One in which controls about three axes are used to avoid slip or skid.

**co-ordinates** Inter-related linear and/or angular measures by which the position of a point may be defined with reference to fixed axes, planes or directions.

**co-ordination** In a pilot, ability to control simultaneous unrelated motions, by left and right hands and feet.

**COP** *1* Changeover point from one navaid to next (US = chop).

*2* Common operating [or operational] picture; 21 adds 21st century [Jscope].

*3* Cab over [snow] plough.

*4* Character-oriented protocol.

*5* Conference[s] of the parties [1995–] (UNFCCC).

**COPA** Canadian Owners and Pilots Association [office, Ottawa].

**copal** Natural resin from tropical trees used in some varnishes.

**COPE, Cope** Controlled overall pressure ratio engine.

**copied** Unauthorised R/T word meaning "received and understood".

**co-pilot** Licensed pilot serving in any piloting capacity other than (1) PIC or (2) being on board solely to receive instruction.

**copper** Malleable metal of distinctive red-gold colour, Cu, density 9.0, MPt 1,084°C.

**Copper Flag** Air-defence equivalent of Red Flag, held at Tyndall AFB (USAF).

**COPR** Cruise overall pressure ratio.

**Cops, COPS** *1* Common operational performance specification.

*2* Common operating procedures.

**copter** Helicopter (approach procedure).

**Copy** "I read you" (radio voice code).

**copy machining** Using machine tool having means for copying shape of template or master part.

**copy milling** See *copy machining*.

**COR, cor** *1* Correct, corrected, correction.

*2* Certificate of Registration.

**Coral** British computer language very similar to Jovial.

**cord** US measure of volume, = 3.6246 m<sup>3</sup>.

**cord, corded** From pioneer era rigging of flight-control surfaces was adjusted by doping on length [guessed from experience] of cord. Even today trim can be improved by cord on one side of trailing edge, and overbalance by adding cord on both sides.

**cordite** Gun propellant prepared mainly from nitro-cellulose (gun-cotton) dissolved in nitroglycerine.

**Cords** *1* Coherent on-receive Doppler system

*2* Centre for Orbital and Re-entry Debris Studies (US).

**Cordtex** Blasting or cutting cord comprising high explosive in flexible filament form.

**Cordwood** Electronic technology (1948–55) designed to achieve maximum packing density of discrete components in pre-semiconductor era.

**CORE, Core** Controlled requirements expression, discipline which defines software design (BAe).

**core** *1* Gas-generator portion of turbofan, term especially when \* small in relation to fan; less relevant to bypass or 'leaky turbojet' engines.

*2* Central part of launch vehicle boosted by lateral or wrap-round rockets.

*3* Low-density stabilizing filling inside honeycomb, foam-filled or other two-component structure.

*4* High-density penetrative filling in armour-piercing projectile.

*5* Magnetic circuit of transformer or inductor.

*6* Central portion of nuclear reactor in which reaction occurs.

*7* Solid shape(s) which make casting hollow.

*8* Loosely, EDP (1) memory of magnetic type, from \* (5).

*9* Interior of carburised or nitrided part unaffected by surface treatment.

**core booster** *Booster* 3.

**core deposits** Solids deposited on metal surfaces of core (1).

**core exhaust mixer** In engine of ejector-lift STOVL, core nozzle capable of inflight limited vectoring and, in jet-lift mode, of deflecting at least 90° while entraining fresh air from above.

**core-failure clutch** Upon major mechanical failure of

## corel

core (1), disconnects drive to tilting rotors (rarely, to helicopter transmission).

**corel** Combined omnidirectional runway/taxiway edge light[ing].

**coring** Uneven flow of oil through oil cooler due to reduced viscosity of oil in hot central core.

**coriolis acceleration** Acceleration of particle moving in co-ordinate system which is itself accelerating, eg by rotating. In Earth-referenced motion, \*\* is experienced in all motion parallel to local surface except for that on Equator.

**coriolis correction** Applied to all celestially derived fixes to allow for coriolis acceleration.

**coriolis effect** 1 Physiological response (eg vertigo, nausea) felt by persons moving inside rotating container (eg space station with rotation-induced gravity) in any direction other than parallel to axis.

2 According to AGARD: 'The acceleration, due to an aircraft flying in a non-linear path in space, which causes the displacement of the apparent horizon as defined by the bubble in a sextant'. This definition is inadequate.

**coriolis force** Apparent inertial force acting on body moving with radial velocity within a rotating reference system. Such a force is necessary if Newtonian mechanics are to be applicable. On Earth, \*\* acts perpendicular to direction of travel, towards right in N hemisphere and towards left in S hemisphere. Also called deflecting force, compound centrifugal force, geostrophic force.

**coriolis parameter** Twice component of Earth's angular velocity about local vertical, ie twice Earth rate multiplied by sin lat.

**coriolis rate sensor** Instrument based on beam vibrating in plane of aircraft-referenced vertical, sensing any disturbance about longitudinal axis.

**corkscrew** Evasive manoeuvre, esp. when subjected to stern attack by fighter; interpretation variable but \* axis basically horizontal.

**Corliss valve** Fluid-system throttle in form of a section of pipe rotating on diametral axis. [not to be confused with steam-engine \* gear].

**cornecob** Descriptive generic name for multi-row radial or multi-bank in-line piston engine (colloq.).

**corner point** Instantaneous change in slope of graph; eg kink in payload/range curve, esp. limiting range for max payload.

**corner reflector** Passive device for giving strong radar echo, based on three mutually perpendicular metal plates or screens which automatically send back radiation directly towards source.

**corner speed** Lowest airspeed at which a fighter can pull structure- or aerodynamic-limiting g.

**Corogard** Vinyl-modified polysulphide paint resistant to hydraulic fluid, usually silver from added aluminium powder.

**Corona** Radio countermeasure: issuing misleading voice commands to enemy fighters (RAF Bomber Command WW2).

**corona discharge** Electric discharge occurring when potential gradient around conductor is sufficient to ionise surrounding gas. Unlike point discharge, can be luminous and audible, but unlike spark discharge there are an infinity of transmission paths carrying continuous current. Also called brush discharge, St Elmo's fire (see *static wick*).

## corrugated strip

**co-rotating wheels** Landing-gear wheels on live axle and thus constrained to rotate together.

**Co-Route** Company route.

**CoRP** Common radar processor, partner to MoRE.

**corpuscular cosmic rays** Cosmic rays are primary particles (protons, alpha particles and heavier nuclei) which react with Earth atmosphere to yield particles and EM radiation. Term corpuscular is redundant.

**CORR** Corridor.

**corrected advisory** Resolution advisory that instructs pilot to change vertical speed [ROC]. [TCAS].

**corrected airspeed** No defined meaning [see *airspeed, SSEC*].

**corrected altitude** No defined meaning, other than "true height above SL" (see *altimeter errors*).

**corrected gyro** Normally taken to be one corrected (by latitude nut) for apparent wander due to Earth rotation.

**correction** Many, such as SSEC.

**corrective advisory** Resolution advisory commanding changes in ROC, vertical speed.

**correlation** Confirmation that aircraft or other target seen visually or on radar display or plotting table is same as that on which information is being received from other source(s).

**correlation criterion** Statistical basis for defruiting or decoding raw IFF, typically on \*\* of 2/7, ie 2 valid synchronous replies detected within any 7 successive interrogations.

**correlation factor** In nuclear warfare, ratio of ground dose-rate reading taken at approximately same time as one at survey height over same point.

**correlation protection** Development by RAE with industry of method of avoiding false ILS indications caused by spurious signals reflected from large objects near runway; localizer and glide-path aerials duplicated (respectively horizontally and vertically) and emit signals which, if not received almost simultaneously at aircraft, are suppressed.

**corridor** 1 Geographically determinate path through atmosphere, typically curved-axis cone with apex at surface, along which space vehicle must pass after launch.

2 Path through atmosphere, geographically determinate for given entry point, along which space vehicle must pass during re-entry; has precisely defined upper and lower limits, above which vehicle will skip back into space and below which it will suffer severe deceleration and risk injuring occupants or burnup through heating.

3 Assumed safe track in LO penetration of hostile territory.

4 Path through atmosphere, usually at low level, along which defences are assumed handicapped by prior seeding with chaff and decoys.

5 Region of any shape on graph within which solution to problem is possible.

6 In Europe pre-1960, nominated tracks along which aircraft were permitted to cross a frontier.

**corrosion** A normally used word, but see *exfoliation*.

**corrugated mixer** Turbofan core nozzle of deep multi-lobe form to promote rapid mixing with fan airflow.

**corrugated skin** Stabilized against local bending by uniform rolled corrugations which, when used as external skin of aircraft, are aligned fore and aft (incorrectly assumed parallel to local airflow).

**corrugated strip** Interposed between welded sections of

## corruption

gas-turbine flame tube, admits film of cooling air; colloq. wiggly-strip.

**corruption** Degradation of EDP (1) memory, typically from severe EM interference or, with volatile memory, from switching off power.

**CORS** Continuously operating reference station (NGS).

**Corsaire** Co-ordination of research for the study of aircraft impact on the environment (EU).

**COS** 1 Corporation for open systems, software improvement concept.

2 Common operating system.

**CoS** Chief of Staff.

**Cosac** Computing system[s] for air cargo.

**Coscap, COSCAP** A grouping being formed (from 2005) by 90+ members to oversee safety and implement international standards and procedures. By 2005 ACSA, PASO, \*SA [south Asia], \*SEA [south-east Asia] and \*NA [north Asia] were functioning, and even more groups had been established (ICAO).

**Cosim** Variometer (colloq., obs.).

**Coslane** Constant [lateral] separation lane.

**Coslettising** Anti-corrosion treatment involving a wet deposition of Zn.

**cosmetic RFP** Issued for sake of appearance, contract award being already decided.

**cosmic speeds** Those sufficiently high for interstellar exploration, similar to that of light; even allowing for relativistic time effects these are wholly unattainable at present.

**cosmodrome** Space launching site (USSR).

**cosmology** Science of the Universe.

**cosmonaut** Member of spacecraft crew (USSR, R).

**cosmonautics** See *astronautics*.

**Cospas** Committee on Space Research [office, F-75016 Paris] (Int.).

**Cospas** Anglicised form of space system for search for distressed vessels [e.g., downed aircraft], in conjunction with *Sarsat* (R).

**Cosro** Conical scan, receive only, i.e. only during reception.

**Cossi** Commercial Operations and support savings initiative.

**Cost** European Co-operation in the field of Scientific and Technical Research [established by EU November 1971] (Int.).

**cost** In procurement main elements may include R&D, T&E, flyaway, spares provisioning, ground equipment, base, crew and publications. Operating adds fuel and other consumables, depreciation and various indirect \*.

**costa** Rib, translated in aviation not as wing rib but as fuselage frame.

**costal** Pertaining to frames or ribs; hence intercostal.

**Costar** Correcting optics space telescope axial replacement (Hubble).

**cost/economical** Cruise conditions for minimum trip cost.

**cost-effectiveness** Measure of desirability of product, esp. a weapon system, in which single quantified figure for capability (including reliability, survivability and other factors) is divided by various costs (total ownership, acquisition etc).

**cost plus fixed fee** Reward invariant with actual costs but fee may be renegotiated.

## countermeasures

**cost plus incentive fee** Reward covers actual costs plus a fee which depends on contractor performance and possibly costs.

**cost-sharing** No fee, contractor merely reimbursed agreed percentage of costs.

**COT** 1 Compressor outlet temperature.

2 At the coast.

3 Centre of twist.

**Cotal** Confederación de Organizaciones Turísticas de la America Latina (Int.).

**CoTAM** Commandement du Transport Aérienne Militaire (F).

**Cotim** Compact thermal-imaging module.

**COTP** Connection-oriented transport protocol.

**COTS, Cots** 1 Commercial off-the-shelf [item already available, esp. for military a/c].

2 Cabin offtake system.

3 Commercial orbital transportation system (NASA).

**cottage loaf** Fuselage with smaller-section upper deck and unfaired sides [almost figure 8].

**cotter pin** 1 Wedge-shaped pin used in joining parts, or transmitting rotation.

2 In US, often split pin.

**CO<sub>2</sub>** Carbon dioxide.

**Cougar** 1 Co-operative unmanned ground-attack robot (USA).

2 Counter-UAV GBAD additional module requirement.

**coulomb** SI unit for quantity of electricity or electric charge, = 1 As, symbol C.

**coulomb damping** That due to opposing force independent of distance or velocity; also called dry friction damping.

**coulomb excitation** Raising of energy level as a result of charged particle passing outside range of nuclear interactions.

**Coulomb's law** Force between two magnetic or electric charges is proportional to product of charges and

$$\text{inversely to square of distance apart: } F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}.$$

**countdown** Oral telling-off of time, usually at first in minutes, then in seconds, remaining before launch of vehicle or other event.

**counter** 1 Portion of ship hull from stern overhanging water; thus applicable to undersurface of rear fuselage above and behind jet nozzles or other lower section.

2 Electronic circuit which counts bits, impulses, waves or other repeated signals.

**counter air** Defensive and offensive actions against enemy air power.

**counterfeit part** An unapproved part knowingly installed.

**counterforce** Attack directed against enemy ICBMs and SLBMs or other strategic forces.

**counter-illumination** Challenging LO technology in which appearance of an object is changed or [in theory] eliminated by nullifying incident illumination; also called active visual camouflage.

**counter-insurgent, Coin** Directed against supposed primitive guerrilla forces.

**countermeasures** All techniques intended to confuse or mislead hostile sensors such as radar, IR, visual, TV or noise.

**counter-pointer**

**counter-pointer** Dial indication comprising rotating pointer(s) and counter readout in same instrument.

**counter readout** Numerical display generated by numerals on adjacent rotating drums, also called veeder.

**counter-reflector** Metal mesh or other radio reflector arranged in pattern under VOR or other ground station to nullify interference and give radiation as from perfect level-surface site.

**counter-rotating** Left and right devices rotate in opposite directions, on different axes.

**countersilo** Counterforce attack against ICBM silos.

**countersink** To form or cut conical depression in work-piece to receive rivet or bolt head flush with surface.

**countersurveillance** All active or passive measures to prevent hostile surveillance.

**countertrade** Trade in reverse direction generated to assist high-tech (eg defence) exports by an industrialised country; in no sense barter.

**countervalue** Attack directed against enemy homeland society and industry.

**country cover diagram** Small-scale map and index showing availability of air reconnaissance information of whole country for planning purposes.

**countup** Oral telling-off of time, usually in seconds, elapsed since liftoff.

**coupé** Aircraft, normally with open cockpit[s], fitted with \* top, generally synonymous with canopy forming integral part of fuselage.

**couple** Two parallel opposing forces not acting through same point, producing rotative force equal to either force multiplied by perpendicular distance separating axes. SI unit Nm (newton-metre), = 0.748604 lb-ft. Also called moment, turning moment, torque.

**coupled engines** Geared to same propeller(s) but not necessarily mechanically joined.

**coupled flutter** In which energy is transferred through distorting structure linking two fluttering masses to augment flutter of either or both.

**coupling** 1 Inertia[!] \*, tendency for inertia forces in manoeuvres to overcome stabilizing aerodynamic forces, esp. in long, dense aircraft having large inertia in pitch and yaw; eg, rapid roll results in violent cyclic oscillation in pitch about principal inertial axis, increasingly marked with altitude owing to divergence of this axis from relative wind.

2 Connection (electrical, electronic or mechanical) between flight-control system and other onboard system such as ILS or TFR.

3 Unwanted connection or interference between two radiating elements in a planar-array antenna.

**coupon** 1 Small extra piece formed on casting or, rarely, forging or extrusion, to provide metallurgical test specimen.

2 See *flight\**.

**courier** See *delayed repeater comsat*.

**course** 1 UK term for *heading*.

2 Often used to mean airfield circuit c1908–18.

**course and distance calculator** Aluminium disc with pivoted arms for solving three- [even four-] vector navigation problems (1917–40).

**course and drift indicator** *Bearing-plate*.

**course and speed calculator** More advanced yet compact mechanical computer for solving vector problems (UK 1935–50).

**course corrections** Allowances for deviation and variation.

**course deviation indicator** Vertical needle of VOR display.

**course light** Visual beacon on airway, or light indicating course [track] of airway (both obs.).

**course line** Locus of points nearest to runway centreline in any horizontal plane along which DDM is zero.

**course sector** Horizontal sector in same plane as course line limited by loci of nearest points having DDM of 0.155.

**course selector** See *OBS*.

**courtesy vehicle** Battery electric car providing up to 6 seats for elderly or disabled passengers.

**courtyard** Space in centre of closed-circuit tunnel; hence \* wall, inner wall of tunnel.

**COV** 1 Common operational value (RAF).

2 Covered, cover, covering (ICAO).

**cove** Local concave curved region where two structures meet, eg wing/pylon or pylon/pod.

**cover** 1 Protection of friendly aircraft by fighters or EW platforms at higher level.

2 Ground area shown in imagery, mosaics etc.

3 To maintain continuous EM receiver watch.

4 To use fighters to shadow hostile contact from designated BVR distance.

**coverage diagram** Plot of air-defence radar performance against target of particular cross-section for different elevation angles, plotted on altitude (ordinate) and slant range.

**coverage index** See *covertrace*.

**Coverage Level** In aerial firefighting, quantity of retardant per unit area, in US usually USG per 100 sq ft.

**cover mod** Paperwork [documents] by which DA accepts SEM (3) or STF (UK).

**cover search** To select best cover (2) for air reconnaissance for particular requirement.

**covertrace** Map overlay listing all air reconnaissance sorties over that ground area, marking tracks and exposures.

**covert search** Patrol using advanced sensors from high level so that aircraft's presence is undetected from ground, esp. in offshore patrol for customs, immigration or fishery protection.

**Covos** Comité d'Etudes sur les Conséquences des Vols dans la Stratosphère (Int.).

**cowl** Covering over installed engine or other device, normally mainly of hinged or removable panels.

**cowl flaps** See *gills*.

**cowling** See *cowl*.

**CP** 1 Critical point.

2 Centre of pressure (often c.p.).

3 Controllable pitch (not constant speed).

4 Chlorinated paraffin.

5 Circularly polarised.

6 General call to several specified stations (ICAO).

7 Co-pilot.

8 Critical parameter.

9 Cathode protection.

10 Command post.

11 Centre-perforate (rocket grain).

12 Computer, or communications, processor.

13 Constant power.

14 Control plane.

- 15 Control panel.  
 16 Conflict probe.
- C/P** Cadet Pilot (RAF).
- C<sub>p</sub>** Helicopter rotor power coefficient.  
**C<sub>p</sub>** 1 Pressure coefficient.  
 2 Specific heat at constant pressure.  
 3 Propeller power coefficient.
- cP** 1 Centipoise.  
 2 Continental polar air mass.  
**cp** Candlepower.
- CP<sup>3</sup>** CPPP.
- CPA** 1 Critical-path analysis (see *critical path*).  
 2 Continuous patrol aircraft.  
 3 Closest point of approach.  
 4 Cabin public address.  
 5 Certified public accountant.  
 6 Civilian Production Administration (succeeded WPB, US).  
**C/PA** Cost/performance analysis.
- CPACS** Coded-pulse anti-clutter system.
- CPAM** 1 Committee of Purchasers of Aviation Materials (Int.).  
 2 Cabin-pressure acquisition module.
- CPC** 1 Cabin-pressure control[er]; S adds system.  
 2 Cursor-position control.  
 3 Controller/pilot communication[s].
- C<sub>pc</sub>** Helicopter climb power coefficient.
- CPCI** Computer program-configuration item.
- CPCP** Corrosion prevention and control programme.
- CPCS** Cabin-pressure control system.
- CPD** 1 Command planning and direction (GTACS).  
 2 Continuing, or continuous, professional development.  
 3 Cabin-pressure detector.
- CPDA** Continuing professional development in aerospace (BWEC).
- CPDL** Controller/pilot data link [C adds communications].
- CPE** 1 Central Photographic Establishment (RAF).  
 2 Circular position error.
- CPF** 1 Complete power failure.  
 2 Central processing facilities.
- CPFF** Cost plus fixed fee.
- CPG** 1 Co-pilot/gunner.  
 2 Consumer Protection Group [CAA] (UK).
- CPGS** Cassette-preparation ground station.
- CPI** 1 Cost plus incentive (F adds ‘fee’).  
 2 Chief pilot instructor.  
 3 Crash position indicator.
- C<sub>pi</sub>** Helicopter power coeffocoent.
- CPIF** Cost plus incentive fee.
- CPIFT** Cockpit procedures and instrument flight trainer (Pacer Systems).
- CPILS** Correlation-protected ILS.
- CPIOM** Core processing, or common processor, input/output module.
- cPk** Continental polar, colder than surface.
- CPL** 1 Commercial pilot’s licence.  
 2 Current flight plan message (ICAO).
- CPL/A** Commercial pilot’s licence, aeroplanes.
- CPL/H** Commercial pilot’s licence, helicopter.
- CPL/IR** Commercial pilot’s licence, instrument rating.
- CPL/SEL** Commercial pilot’s licence, single-engine limitation.
- CPM** 1 Capacity passenger-miles.  
 2 Critical-path method.  
 3 Core [or control, or common, or central] processor [or processing] module.  
 4 Certification program manager.  
 5 Command-post modem; P adds processor.  
 6 Cabin pressure-altitude monitoring and warning system.  
 7 Channel-plate multiplexer.
- CPMIEC** China Precision Machinery Import and Export Corporation, Beijing.
- CPO** Close parallel operation.
- CPP** 1 Cost per passenger.  
 2 Critical parts plan (ECP).  
 3 Crossfeed phasing parameter [ $\mu$  is preferred].
- C<sub>p<sub>b</sub></sub>** Helicopter parasitic power coefficient.
- CPPC** Cost plus percentage of cost.
- CPR** 1 Coherent-pulse radar.  
 2 Crack-propagation rate.  
 3 Contract (or contractor, or cost) performance report.  
 4 Covert penetration radar.
- CPRSR** Compressor.
- CPRTM** Cents per revenue ton-mile.
- CPS** 1 Central processing system (or site).  
 2 Cabin-pressure sensor.  
 3 Covert penetration system.  
 4 Characters per second (also cps).  
 5 Control power supply.  
 6 Conventional[ly] profiled sortie.
- cps** Cycles per second (Hz is preferred).
- CPSA** Conseil Permanent de la Sécurité Aérienne [Paris F-75015] (F).
- CPT** 1 Cockpit procedure[s] trainer.  
 2 Central passenger terminal complex.  
 3 Civilian pilot training program (US, 1939–46).  
 4 Clearance, pre-taxi.  
 5 Combined processor/totaliser [fuel system].
- CPTA** Civilian Pilot Training Act (1939).
- CPTP** CPT Program (US 1939–42), became WTS.
- CPTR** Command-post terminal replacement.
- CPU** 1 Contractor payment unit.  
 2 Central [or communications] processing unit.  
 3 Control-panel unit; -F adds front, -S side.
- cPw** Continental polar, warmer than surface.
- CPX** Command-post exercise.
- C<sub>p<sub>0</sub></sub>** Helicopter profile power coefficient.
- CQ** 1 Carrier (ship) qualification.  
 2 General message to all stations.  
 3 Target control (remotely piloted target), USAAF 1942–47.
- C<sub>Q</sub>** Helicopter rotor torque coefficient.
- CqS** Constant-q stagnation trajectory.
- CQWI** Combined Qualified Weapons Instructor (RAF).
- CR** 1 Compression ratio.  
 2 Credit (aerial victory).  
 3 Cost-reimbursable.  
 4 ATC request (FAA).  
 5 Change request.  
 6 Fighter-reconnaissance (F).  
 7 Contrast ratio.  
 8 Root chord, also C<sub>r</sub>.  
 9 Canard/rotor, also C/R.  
 10 Countermeasures receiver.

- 11 Close-range.  
 12 Component repair.  
 13 Common requirements (ANSP).  
 14 See next.
- C/R** 1 Counter-, or contra-, rotating, or rotation, usually refers to handed engines driving single-rotation propellers in opposite directions.  
 2 Command/response.  
 3 See CR (9).
- Cr** 1 Resultant-force coefficient.  
 2 Range constant, velocity  $\times$  wt/fuel flow.
- Cr** Chromium.
- C<sub>r</sub>** Sometimes cr, wing chord at root.
- Cr<sub>2</sub>O<sub>3</sub>** One of the three chromium oxides.
- CRA** Centro Ricerche Aerospaziali, Rome.
- crab** 1 To fly with wings level but significant drift due to crosswind.  
 2 To fly with wings level but significant yaw due to asymmetric thrust.  
 3 To fly with wings level but significant yaw imparted by rudder to neutralise effect of crosswind.
- 4 Miniature trolley driven by Link trainer and certain other simulators which reproduces aircraft track on map on instructor's desk.
- crab angle** 1 Drift angle.  
 2 In landing, angle between runway axis and aircraft heading.  
 3 Angle between fore/aft camera axis and track.
- crab list** List of snags after flight test (US, WW2).
- crab-pot** Fabric non-return valve in circular duct in airship, controlled by bidirectional pull of cord attached to centre.
- crack** 1 Microscopic rupture in stressed metal part which under repeated loads progressively grows longer, without deformation of structure, until remaining material suddenly breaks.  
 2 To break down hydrocarbons by cracking. Originally done continuously in giant cat-crackers in refineries, this is becoming a procedure necessary in JP7-fuelled hypersonic ramjets.
- cracking** Application of heat and usually pressure, sometimes in presence of catalysts, to break down complex hydrocarbons, esp. petroleums, into desired products. Hence cracked spirit.
- crack-stopper** Structural design feature, such as assembly of part from several components with joints perpendicular to expected crack directions, to prevent crack progressing right across.
- CRAD, Crad** Critical R&D.
- CRADA, Crada** Co-operative R&D agreement.
- CRAF** 1 Civil Reserve Air Fleet (US, from 1951).  
 2 Comet rendezvous/asteroid flyby.  
 3 Committee on Radio Astronomy Frequencies.
- crafted** Made (US usage).
- Crag, CRAG** From Pacer -\*, compass, radar, GPS.
- C-RAM** Counter rockets, artillery and mortars.
- Cram** Conditional route-availability message.
- crane helicopter** Designed for local lifting and positioning of heavy or bulky items rather than normal transport; characterised by vestigial fuselage with payload attached externally or slung.
- Cranfield** Formerly College of Aeronautics, now Cranfield University [Bedfordshire, MK43 0AL] (UK).
- crank** Apart from familiar meanings, a single rotation of crank handle [human inceptor], thus full flap may need 12 cranks.
- cranked wing** Has acute anhedral inboard, dihedral outboard, usually with abrupt change at about 30 per cent semi-span.
- cranking** 1 Turning engine (any type) by external power.  
 2 Making a max-rate turn away from the target immediately upon launching an AAM, hence: a crank.
- C-Rap** Condensed recognized air picture.
- crash** Unpremeditated termination of mission at any point after start of taxi caused by violent impact with another body, with or without pilot in control, usually causing severe damage to aircraft. Term never used in official language.
- crash arch** Strong structure above or behind pilot(s) head(s), esp. in open cockpit or small cabin aircraft, able to bear all likely loads in overturning and sliding inverted on ground.
- crash barrier** See *barrier*.
- crash deflector lever** See *crash switch*.
- crash gate** Gate in airfield periphery through which crash/fire/rescue teams can most quickly reach nearby crashed aircraft.
- crash landing** Emergency forced landing with severe features such as rugged terrain or incapacitated pilot, resulting in more than superficial damage to aircraft.
- crash locator beacon** Automatic radio beacon designed to be ejected from crashing aircraft, thereafter to float and survive all predictable impacts, crushing forces or fire while broadcasting coded signal.
- crash pan** Secondary structure under para-dropped load, esp. vehicle or artillery, which absorbs landing shock by plastic deformation.
- crashproof tank** Euphemistic, denotes fuel or other tank designed not to rupture, leak or catch fire in all except most severe crash.
- crash pylon** Structure having same purpose as crash arch.
- crash restraint barrier** Quickly fitted/removed barrier across the front of a cargo deck.
- crash switch** Electrical switch triggered by various crash symptoms to shut off fuel, isolate electric batteries, activate fire/explosion suppression, release CLB, etc.
- crashworthiness** Generally unquantifiable ability of aircraft to crash without severely injuring occupants or preventing their escape. A crashworthy fuel system is designed to remain fuel-tight in a crash.
- crate** Aerodyne, esp. aeroplane (colloq., derogatory, archaic).
- CRaTER** Cosmic-ray telescope for the effects of radiation (NASA).
- CRAW** Carrier replacement air wing (USN).
- CRB** 1 Chlorinated rubber-based; P adds paint [airfields].  
 2 Crash restraint barrier.
- CRC** 1 Control and Reporting Centre.  
 2 Carbon-fibre reinforced composite.  
 3 Communications Research Center (Canada).  
 4 Central [ised] radio control.  
 5 Cyclic redundancy check, or code.  
 6 Cassegrain Ritchey/Chretien.
- CRCACS** Cooperative Research Centre for Advanced Composite Structures [Fishermens Bend, Vic.] (Australia).

**CRCO** Central Route Charges Office (ICAO).

**CRD** 1 Controller, Research & Development (MAP, WW2).

2 Current routing domain.

**CRDA** Cooperative research and development agreement (FAA).

**cRDC** Common remote data concentrator[s].

**CRD/F** Cathode-ray direction-finding; ground D/F receiver in which aerial automatically rotates to null azimuth as soon as pilot transmits, bearing being instantly shown on circular display.

**CRE** 1 Command-readiness exercise.

2 Communications radar exciter.

3 Control and reporting element.

4 Central Reconnaissance Establishment (RAF, formerly).

**creamed** Shot down, destroyed (colloq.).

**creamer** A perfect landing.

**creamy** A pilot diverted from normal career [creamed off], either put into a career holding pattern or “promoted sideways” (RAF).

**Create** Homeland Security Center for Risk and Economic Analysis of Terrorism Events [University of S California] (US).

**credible** Of deterrent, demonstrably capable of being used and having desired effect; depends on its ability to penetrate and on government’s resolution.

**credit** Unit of aerial victory scores made up of air-combat plus strafing (aircraft destroyed on ground), with fractions for targets shared (US).

**creep** 1 Slow plastic deformation under prolonged load, greatly accelerated by high temperatures.

2 Gradual rotation of tyre around wheel; hence \* marker, white index marks on wheel and tyre initially in alignment.

3 Slow taxi under idle power

4 See next.

**creepback** Tendency of bombs to fall progressively further back in front of target (RAF Bomber Command).

**creeping landing** Landing by jet-lift STOVL aircraft with just enough forward speed to avoid reingestion of hot gas or debris from unpaved surface.

**creeping line ahead search** This covers an area by flying repeated parallel tracks sufficiently close together that an object of interest is unlikely to be missed.

**creeping wave** EM [especially radar] wave attached to the surface of a solid body.

**creep life** Safe service life of turbine rotor blades, normally set at or near point at which elongation ceases to be proportional to time.

**creep strength** Stress that will produce specified elongation over given period (typically 0.1% over 1,000 h) at given temperature.

**CRES, Cres** Corrosion-resistant steel.

**crescent wing** Has progressive reduction in both t/c radio and sweep angle from root to tip, usually in discrete stages.

**Crest** 1 Comprehensive radar effects simulator trainer.

2 Consolidated reporting and evaluating subsystem, tactical.

3 Crew escape technology.

**cresting** Ceremonial admission to exclusive group, such as Blue Angels (USN).

**crevice corrosion** Initiated by presence of crevice in

structure in which foreign material may collect; eliminated by modern structural coating and assembly methods.

**crew** Divided into flight \* to fly aircraft, mission \* to carry out other duties in flight, cabin \* to minister to passengers and, arguably, instructors; all assigned to these duties by appropriate authority.

**crew duty time** Measured from reporting for duty to completion of all post-flight duties.

**crewing** 1 Make-up of flight crew by trade or appointment.

2 Make-up of flight crew by individual rostered names.

**crew ratio** Number of complete air crews authorised per line aircraft (civil) or per aircraft in unit complement (military).

**crew resource management** Ever-refined improvement in in-flight [airline] crew behaviour, esp. in flight-deck and cabin communications, esp. in crisis.

**crew return vehicle** Lifting-body vehicle, with final descent by inflatable wing, to bring ISS crew of six back to Earth.

**crew room** Room reserved for (usually military) flight crews, some on standby and others relaxing after a mission, where publications are kept and notices promulgated.

**crew trainer** Aircraft designed to train whole flight crew, esp. of traditional military aircraft requiring several flight-crew trades: pilot/navigator/bombardier/signaller/engineer/gunner.

**CRFMU** Cabin radio-frequency management unit [ensures passenger phones do not cause RF interference].

**CRG** Contingency Response Group (USAF).

**crib** Shop-floor container for small tools, parts or material other than scrap.

**CrIMSS** Cross-track IR microwave sounder system.

**CRIP** Coat-rod inches per passenger.

**crisis management** Management of military (war or near-war) situations or of civil crises such as major accidents or natural disasters.

**CrIS** Cross-track IR sounder.

**Crisp, CRISP** 1 Contra-rotating integrated shrouded propfan.

2 Computer-reconstructed images from space photographs.

3 Compact reconfigurable interactive signal processor.

**Crista** Cryogenic infrared spectrometer telescope for the atmosphere.

**CRIT** Centre de Recherches Industrielles et Techniques (F).

**critical altitude** 1 The highest density altitude which a supercharged piston engine can maintain its maximum continuous rated power.

2 See *decision height*.

**critical angle** 1 Angle from local vertical at which radio signals of given frequency do not escape through ionosphere but just return to Earth.

2 Incorrectly used to mean stalling angle of attack.

**critical case** That combination of failures (of propulsion, flight controls or systems) giving worst performance (see *critical engine*).

**critical crack** One of \* length.

**Critical Design Review** Almost self-explanatory, the CDR immediately follows the stage of detailed design of hardware and software, and is the last opportunity to

introduce changes without incurring very large costs in item and money. Passing CDR permits the hardware build and software coding that will result in the prototype or other initial product.

**critical engine** Engine of a multi-engine aircraft, the failure of which is most disadvantageous, due to asymmetric effects, loss of system power or other adverse factors; failure of \*\* at  $V_1$  is basis of takeoff certification in most multi-engine aircraft.

**critical frequency** 1 That corresponding to natural resonance of blade, control surface or other structure.

2 Helicopter main-rotor blade-passing frequency at which whole machine resonates on landing gear.

3 Frequency at which critical angle becomes zero; highest at which vertical reflection is possible.

**critical-length crack** Crack of length at which application of limit load causes failure.

**critical line** Locus of critical points (when track is not known precisely).

**critical Mach number** 1  $M_{crit}$ ; Mach number at which most-accelerated flow around a body first becomes locally supersonic; for thin wing might be  $M = 0.9$  while thick wing may have \* below 0.75.

2 Mach number at which compressibility effects significantly influence handling.

**critical mass** Mass of fissile material in which chain reaction becomes self-sustaining.

**critical part** An item whose failure would imperil continuation of safe flight.

**critical path** That traced through number of tasks proceeding both consecutively and concurrently (as during turn-round of aircraft) that determines minimum total elapsed time.

**critical-path technique** Minimisation of total elapsed time by concentrating on those elements that form critical path.

**critical point** That from which two fixed bases, such as departure airfield and destination, are equidistant in time.

**critical position** That over large city or mountain range at which propulsion failure would be most serious.

**critical pressure** In fluid flow through nozzle, that final pressure below which no further reduction results in increase in flow from fixed initial pressure; usually rather more than 50% of initial pressure (fixed ratio for any given medium and temperature).

**critical pressure coefficient**  $C_{pc}$ ; pressure coefficient at critical Mach number, approximately given by Prandtl-Glauert.

**critical pressure ratio** That at which particular axial compressor suddenly ceases to operate efficiently due to choking, stall or other flow breakdown.

**critical speed** 1 See  $V_1$ .

2 That rotational speed at which machinery (eg, engine) suffers dangerous resonance or whip of shafting.

**critical static pressure** That at critical Mach number; symbol  $P_c$ .

**critical temperature** That below which gas or vapour may be liquefied by pressure alone.

**critical velocity** Speed at which fluid flow becomes sonic, ie locally reaches Mach number of unity;

$$V_{cr} \text{ or } V_{crit} = a_o \sqrt{\frac{(\gamma - 1) M_0^2 + 2}{\gamma - 1}}$$

**CRL** 1 Common rail launcher.

2 Cambridge [Massachusetts] Research Laboratory (USAF).

**CRLCN** Circulation.

**CRM** 1 Originally cockpit resource management, now crew resource management.

2 Collision-risk model.

3 Customer relationship, or resource, management.

**CRN** Common random number.

**CRNA** Centre Régional de la Navigation Aérienne (F).

**CRO** 1 Civilian Repair Organization.

2 Cathode-ray oscilloscope.

3 Community relations officer (RAF).

4 Combat recovery operation[s].

**Crocco** Luigi Crocco (1932) derived equation:

$$T = Tw - (Tw - Tf) \frac{u}{Uf} + \frac{u(Uf - u)}{2Cp}$$

where  $T$  is temperature within boundary layer,  $Tw$  temperature of adjacent solid surface,  $Tf$  free-stream temperature,  $u$  local velocity,  $Uf$  free-stream velocity, and  $Cp$  specific heat at constant pressure.

**crocodile** 1 Control surface, usually aileron, which can split apart into upper and lower halves as airbrake; see *deceleron*.

2 Covered gangway to protect passengers from slipstream, c 1920–40.

**cropped-fan engine** Turbofan whose fan has been reduced in diameter to match reduced thrust requirement and permit LP turbine and other parts to be simplified.

**cropped surface** Wing, tail or other surface whose tip is cut off diagonally at Mach angle appropriate to particular supersonic flight condition.

**cropped tip** *Cropped surface*.

**cross** To pass over a fix under ATC at a specified altitude, or a specified maximum or minimum altitude.

**cross-bar** System of approach lighting using straight rows of white lights perpendicular to runway centreline. Calvert and some other systems use several bars decreasing in width to threshold while US practice is single white bar followed by red undershoot zone.

**cross-beam rotor** Helicopter (usually tail) rotor comprising two two-blade assemblies superimposed; usually set at 90° but in AH-64 at 55°/125°.

**cross-bleed** Pneumatic pipe system connecting all engines so that bleed from one can start, or drive accessories on, any other.

**Crossbow** Code for air attacks on flying-bomb launch sites, 1944.

**cross-bracing** Use of crossed diagonal wires, cables or struts/ties to achieve a rigid structure.

**cross certification** To certify an item on the basis of certification by another country.

**crosscheck** Brief message from one pilot to another, or another crew member, in same aircraft giving or confirming situation, eg “Inner marker” or “crosscheck, I have the yoke”.

**cross-cockpit collimated display** Simulator display providing large visual scene on back-projected screen viewed in curved concave mirror, giving correct perspectives with no discontinuities.

**cross-country** Flight to predetermined destination, where landing may or may not be made, esp. one to gain practice in map-reading and navigation.

**cross-crew qualification** Training course for mixed-fleet flying.

**cross-deck** Operations by two or more aircraft carriers, not necessarily of same navy, in which aircraft operate from unfamiliar decks on exchange basis; hence \**ing*.

**cross-drive** Facility enabling an engine to drive a secondary power item on the other side of the aircraft centreline, e.g. left engine to drive right hydraulic pump.

**crossed controls** Application of flight-control movements in opposite sense to those in normal turns or manoeuvres, eg right stick and left rudder; rarely required.

**crossed-spring balance** Wind-tunnel balance whose pivots are made up of two or more leaf springs crossing diagonally and giving virtually frictionless flexure through defined axes.

**cross-fall** Transverse slope of runway surface, to ensure sufficiently quick run-off of water to avoid aquaplaning except in particular adverse crosswinds.

**cross-feed** 1 Feeding items (eg, engines) on one side of aircraft from supply (eg, fuel) on opposite side; abnormal condition under pilot control.

2 Often crossfeed, use of rudder to minimise sideslip in roll or in sustained very steep turn. See next.

**crossfeed phasing parameter** Not quantifiable-value  $\mu$  derived from ratios of transfer-function numerators of rudder: sideslip and aileron: sideslip, with profound effect on pilot rating.

**cross-flow** Having two fluids flowing past each other at 90° while separated by thin metal walls.

**cross-level** Lateral clinometer, instrument formerly used to indicate direction of local vertical as aircraft manoeuvres in rolling plane.

**cross-modulation** Unwanted modulation from one carrier being impressed on another in same receiver, usually resulting from inability to filter out certain sidebands.

**cross-needle** Instrument display based on two pivoted needles which pilot attempts to keep crossed at 90° in centre of display.

**cross-over exhaust** Gas from inboard cylinders of multi-piston engine aircraft is piped to discharge on outboard side to reduce noise in fuselage.

**cross-over model** That model of compensatory operation in a powered flight-control system at which the open-loop frequency response has a gain of unity, the same as the closed-loop bandwidth  $\Omega_c$ , i.e. at which open-loop amplitude response crosses 1.0 [zero db] line.

**cross-over struts** Inclined radial gas paths in one form of coannular inverted-flow engine to convey high-V core jet to outer periphery and low-V fan flow to centre.

**crossover turn** Fighter battle formation in which left aircraft move across to right.

**cross-qualification** Among other meanings, qualification of pilots on a type of aircraft with characteristics and flight deck similar to that habitually flown, but (except on simulator) not actually flown; eg, A300B/A310, B737-300/B757.

**cross-radial navigation** Routeing not on a radial constituting a promulgated airway; ie, RNav using VOR and/or DME to fly direct from A to B (see *GNav*).

**cross-range** Approximately at 90° to axis of missile or space launch range. See next.

**cross-range limit** Maximum lateral distance to either side of re-entry trajectory which can be reached by a lifting body on a particular re-entry.

**cross-section** 1 Transverse section through object, eg fuselage or structural member.

2 Measure of radar reflectivity of object, usually expressed as area of perfect isotropic reflector perpendicular to incident radiation; depends on structural materials, incident angles, physical size of target, radar wavelength and possibly other factors.

3 In nuclear or atomic reactions, area (expressed in barn) giving measure of probability of process occurring.

**cross-servicing** Between-flights routine maintenance and replenishment of aircraft at base of different armed force or different nation; \* guide is manual facilitating operational turnaround at locations where relevant documents are not available.

**cross start** Using power from one engine [electrical, air bleed or whatever] to start another.

**crosstalk** Unwanted signals generated in one set of circuits in communications or EDP (1) system by traffic in another.

**cross-trail** Distance bomb or other free-fall object falls downwind measured perpendicular to track (or track at release point projected ahead).

**cross-trail angle** Angle in horizontal plane measured at release point between track and line to point of bomb impact.

**crosstube** Transverse tube forming main spar of wing in most microlight and similar aircraft.

**cross-turn** Rapid 180° in which each half of formation turns towards remainder.

**crosswind** One blowing more or less at right angles to track, to runway direction, or to other flown direction.

**crosswind axis** Straight line through c.g. perpendicular to lift and drag axes.

**crosswind component** Velocity of wind component at 90° to runway, track or other direction; = WV sin A where A is angle between WV and direction concerned.

**crosswind force** Component along crosswind axis of resultant force due to relative wind; normally zero except in sideslip.

**crosswind landing gear** One whose wheels can be castored or prealigned with runway while aircraft crabs on to ground with wings level.

**crosswind leg** In landing circuit, that made at 90° to landing direction from end of downwind leg to start of approach.

**crosswind testing** Testing of engine with high-velocity wind (simulated at known speed) blowing across inlet.

**crowbar** Unswept wing (c 1950 colloq.).

**crowd-line** Often one word, line defining front edge of airshow crowd, parallel to runway.

**crown** 1 Upper part of fuselage, above cabin ceiling, of passenger transport, especially large pressurized aircraft.

2 Loosely, upper part of any fuselage.

3 Top of canopy [envelope] of balloon.

**CRP** 1 Carbon-fibre reinforced plastics.

2 Control and reporting point (or post).

3 Counter-rotation propfan.

4 Compulsory reporting point.

5 Contractor's Repair Party.

**CRPA** Controlled reception-pattern antenna.

**CRPAE** Cercle des Relations Publiques de l'Aéronautique et de l'Espace (F).

**CRPM** Compressor rpm.

**CRPMD** Combined radar and projected-map display.

**CRR** Cutover readiness review.

**CRRA** Capabilities review and risk assessment.

**CRS** 1 Container release system.

2 Control and reporting squadron (or section).

3 Component repair squadron (US).

4 Computer reservation system.

5 Child restraint system.

6 Congressional Research Service (US).

7 Cosmic-ray subsystem.

8 Not recommended, course.

**crs** 1 Course.

2 Cruise.

**CRT** Cathode-ray tube.

**CRT display** CRT whose electron beam[s] create pictures and diagrams on the tube-face, a basic element in radars and, since c1960, flight instruments.

**CRTE** Combat rescue training exercise.

**CRTS** CRT scope; term not recommended.

**CRU** 1 Control routing unit [MIL-1553B].

2 Chemical-resistant urethane.

3 Computer receiver unit.

**CRUAV** Communications-relay UAV.

**crucible** Hot source designed for radiating IR, for decoy or training.

**cruciform** Having approximate form of a cross, in aerospace usually when viewed from front; thus \* wing missile has four wings arranged radially (often at 90°) at same axial position round body.

**cruise** 1 In any flight from one place to another, that portion of flight from top of climb to top of descent en route to destination, usually at altitudes, engine settings and other factors selected for economy and long life.

2 Verb, to perform (1).

3 Tour of operations by naval air unit aboard carrier.

**cruise configuration** Describes not only aerodynamic (normally fully clean) status but also systems status and possibly location and duties of flight crew, during cruise (1).

**cruise missile** Long-range pilotless delivery system whose flight is wing-supported within atmosphere.

**cruise motor** Propulsion, of any kind, used to sustain speed of missile from boost burnout onwards.

**cruising altitude** That assigned to or selected by captain for flight from top of climb to top of descent; varies with type of aircraft, sector distance, take-off weight, ATC rules and other traffic, winds and other factors.

**cruising boost** With piston engine, that available in weak mixture for continuous operation giving best time or lowest fuel burn.

**cruising ceiling** Formerly, greatest height at which 1.35  $V_{i-mp}$  could be maintained at max WM cruise power.

**cruising speed** That selected for cruise (1).

**cruising threshold** 1.35  $V_{i-mp}$ , considered (1935–50) practical lower limit to cruising speed.

**crutches** Lateral arms carrying pads which are screwed down on upper sides of bomb, missile or other store to prevent movement relative to rack, pylon or other carrier.

**CRV** 1 Centre-reading voltmeter.

2 Crew rescue vehicle.

3 Crew-return vehicle.

**CR/W** Canard rotor/wing.

**CRW** Circular rotating wing; spinning wing provides gyrostabilization as well as [in fast forward flight] adequate lift.

**cryogen** See *refrigerant*.

**CryoGenesis** Cleaning by blast of air + solid CO<sub>2</sub> [dry ice].

**cryogenic** Operating at extremely low temperatures.

**cryogenic fuels** By far the most important is LNG (liquefied natural gas), consisting mainly of methane with traces of ethane and other gases; BPt is about -161°C. LH<sub>2</sub>, liquid hydrogen, has the drawbacks of very low density and exceedingly low BPt (near absolute zero, at -253°C).

**cryogenic materials** Limited range of highly specialized materials suitable for sustained structural or other use at below -180°C.

**cryogenic propellants** Gases used in liquid state as oxidants and/or fuels in rocket engines, esp. Lox, LH<sub>2</sub>, Fl and various Fl compounds or mixtures.

**cryoplane** Aeroplane designed to use cryogenic fuel.

**cryopump** High-vacuum pump operating by cooling chamber walls so that residual gas molecules are condensed on to them, leaving vapour pressure below that required.

**cryostat** Usually small lab rig for experiments at ultra-low temperatures, eg NMR, superconductivity etc.

**Cryotech** Range of deicer materials, used alone or in combination with sodium or potassium acetate.

**crystal laser** One whose lasing medium is a perfect-lattice crystal, eg ruby.

**crystal lattice** Three-dimensional orthogonal space lattice whose intersections locate the atoms of a perfect crystal (except on small scale, most crystals contain important imperfections).

**crystal oscillator** One with added subcircuit containing piezo-electric crystal (eg quartz) whose extremely rigid response gives high frequency stability.

**crystal transducer** Transducer containing piezo-electric crystal which translates mechanical strain into electrical voltage.

**CRZ** Cruise.

**CS** 1 Constant-speed (c/s is preferred).

2 Cassegrain system.

3 Chemical harassing agent OCBM.

4 Certification standard.

5 Or C/S, c/s, callsign.

6 Communications subsystem.

7 Control subsystem (ECM).

8 Colour stripping (baggage screening).

9 Cargo system.

10 Common service.

11 Suffix, close support.

**C/S** Callsign.

**Cs** 1 Cirro stratus.

2 Caesium.

**Cs** 1 Specific fuel consumption (F).

2 Constant in torsion/bending of tube or box structure, resistance to rotation caused by warp load.

3 Chord at selected wing station (usually 70 per cent semi-span).

**c/s** 1 Constant-speed.

2 Course/airspeed.

3 Cycles per second (Hz is preferred).

4 Centre-section of wing.

5 Callsign.

6 Characters per second.

**CSA** 1 Canadian Space Agency.

2 Configuration status accounting (software).

3 Control-stick assembly.	<b>CS-E</b> Certification specifications for Engines (EASA).
4 Chief Scientific Advisor (UK MoD).	<b>CS/EL</b> Combat survivor/evader locator.
5 Customer Service Agent.	<b>CSELT</b> Centro Studi e Laboratori Telecomunicazioni (I).
<b>CS-A</b> Certification Specifications for Airframes (EASA).	<b>CSET</b> Certification, standardization and evaluation team.
<b>CSAA</b> Chinese Society of Aeronautics and Astronautics [office, 100010 Beijing] (China).	<b>CSEU</b> Control-system electronics unit.
<b>CSAF</b> Chief of Staff (USAF).	<b>CSF</b> Command/status frame.
<b>CSAM</b> 1 Conseil Supérieur de l'Aviation Marchande (F).	2 Customer service facility.
2 Canadian Society of Aviation Medicine [office, Ottawa].	<b>CSFIR</b> Crash-survivable flight-information recorder.
<b>CS&amp;S</b> Customer solutions and support.	<b>CSG</b> 1 Centre Spatial Guyanais (F).
<b>CSAR</b> Combat search and rescue.	2 Constant-speed generator.
<b>CSAS</b> 1 Command [one source says "control"] stability augmentation system.	3 Counterterrorism Security Group (NSC).
2 Common-service airlift system.	4 Computer signal [or symbol] generator.
<b>CSASI</b> Canadian Society of Air Safety Investigators [Agincourt, PO].	5 Cryptologic Systems Group (USAF).
<b>CSATC</b> Central School for Air Traffic Control (RAF).	6 Carrier Strike Group.
<b>CSAV</b> Academy of Sciences (Czech).	<b>CSH</b> Combat support helicopter, basically transport role.
<b>CSAW</b> Commander's situational-awareness workstation.	<b>CSI</b> 1 Combined speed indicator, displaying airspeed and Mach.
<b>CSB</b> 1 Closely spaced basing (ICBM).	2 Computer-synthesised image, or imagery, in hybrid simulator blended with CGI.
2 Carrier and sidebands (ILS).	3 Commercial satellite imagery.
<b>CSBA</b> Center for Strategy [or Strategic] and Budget[ary] Assessment[s] (US Congress).	4 Carriage/store interface.
<b>CSBM</b> Confidence and security building measures (MBFR treaty).	5 California Space Institute [UCSD] (US).
<b>CSBPC</b> Control-stick boost and pitch compensator.	<b>CsI</b> Caesium [US cesium] iodide.
<b>CSBS</b> Course-setting bombsight.	<b>CSiC</b> Carbon/silicon carbide composite.
<b>CSC</b> 1 Course and speed calculator.	<b>CSII</b> Centre for Study of Industrial Innovation (UK).
2 Constant symbol contrast (HUD).	<b>CSINA</b> Conseil Supérieur de l'Infrastructure et de la Navigation Aérienne (F).
3 Centreline stowage cabinet.	<b>CSIP</b> Customer satisfaction improvement programme.
4 Chief sector controller.	<b>CSIRO</b> Commonwealth Scientific and Industrial Research Organization [HQ, Dickson ACT 2602] (Int.).
5 Cargo- or communication-, or compass-system controller.	<b>CSIRS</b> Covert survivable in-weather reconnaissance/strike.
6 Cataloging and Standardization Center (USAF Battle Creek, Mich.).	<b>CSIS</b> 1 Cabin sensor indicating system.
7 Carbon/silicon carbide.	2 Canadian Security Intelligence Service.
<b>CSCE</b> 1 Conference on Security and Co-operation in Europe.	3 Center for Strategic and International Studies (US).
2 Communication systems control element.	<b>CSK</b> Countersunk.
<b>CSCG</b> Communications system control group.	<b>CSLC</b> Coherent side-lobe canceller, or cancellation.
<b>CSCI</b> Computer-software configuration item.	<b>CSM</b> 1 Command/service module.
<b>CSCP</b> 1 Computer software change proposal (usually SCP).	2 Customer support manager.
2 Cabin-system control panel.	3 Crash-survivable memory [M adds module, U unit].
<b>CSCS</b> Contractor[s] satellite control site.	4 Cabin-systems management [U adds unit].
<b>C/SCSC</b> Cost/schedule control systems criteria.	5 Computational solid mechanics.
<b>CSD</b> 1 Constant-speed drive.	<b>CSMA</b> Carrier-sense multiple access.
2 Common strategic Doppler.	<b>CSMM</b> Crash-survivable memory module (CSMU, see above).
3 Critical-sector detector.	<b>CSN</b> Catalogue sequence numbers[s].
4 Circuit-switch data.	<b>CSO</b> 1 Command Signals Officer (RAF).
<b>CSDB</b> Commercial standard data-bus, or digital bus.	2 Communication systems operator.
<b>CSDC</b> Computer signal data converter.	<b>CSOC</b> Combined Space (or Satellite) Operations Center (pronounced C-sock).
<b>CSDE</b> Central Servicing Development Establishment (RAF).	2 Consolidated space operations contract.
<b>CSDS</b> 1 Constant-speed drive starter.	<b>C/SOIT</b> Communications/surveillance operational implementation team.
2 Cargo smoke-detector system.	<b>CSP</b> 1 Common signal-processor.
<b>CSDU</b> 1 Constant-speed drive unit.	2 Capability-sustainment programme (UK), or plus.
2 Cabin satellite data unit.	3 Comprehensive surveillance plan[s] (ATOS).
<b>CSE</b> 1 Central Studies Establishment (Australia).	4 Common services programme [airlines share maintenance].
2 Central Signals Establishment (UK).	<b>CSPA</b> Canadian Sport Parachuting Association [office, Navan, PO].

- CSR** 1 Covert strike radar.  
 2 Corporate social responsibility.  
 3 Comprehensive spending review.
- CSRDF** Crew-station research and development facility.
- CSRL** Common strategic rotary launcher.
- CSRP** Cabin-safety research program.
- CSRS** Counter-surveillance and reconnaissance system.
- CSS** 1 Control-stick steering.  
 2 Cockpit system(s) simulator.  
 3 Clean stall[ing] speed.  
 4 Communications subsystem.  
 5 Complementary satellite system.  
 6 Computer support [or sighting] system.
- CSSD** Strategic Defense Command (USA).
- CSSI** Carriage/store/station interface.
- CSSO** Concurrent subspace optimization.
- C/SSR** Cost/schedule status report.
- CSSS** Combat service support system.
- CST** 1 Combined station and tower.  
 2 Centre Spatial de Toulouse (F).  
 3 Commercial space transportation.  
 4 Central Standard Time (US).  
 5 Coast, coastal.
- cSt** Centistoke[s].
- CSTA** Chambre Syndicale du Transport Aérien [F-75009 Paris] (F).
- CsTe** Caesium telluride, photocathode material.
- CSTF** Cross-scan terrain following.
- CSTI** Control-surface tie-in.
- CSTM** Centro Studi Trasporti Missilistici (I).
- CSTMS** Customs.
- CSU** 1 Constant-speed unit.  
 2 Central suppression unit, prevents mutual interference in complex avionics.  
 3 Command sensor unit.  
 4 Cabin service unit.  
 5 Configuration stopping [or strapping] unit.  
 6 Communications switching unit.  
 7 Crew-station unit.  
 8 Control-status unit.  
 9 Control selection unit.  
 10 Categorization and status unit (ILS).  
 11 Cross-strap unit.
- CSV** 1 Capacity (or catapult) safety-valve.  
 2 Common standard vehicle.
- CSVVR** Crash-survivable voice recorder.
- CSVTS** Scientific and technical society (Czech).
- CSW** 1 Conventional standoff weapon.  
 2 Combat Support Wing.
- CWSWP** Certification scheme for weldment inspection personnel.
- CSWS** Corps-support weapon system.
- CT** 1 Carry trials.  
 2 Counter-terrorist.  
 3 Current transformer.  
 4 Tip chord [also Ct].  
 5 Clearance time.  
 6 Contact.  
 7 Computerized, or computed, tomography.  
 8 Crew-member terminal.  
 9 Control transmitter, or tower.
- 10** Cockpit trainer; /IPS adds interacting, or interactive, pilot station, /IPS-E further adds enhanced.
- Cr** Thrust coefficient, eg of propeller, helicopter rotor, or forced flow through a slit in CC aerofoil.
- C<sub>t</sub>** Propeller torque coefficient.
- cT** Continental tropical airmass.
- C<sub>t</sub>, c<sub>t</sub>** Equivalent tip chord of wing [there are formulae for rounded tips].
- CTA** 1 Control area.  
 2 Companion trainer aircraft.  
 3 Centro Técnico Aeroespacial (Braz.).  
 4 Controlled, or calculated, time of arrival.  
 5 Cryogenic telescope assembly.  
 6 Canadian Transportation Agency (issues licences).  
 7 Central terminal area.
- CTAA** Commandement des Transmissions de l'Armée de l'Air (F).
- CTAF** 1 Comité des Transporteurs Aériens Français.  
 2 Common-traffic advisory frequency areas.
- CTAGS** Co-operative transatlantic air-ground surveillance; S adds system.
- CTAI** 1 Cowl thermal anti-icing.  
 2 China Taipei Aerospairs Association (Taiwan).
- CTAM** Climb to and maintain.
- CTAPS** Contingency theater [or tactical] air [or aircraft, or automated] planning system (USAF).
- CTAR** Comité des Transporteurs Aériens Complémentaires (F).
- CTAS** 1 Center Tracon automation system.  
 2 Co-operative Transatlantic AGS [aerospace ground surveillance] System (Int.).
- CTB** 1 Comprehensive Test Ban (T adds 'treaty'), 1996.  
 2 Central terminal building.
- CTC** 1 Canadian Transport Commission (Ottawa).  
 2 Command track counter.  
 3 Cabin-temperature control[er].  
 4 Counter-Terrorism Committee (UN).  
 5 Central telemetry control.
- Ctc, etc** Contact.
- CTD** 1 Compound turbo diesel.  
 2 Colour tactical display.  
 3 Critical technologies demonstration, or [Australia] capability and technology demonstrator.
- CTDC** Civil Transport Development Corporation (J).
- CTE** Coefficient of thermal expansion.
- CTF** 1 Combined test force.  
 2 Central Test Facility.  
 3 Conventional turbofan.
- CTFE** Chlorotrifluoroethylene, advanced non-flammable hydraulic fluid.
- CTHA** Contrawound toroidal helical antenna.
- CTI** 1 Costings technology integration [O adds office] (USAF).  
 2 Computer/telephone, or telephony, integration.  
 3 Continuous technology insertion.  
 4 Commission Technique et Industrielle (F).  
 5 Combined threat image.
- CTIPS** See CT (10).
- CTK, etk** 1 Capacity tonne-kilometres.  
 2 Command track.
- cTk** Continental tropical air, colder than surface.
- CTL** 1 Control.  
 2 Tactical air command (Netherlands).  
 3 Contour tape-laying.

<i>4</i> Coal to liquid.	
<b>CTLA</b> Control area.	
<b>CTLZ</b> Control zone.	
<b>CTM</b> <i>1</i> Capacity ton-miles (unless otherwise stated, short tons, statute miles).	
<i>2</i> Centrifugal twisting moment.	
<i>3</i> Cost per ton-mile.	
<b>CTMO</b> Central[ized] air-traffic flow management organization.	
<b>CTN</b> <i>1</i> Caution.	
<i>2</i> Case, throat, nozzle.	
<b>CTO</b> <i>1</i> Chief technical officer.	
<i>2</i> Conventional takeoff.	
<i>3</i> Crypto operator.	
<b>CTOC</b> Common tactical operations centre (GBAD).	
<b>CTOL</b> Conventional takeoff and landing, ie ordinary aeroplane.	
<b>CTOT</b> <i>1</i> Calculated takeoff time.	
<i>2</i> Constant torque on takeoff.	
<b>CTP</b> <i>1</i> Chief test pilot.	
<i>2</i> Command track pointer.	
<i>3</i> Common technology programme (ASTOVL).	
<i>4</i> Critical technology project[s].	
<b>CTPA</b> Comité Technique de Programmes d'Armement (F).	
<b>CTPB</b> Carboxy-terminated polybutadiene rocket propellant.	
<b>CTR</b> <i>1</i> Controlled airspace, control zone [see CTZ].	
<i>2</i> Controllable-twist rotor.	
<i>3</i> Common Type Rating.	
<i>4</i> Co-operative Threat Reduction (US, R).	
<i>5</i> Click to refresh.	
<i>6</i> Continuous technology refreshment.	
<i>7</i> Common, or configuration, test requirements; D adds document.	
<i>8</i> Civil tilt-rotor.	
<i>9</i> Center, centre.	
<i>10</i> Conversion to role; T adds training.	
<b>CTRD</b> Configuration test requirements document.	
<b>CTRDAC</b> Civil tilt-rotor development advisory committee.	
<b>CTRL</b> Control.	
<b>CTS</b> <i>1</i> Central tactical system.	
<i>2</i> Cockpit television sensor.	
<i>3</i> Common termination system.	
<i>4</i> Clear to send.	
<i>5</i> Contractor transition support (USAF).	
<i>6</i> Communications technology satellite.	
<b>C<sup>T</sup>ls, or C<sub>T</sub>/σ</b> Helicopter blade-loading coefficient.	
<b>CTSS</b> Commercial training simulator, or simulation, services (USAF).	
<b>CTT</b> <i>1</i> Capital-transfer tax (UK).	
<i>2</i> Commander's tactical terminal; H/R adds hybrid-receive only.	
<i>3</i> Controlled-torque tightening.	
<i>4</i> Conversion to type; T adds training.	
<i>5</i> Combined Test Team (Int.).	
<i>6</i> Council for Travel and Tourism, [office London] (UK).	
<b>CTTO</b> Central Tactics & Trials Organization (RAF).	
<b>CTTF, CT<sup>3</sup>F</b> Combating Terrorism Technology Task Force (DoD).	
<b>CTU</b> <i>1</i> Control terminal unit.	
<i>2</i> Cabin telecommunications, or telephone, unit (satcom).	
<b>CTV</b> <i>1</i> Curved trend vector.	
<i>2</i> Crew transfer vehicle.	
<b>CTVS</b> Cockpit TV sensor [or system].	
<b>CTWADN</b> Council of Third World Aerospace & Defence Newspapers [Karachi, Pakistan].	
<b>C2PC</b> Command and control personal computer.	
<b>CTZ</b> <i>1</i> Control zone [this is preferred].	
<i>2</i> Corps tactical zone.	
<b>CU</b> <i>1</i> Conversion unit.	
<i>2</i> Cage/uncage; gyro system control.	
<i>3</i> Common use[r]; BES adds baggage enterprise system [cubes], PS passenger self-service, SS self-service and TE [cute] terminal equipment.	
<i>4</i> Control unit (HMS).	
<i>5</i> Combiner unit (HUD).	
<i>6</i> Channel utilization.	
<b>Cu</b> Cumulus.	
<b>CUAV</b> Clandestine UAV.	
<b>cubage</b> Total volume of rectilinear cargo that can be accommodated; typically 0.7 of pressurized above-floor cargo volume.	
<b>Cuban eight</b> Manoeuvre in vertical plane normally comprising $\frac{3}{4}$ loop, half-roll, $\frac{3}{4}$ loop, half-roll.	
<b>cube out</b> To run out of payload volume (either pax, cargo or both) at less than MSP (5).	
<b>cubic foot</b> Non-SI measure of volume, $1^* = 28,316.7 \text{ cm}^3$ , $= 0.0283167 \text{ m}^3$ ; reciprocals, $3.53 \times 10^{-5}, 35.3148$ .	
<b>cubic inch</b> Non SI measure of volume, $1 \text{ cu in} = 16.387 \text{ cm}^3 = 0.0164 \text{ litre}$ ; reciprocals 0.06102, 60.9756.	
<b>c/u/c</b> Cage/uncage.	
<b>CUDS</b> Common-user data services.	
<b>CUE</b> Computer update equipment.	
<b>cue</b> <i>1</i> Glimpse of Earth's surface through cloud or darkness giving helpful attitude and distance information.	
<i>2</i> To slave homing seeker of missile to target, using information from other source.	
<b>CuF</b> Cumuliform cloud.	
<b>cuff</b> <i>1</i> Secondary structure added around propeller blade root, usually for aerodynamic reasons.	
<i>2</i> Structure added ahead of wing LE extending chord 3–5%, with sharp inboard end.	
<i>3</i> Heated muff round drain valve or drain mast.	
<b>Cufos</b> J. Allen Hynek Center for UFO Studies [Chicago, Illinois 60659] (US).	
<b>CuFra</b> Cumulus fractus.	
<b>CUG</b> Computer Utilization Group (OECD).	
<b>CUGF</b> Counter underground facilities [weapons against caves].	
<b>CUGR</b> Cargo utility GPS receiver.	
<b>CUI</b> Committee on Unlawful Interference.	
<b>cu in</b> Cubic inch, $16.387 \text{ cm}^3$ .	
<b>culture</b> Man-made terrestrial features.	
<b>cumulonimbus</b> Cb, extremely large cumuliform clouds whose tops reach stratosphere and spread in form of fibrous ice-crystal anvil. Extreme vertical velocities and turbulence make them dangerous.	
<b>cumulus</b> Cu, dense white clouds with almost horizontal base and large vertical development, domeshaped tops (cauliflower) showing growth in strong upcurrents.	
<b>cumulus mammatus</b> Cumuliform clouds having pendulous protuberances on underside.	
<b>CUP</b> <i>1</i> Capabilities upkeep program (USN).	

**2** Cockpit upgrade program[me].

**cup** Non-SI unit of volume,  $= 2.3659 \times 10^{-4} \text{m}^3$ .

**Cupid** Common, or combat, upgrade plan integration, or integrated, details (USAF).

**cupola** *1* Turret-like structure projecting from aircraft with windows giving maximum field of view.

*2* Manned viewing station on space station for observation of docking, truss construction and placement of antennas and other equipment.

**cupping** Re-rigging to increase angle of incidence.

**curie, Ci** Unit of radioactivity equal to  $3.7 \times 10^{10}$  disintegrations or transformations per second, replaced by becquerel.

**curie point** Critical temperature, different for each material, above which ferromagnetic materials lose permanent or spontaneous magnetisation.

**curing** Process by which most synthetic rubbers, plastics and solid-propellant binders are converted to compositions of higher molecular weight; may involve heating (condensation polymerization), chain reaction via free-radical or ionic mechanism (addition polymerisation), or use of catalysts. In solid rocket motors semi-liquid is often cured in case, solidifying and becoming case-bonded.

**curl** Vector resulting from action of operator del (differential operator in vector analysis) on vector; sometimes called rotation.

**curling die** Used with curling punch to bend sheet edges to tubular form.

**curlover** Possibly dangerous downdraft and turbulence downwind of trees or buildings.

**currency** Continuing validity of licence, esp. that for pilot.

**current** *1* Pilot is qualified on particular type and routinely flying it.

*2* Civil aircraft is on active register and in routine operation.

*3* Flight plan is that being followed.

**cursive writing** Rounded, flowing writing with strokes joined; hence formed in display by actual strokes rather than TV-type raster scanning.

**curtain** *1* Non-gastight partition in aerostat.

*2* Electronic barrier formed by wall of chaff.

**curved approach** *1* Adopted by some aircraft, notably WW2 fighters, because of inadequate forward view straight ahead at low airspeeds.

*2* Any of numerous possible quasi-elliptical paths followed when using MLS or other system offering such approach paths on either side of straight centreline.

**curved trend** Turn information imparted by three future track-lines on EHSI terminating 30 sec, 60 sec and 90 sec hence; these are straight with wings level but in banked turn show \*, in extreme case linking in  $360^\circ$  circle (does not allow for drift).

**curve of pursuit** Followed by any aircraft chasing another and continuously steering towards latter's present position; with non-maneuvring target curve soon becomes asymptotic with target straight-line course.

**curvic coupling** Joint between driving and driven shaft systems which transmits torque perfectly; allows for small errors in alignment or angle but does not secure one to other [in fact, making faces tend to push apart]. In simplest form comprises two sets of meshing radial teeth of smooth curving profile.

**curvilinear flight** Accelerated flight, ie not straight and level.

**Cus, CUS** Customs available.

**cushion** See *ground cushion*.

**cushion creep** Use of ground cushion for gradual helicopter takeoff.

**CUSRPG** Canada/US Regional Planning Group.

**Cuss, CUSS** Common-use self-service, for check-in desks which automatically identify and process passenger. CUSS is an electronic standard [v1.0], produced by SITA but specified by IATA. K adds kiosk.

**customer** Usually purchaser and operator are synonymous; where purchaser is government agency and operator an air force, or purchase is finance company or bank, \* normally applies chiefly to operator.

**customer base** Total list of customers (term usually refers to civil air carriers) committed to purchasing or leasing new type.

**customer bleeds** See *customer supplies*.

**customer mock-up** Exact reproduction of aircraft interior, or part thereof, furnished with materials, fabrics, colours, seats and other equipment as specified by customer.

**customer supplies** Bleed-air or shaft power, other than that required for propulsion, needed for aircraft services.

**customised lead time** No spares supplied until needed, \* typically 2h–2 years.

**customising** *1* Finishing GA aircraft to customer's spec., eg furnishing, avionics kit, external paint.

*2* Finishing avionics or instruments for particular task with chosen language, labels, IC chips and self-test.

**cusum** Cumulative sum [suggest: tautology].

**cut** Sudden complete shutdown of power [noun and verb]; hence: the \*, command given by batsman on carrier.

**C/UT** Code/unit test.

**cutaway** General term for detailed perspective drawing showing maximum detail of 3-D object.

**cutback** *1* Sudden partial closure of throttles at end of first climb segment for noise-abatement reasons.

*2* Reduction in existing or planned procurement.

*3* Reduction in manufacturing rate.

**cut-back nozzle** Normally, one (not of con-di type) shortened in length and terminating obliquely to give thrust slightly inclined to pipe axis.

**cutback speed** ASIR at top of first segment.

**Cute** Common-user terminal equipment (SITA).

**Cutlass** Combat UAV target locate and strike system.

**cutlet** Cutlet-shaped flattened outer arm of hub forging of rigid rotor.

**cutoff** *1* Termination of rocket propulsion before burnout because desired trajectory and velocity have been reached.

*2* Flying shortest track to intercept an air target.

**cutoff ports** Circular apertures in forward face of solid motor which can swiftly be blown open to terminate combustion.

**cut-out** *1* Aperture in pressurized fuselage, for door, window, hatch or other purpose.

*2* Absence of rear inner part of elevator, terminating in diagonal edge, to allow full rudder to be applied.

**cut-out switch** One isolating or inactivating circuit or subsystem.

**CV** *1* Fleet [aircraft] carrier.

*2* Carrier vehicle (SDI).

**C<sub>v</sub>**

- 3 Compiler vendor.
- 4 Cryptographic variable.
- 5 Controlled variable[s].
- C<sub>v</sub>** Specific heat at constant volume.
- cv** Cheval vapeur, metric horsepower = 0.98632 hp = 0.7355 kW; reciprocals 1.01387, 1.35962.
- CV(A), CVA** 1 Fleet carrier, attack.
  - 2 Creditors voluntary agreement.
- CVBG** Carrier battle group.
- CVCC** Constant-volume combustion cycle; E adds engine.
- CVD** Chemical vapour deposition.
- CVDR** Cockpit voice data recorder.
- CVE** 1 Escort carrier.
  - 2 Combat value enhancement.
- CVF, cv(f)** Future aircraft carrier.
- CVFD** Cockpit voice and flight data [R adds recorder].
- CV/DFDR** Cockpit voice and digital flight data recorder.
- CVFP** Charted visual flight procedure.
- CVFR** Controlled visual flight rules.
- CVH** Helicopter carrier.
- CVI** Counter-flow virtual impactor.
- CVID** Clearly visible impact damage.
- CVL** 1 Controlled-vortex lift.
  - 2 Light aircraft carrier.
- CVM** Comparative vacuum monitoring.
- CV(N), CVN** Fleet carrier, nuclear-propelled [X adds next-generation]
- CVOR** Commutated VOR.
- CVR** 1 Cockpit voice recorder [CP adds control panel].
  - 2 Crystal video receiver.
- CVRS** Computerized voice reservation system.
- CV(S), CVS** Carrier, escort/ASW.
- CVUT** Czech aeronautical society [office, Prague 2] (Czech Rep.).
- CVV** 1 Compressor variable vane.
  - 2 Combined validation and verification.
- CVW** Carrier air wing (USN).
- CV-WST** Carrier-based weapon-system trainer.
- CW** 1 Continuous wave.
  - 2 Ambiguously, carrier wave.
  - 3 Clockwise.
  - 4 Chemical warfare.
  - 5 Composite Wing (USAAF, USAF).
  - 6 Complex weapons.
- C<sub>w</sub>** Helicopter weight coefficient.
- CWA** 1 Center weather advisory (inflight, unscheduled).
  - 2 Civil Works Administration (US, 1933).
  - 3 Communications Workers of America.
- CWAN** Coalition wide-area network.
- CWAR** CW (1) acquisition radar.
- CWB** Centre wing box.
- CWC** 1 Crosswind component.
  - 2 Chemical Weapons Convention, 15 January 1993.
  - 3 Comparator warning computer.
- CWCS** Common weapons control system.
- CWD** Chemical warfare defence.
- CWDS** Clean-wing detection system, senses thickness of contaminant, eg ice.
- CWFS** Crashworthy fuel system.
- CWG** 1 Charges Working Group (IATA).
  - 2 Capability Working Group (MoD and NATO).

**cycle parameters**

- CWH** Canadian Warplane Heritage Museum [Mount Hope, PO].
- CWI** Continuous-wave illuminator [or interference].
- CWID** Coalition Warrior interoperability demonstration (NATO).
- CWIN** 1 Cockpit weather information system.
  - 2 Cyber warfare integration network.
- CWM** Comparator warning monitor.
- CWN** Call when needed, short-term contract prevalent in firefighting.
- CWP** 1 Central warning panel.
  - 2 Contractor's working party.
  - 3 Compact when packed (antennas).
  - 4 Controller, or controlled, work[ing] position[s].
  - 5 Central West Pacific (ICAO).
- CWR** Continuous-wave [or colour weather] radar.
- CWS** 1 Caution/warning system.
  - 2 Central [or collision] warning system.
  - 3 Control-wheel steering.
  - 4 Container weapon system.
- CWSG** Civil Wing Study Group.
- CWSU** Central [or Center] Weather Service Unit (US).
- cwt** Hundredweight, archaic unit of mass, = 112 lb = 50.8032 kg; US short \* = 100 lb = 45.3592 kg.
- CWU-45P** Classic USAF leather flight jacket.
- CWV** Crest working voltage.
- CWW** Cruciform-wing weapon.
- CWY** Clearway.
- C<sub>x</sub>** 1 Longitudinal [axial] force coefficient (=  $C_d \cos A$  minus  $C_l \sin A$ , where A is angle of attack).
  - 2 Controlled expansion, for fatigue enhancement of holes.
- CXO** Chandra X-ray Observatory.
- C-X** Center Experimental (USAF).
- CXR** Helicopter configuration, co-axial rotor(s).
- CXV** Crew transfer vehicle.
- CXRS** Coherent X-ray scattering (baggage screening).
- CY** Calendar year.
- C<sub>y</sub>** 1 Side-force aerodynamic coefficient, = side force divided by  $qS$ , dynamic pressure  $\times$  wing area.
  - 2 Helicopter Y-force coefficient.
- cyan** Bright blue colour, e.g. marking FLOT/FEBA on radar.
- cyaniding** Surface hardening of steel by immersion in bath of cyanide (and other) salts producing nitrogen as chief agent.
- Cyβ** Sideforce derivative due to sideslip; subscript β, due to sideslip rate.
- cyber** Prefix, concerned with information, computers and the internet, hence \* attack, \* crime, \* defence, \* security, \* strategy, \* tools.
- Cyc, CYC** Cyclonic.
- cycle** One complete sequence of events making up portion of life of machine; thus for piston engine, four strokes of Otto \*, while for aircraft usually start-up, taxi, takeoff, climb, cruise, possibly combat, descent, landing, thrust-reverse, taxi, shutdown.
- cycle-dependent costs** Directly proportional to usage, eg reverser.
- cycle efficiency** Measure of performance of heat engine derived from PV or entropy diagram; usually synonymous with thermal efficiency.
- cycle parameters** For gas turbine, primary \* are EPR and TET.

**cyclic pitch**

**cyclic pitch** In most helicopters main rotor blade pitch progressively increases from minimum (a very small) angle when head-on to airstream (momentarily occupying position of wing) to maximum 180° later (when in position of wing trailing-edge-on to airstream); this makes blade fall on advancing side of rotor and rise on retreating side, effectively decreasing and increasing angle of attack to even-out lift on both sides. This is also called feathering, and results in blade flapping (see \*control).

**cyclic-pitch control** Primary helicopter flight control. Usually governed by stick, similar to aeroplane control column, which in central position causes basic cyclic variation as described above by tilting stationary and rotating stars on rotor hub. Pilot demand is passed through mixing unit and output tilts fixed star in desired direction to superimpose additional cyclic variation causing disc to tilt in desired direction to cause helicopter to rotate about pitch or roll axis.

**cyclic rate** Rate at which automatic gun fires, expressed in shots per minute, measured after maximum rate has been attained and not necessarily attainable except for brief periods.

**cyclic stick** Cyclic-pitch control stick.

**cyclic testing** Repeated application of supposed operating cycle, usually of exceptionally severe nature, under arduous environmental conditions to prove endurance or life of hardware.

**cycling** Cyclic testing.

**Cycloconverter** Elegant method of generating constant-frequency a.c., by commutating six phases of h.f. [over 1,600 Hz] to very precise 400 Hz three-phase.

**cyclogenesis** Development of a cyclone.

**cyclogiro** Aerodyne, never successfully achieved, lifted and propelled by pivoted blades rotating about substantially horizontal transverse axis as in paddle steamer.

**cyclone** Tropical revolving storm.

**Cyclonite** See *RDX*.

**cyclostrophic force** That experienced by wind following

curved isobars acting in addition to geostrophic force to give resultant wind along isobar according to Buys Ballot's law. At Equator geostrophic force vanishes, leaving pure cyclostrophic wind.

**cyclostrophic wind** As explained above, wind near Equator with strong circular motion, such as a tornado.

**Cyclotol** Specially formulated high explosive, used alone or with PBX-9500 series, to cause implosion trigger (NW).

**cyclotron** Family of magnetic resonance particle accelerators, many extremely large.

**cyclotron resonance** Motion of moving charged particle in magnetic field on which is superposed alternating electric field normal to magnetic field.

**cycl/sec** Cycles per second, SI unit is Hz.

**CYI** Canary Islands (AMR).

**cylinder** One unit of piston engine, or, specif., surrounding cylinder enclosing combustion space and guiding piston.

**cylinder block** Single unit enclosing row of liquid-cooled in-line piston engine cylinders.

**cylinder head** Usually removable top of piston engine cylinder containing plugs, inlet/exhaust connections and (except with sleeve valve) valves.

**cylinder liner** Hard abrasion-resistant lining inserted into cylinder of light alloy or other soft material.

**C<sub>y</sub>p** Side force due to roll rate.

**C<sub>y</sub>r** Sideforce due to yaw rate.

**Cytac** Loran-C.

**CY2KSS** Center for year-2000 strategic stability (US/R).

**CZ** Control-zone (US).

**C<sub>z</sub>** Normal force coefficient,  $C_L \cos A + C_d \sin A$ , where A is angle of attack; rarely called C<sub>N</sub>, which is strictly negative.

**cZ** Fore/aft magnetic VSI component.

**CZCS** Coastal zone colour scanner.

**CZI** Compressor-zone inspection.

# D

- D**
- 1 Total aerodynamic drag.
  - 2 Danger area (ICAO).
  - 3 Duration of phenomenon in seconds, eg D<sub>60</sub>.
  - 4 Drift.
  - 5 Diameter (rarely, d); for tyre [tire], at rim ledge.
  - 6 For airspace, see \*-class.
  - 7 Departure chart.
  - 8 Pavement bending strength for dual-wheel landing gear.
  - 9 Drone (UK).
  - 10 Drone director (US modified-mission prefix).
  - 11 Electric flux density.
  - 12 Fuze delay time.
  - 13 PPL Group for microlights (CAA).
  - 14 Sport-parachuting certificate: 200 free-falls, 20 landing ≤15m of target.
  - 15 Detail [maintenance check], followed by number.
  - 16 Aircraft category: gliders and motor gliders (FAI).
  - 17 Other meanings include Doppler, downward, distance, day, dust, delete, designated, delay, displacement, differential coefficient, chemical diffusion coefficient and decision.
  - d**
    - 1 Distance, and spacing between structural members.
    - 2 Differential.
    - 3 Deci, prefix, multiply by 10<sup>-1</sup> (not recommended).
    - 4 Clear distance between contact areas of landing wheels (can include axial or transverse distance between wheels of bogie).
    - 5 Thickness of RAM surface-wave absorber.
    - 6 Usually as subscript, design.
    - 7 Diameter of fuselage, jet or propeller (alternative to D).
    - 8 Diode.
    - 9 Relative density.
    - 10 90 per cent semi-span, usually measured outboard from root.
    - 11 Maximum depth of wing at root [assumed to be greatest anywhere on semi-span].
  - D\*** Also called co-ordination-perception parameter, time-response criterion for the lateral/directional control response, combining lateral acceleration and angle of sideslip.
  - D̄** In 2-D flow, often used for section drag [per unit span, parallel to freestream].
  - D<sub>1</sub>, D<sub>2</sub>** Non-dimensional drag factors.
  - D<sub>1</sub>** Deliverable one, the first report (Sesar).
  - D<sup>3</sup>S** Dynamic data-display subsystem.
  - D8PSK** Differential-8 phase-shift keying.
  - D<sub>100</sub>** Drag at 100 ft/s.
  - D-check** Major overhaul carried out every 3–5 years.
  - D-class** Airspace up to 2,500 ft (762 m) AGL above airfield with operating tower; 2-way dialogue radio required.
  - D-code** In flight plan, have DME.
  - D-factor** Actual, or true, altitude divided by pressure altitude.
  - D-gun** Detonation gun, firing suspended particles of hard surface coating by detonation of oxy-acetylene.

- D-layer** Region of increasing electron and ion density in ionosphere, existing in daytime only and merging with bottom of E-layer.
- D-licence** For inspection of engines after overhaul.
- D-nose** Strong leading edge of aerofoil, often forming principal structural basis of wing or helicopter rotor blade.
- D-notice** Issued regularly to advise [esp. Press, broadcasters] of changes in classification status of defence or other sensitive subjects (UK MoD).
- D-nozzle** Propulsive nozzle of jet engine on centreline of fuselage or nacelle vectoring to give lift or thrust (from cross-section).
- D-ring** Steel handle with which parachutist pulls ripcord.
- D-spar** D-nose.
- D-tube** Leading edge of lightplane or micro comprising spar and load-bearing skin, generally simpler than D-nose.
- D-value** Departure from pressure altitude.
- DA**
  - 1 Drift angle.
  - 2 Diplomatic authorization.
  - 3 Double attack.
  - 4 Long-range (bomber) aviation, predecessor of ADD (USSR).
  - 5 Delayed-action (bomb).
  - 6 Dual-alloy (turbine disc).
  - 7 Direct action (fuze).
  - 8 Deck alert.
  - 9 Decision [or density] altitude.- 10 Danger area.
- 11 Development aircraft.
- 12 Design authority.
- 13 Duplex aluminide.
- 14 Air defence (F).
- 15 Defence advisory.
- 16 Drought area.
- 17 Direct access (telecoms).
- 18 Descent advisor, or advisory.
- 19 Display Authorization.
- da** Deca [US, deka], prefix, multiplied by 10, non-SI.
- d<sub>a</sub>**
  - 1 Radar resolution in azimuth.
  - 2 See δ<sub>a</sub>.
- D/A** Digital/analog.
- DAA**
  - 1 Directorate of Air Armament (UK).
  - 2 Digital/analog adaptor.
- DAA** Directorate, Army Aviation [DAAv is preferred] (UK).
- DAACM** Direct airfield-attack cluster munition.
- DAAIS** Danger area activity information service (CAA, UK).
- DAAS** Defense advanced automation system (ATC)
- DAAT** Digital angle-of-attack transmitter.
- DAAv** Directorate of Army Aviation (UK).
- DAB**
  - 1 Defense Acquisitions Board (US).
  - 2 Digital audio broadcast[ing].
- DABF** Digital adaptive beam-forming; N adds network
- DABM** Defence against ballistic missile(s).
- DABRK** Daybreak.

**DABS, Dabs** 1 Discrete-address, or addressable, beacon system; can address individual aircraft via transponder, pointing a narrow beam at it to transmit messages via data-link.

2 Dual aft-body strakes.

**Dabsef** Dabs Experimental Facility (Lincoln Laboratories, US).

**DAC** 1 Deployable ACCS component (USAF).

2 Design aperture card.

3 Dual annular combustor.

4 Dangerous air cargo.

5 Defensive-aids computer.

6 Duplex aluminide coating.

7 DSMC (2) analysis code.

8 Divide and conquer [parallel modelling].

9 See DAeC.

**dac** Digital-to-analog converter.

**DACC** Dangerous Air Cargo Committee (UK, RAF).

**DACOS, Dacos** Deputy Assistant Chief of Staff; CS adds Carrier Strike.

**Dacota** Dispositif d'association, de correlation et de traitement radar pour les approches (F).

**DACP** Dirección de Aeronáutica Civil del Perú [office, Lima].

**Dacron** A commercial polyethylene glycol terephthalate fibre and woven fabric related to Terylene and Mylar.

**DACU** Data-acquisition control unit.

**DACS** 1 Directorate of Aerospace Combat Systems (Canada).

2 Danger area crossing service (CAA, UK).

3 See next.

**Dacs** Divert and attitude control system.

**DACT** 1 Dissimilar air-combat training, or tactics.

2 Data automated communications terminal.

**DACU** Data-acquisition control unit.

**DAD** 1 Deep air defence.

2 Dual-alloy disc.

3 Density - altitude display.

**Dadacs** Danger-area divert and attitude-control system.

**DADC** Digital air-data computer.

**DADNE, Dadne** Diaminodinitroethylene.

**dadopanel** Cabin wall just above floor [one word]

**DADR** Deployable [not fixed-base] air-defence radar.

**DADS** 1 Deployable air-data sensor.

2 Digital air-data system.

**DADTA** Durability and damage – tolerance analysis.

**DAeC** Deutscher Aero Club eV [D-63150 Heusenstamm] (G).

**Daedalians** National fraternity of military pilots (US).

**DAES** Directorate of Avionic Equipment and Systems (UK).

**DAFCS** Digital automatic, or advanced, flight-control system.

**DA/FD** Digital autopilot/flight director.

**Dafics** Digital automatic flight inlet control system.

**DAFIF** Digital aeronautical flight-information file.

**Dafusa** Data-fusion airports (Euret).

**DA fuze** Direct-action fuze; designed to explode on impact.

**DAG** 1 Deutsche Angestellten-Gewerkschaft Bundesgruppe Luft- und Raumfahrt.

2 Domestic Aviation Grade.

**Dagmar** Fairied shape [a body, not a blister] in front of a bluff projection.

**DAGR** Defense advanced GPS receiver, probably to replace PLGR.

**DAI** 1 Direction des Affaires Internationales (F, MoD).

2 DCMS Audio interface.

3 Directed airborne intelligence (UK).

**DAIR** Direct altitude and identity readout (FAA/USAF).

**DAIRS** Distributed-architectures, or aperture, IR system, or sensing.

**DAIS** 1 Digital avionics information system.

2 Distributed airport information system.

**DAISS** Digital airborne intercom switching system.

**Daisy** Decision-aid for interpretation of air situation display (Alcatel from 1994).

**daisy chain** Several helpers link arms to swing large propeller.

**daisy cutter** US tactical store designed to kill maximim number of exposed infantry [1969–].

**DAIW** Danger area infringement warning.

**DALGT** Daylight.

**Dallenbach layer** Pioneer form of RAM(2) coating consisting of homogeneous lossy layer backed by metallic plate (eg, aircraft skin); if lossy layer has same impedance as free space there will be no surface reflection.

**Dalmatian effect** Increase in number of spots in map of V/STOL air bases compared with airfields.

**DALO** Divisional Air Liaison Officer (UK).

**DALR** Dry adiabatic lapse rate.

**D-alt** Density altitude.

**Dalton computer** Family of pocket-size mechanical calculators for navigation [esp triangle of velocities] problems.

**Dalton's Law** Empirical generalization that, for many so-called perfect gases, a mixture will have pressure equal to sum of partial pressures each would have as sole component within same volume and temperature, provided there is no chemical interaction.

**DAM** Dollars per aircraft-mile.

**Dama, DAMA**. Demand-assigned, or assignment, multiple access.

**damage assessment** Determination of effect of attacks on targets.

**damage cycle** Loss of life of engine or other hardware.

**damage limitation** Ability to limit effects of nuclear destruction by using offensive and defensive measures to reduce weight of enemy attacks.

**damage-tolerant** Structure so designed as to continue to bear normal in-flight loads after failure (through fatigue, external damage or other cause) of any member (see *fail-safe*).

**Damask** Direct-attack munition affordable seeker.

**DAME** Designated aviation medical examiner.

**damped natural frequency** Frequency of free vibration of damped linear system; decreases as damping increases.

**damped wave** Wave whose amplitude decreases with time or whose total energy decreases by transfer to other frequencies.

**damper** 1 Mass[es] attached to crankweb, either rigidly or free to oscillate, to eliminate dangerous vibration at critical frequencies of crankshaft.

2 Snubber or part-span shroud on fan blade.

3 See *flame* \*.

4 See *roll* \*.

5 See *shimmy* \*.

## damping factor

## DASR

6 See *yaw* \*.

**damping factor** Ratio of peak amplitudes of successive oscillations.

**damping moment** Proportional to rate of displacement; tends to restore aircraft to normal flight attitude after upset.

**DAMS** 1 Dynamic airspace management system(s).

2 Drum auxiliary memory subunit.

**Damsl** Dictionary and message specification language.

**daN** Decanewton, unit of force = 2.248 lbf.

**Danac** Decca area-navigation airborne computer (1984 also appeared as digital air-navigation control).

**D&C** 1 Design and clearance.

2 Diagnostic and conditioning.

3 Delays and cancellations, numerically = dispatch reliability.

**D&D** 1 Distress and diversion (ATC).

2 Diesel and dye (smoke-making).

**D&F** Determination and findings.

**D&O** Description and operation.

**D&P** Development and Production (MoD contracts).

**D&V** Demonstration and validation.

**danger area** Airspace of defined dimensions in which activities dangerous to flight may exist at specific times.

**dangle** Angle between local horizontal at glider and end of tow-rope (usually air tow).

**DAO** 1 Defence Attaché Office.

2 Distributed analysis optimization.

3 Defence Acquisition Organization [ACT2600] (Australia).

**DAP** 1 Distortion of aligned phases (LCD).

2 Director(ate) of Aircraft (originally Aeroplane) Production (UK, WW2).

3 Distributed-array processor.

4 Directorate of Airspace Policy (CAA, UK)

5 Digital service accept product.

6 Data-access protocol [see next].

**DAPS** Data-access protocol system.

**DAPU** Data acquisition and processing unit.

**DAR** 1 Design and Airworthiness Requirements (UK)

2 Drone, anti-radar.

3 Direct-access recorder.

4 Design assurance review.

5 Defense Acquisition Regulation.

6 Diffuser area ratio.

7 Digital archive recorder.

8 Defence Airfield Review [programme of further base closures post-2007] UK MoD).

**Dara, DARA** 1 Defence Aviation Repair Agency [St. Athan, CF62 4WA] (UK).

2 National space agency (G).

**Dare, DARC** Direct-access radar channel.

**DARE** Defence Avionics Research Establishment [Bangalore] (India).

**Darin** Display attack and ranging inertial navigation.

**dark** Switched off.

**dark burst** Gamma-ray burst that fades very rapidly.

**dark cockpit** All lights out, ie correct configuration and all systems normal.

**darkfire** Missile system operable at night in clear visibility.

**dark-trace** Display phosphor creating image through reflection/absorption of light instead of light emission from phosphor (see *skiatron*).

**Darlington pair** High-gain amplifier stage using two transistors in which base of second is fed from emitter of first.

**DArmRD** Directorate of Armament Research and Development (UK).

**DARO, Daro** Defense Airborne Reconnaissance Office[r] (DoD).

**Darp** 1 Dynamic airborne rerouting procedures, or programs.

2 Digital audio recording and playback.

**Darpa, DARPA** Defense Advanced Research Projects Agency [office, Arlington, VA22203-1714] (DoD, US).

**Dars** Dynamic aircraft route-planning study.

**DARS, Dars** 1 Digital attitude-reference system.

2 Dynamic-assist retargeting system.

3 Drogue air-refuelling system.

4 Digital audio radio system, or service[s].

5 Deployable ARS 12 (NATO).

**Dart, DART** 1 Defensive-avionics receive, or receiver, transmitter; jams hostile IR-seekers.

2 Directional automatic realignment of trajectory (ejection seat).

3 Dual-axis rate transducer.

4 Deployable automatic relay terminal.

5 Demonstration of autonomous rendezvous technique, or technology (NASA).

6 Design [of] advanced rotor for tilt-rotor technology.

**dart** 1 Unpowered aerodynamic vehicle with stabilizing tailfins.

2 Any freeflight vehicle with stabilizing tailfins but no trajectory control.

3 Guided missile accelerated to speed by rocket[s] jettisoned at burnout, thereafter coasting to target.

**Darts** 1 Diversified aircrew readiness training support.

2 Digital airborne radar threat simulator.

3 Departure and arrival traffic-management system.

**DARU, Daru** Data acquisition and recording unit.

**Darwin** Design assessment of [engine] reliability with inspection (FAA).

**DAS** 1 Defensive-aids suite, or system, or subsystem.

2 Defensive avionics system.

3 Director, Air Staff (UK).

4 Directorate of Aerodrome Standards (UK).

5 Distributed-aperture system.

6 Designated alteration station (FAA).

7 Digital autopilot system.

8 Data-acquisition system.

**DASA** 1 Defense Atomic Support Agency (US, MoD).

2 Defence Analytical Services Agency (UK).

**Dasals** Distributed-aperture semi-active laser seeker.

**DASC** 1 Direct air support centre.

2 Defence Aviation Safety Centre (MoD, UK).

**DASD** Deputy Assistant Secretary for Defense.

**DASE** Digital autostabilizer equipment.

**DA718** Advanced (1995) DS compressor-blade alloy.

**DASH** 1 Drone anti-submarine helicopter.

2 Differential airspeed hold.

3 Display and sight[ing] helmet.

**dash** Portion of attack mission through defended hostile territory at full afterburning power at low level, ignoring high fuel burn.

**DASP** Discrete analog signal processing.

**DASR** 1 Digital airspace, or airport, surveillance radar.

2 Direct air-to-satellite relay.

**DASS**

**DASS** 1 Defensive-aids subsystem.

2 Dynamic-assembly scheduling system.

**DAST, Dast** Drone[s] for aerodynamic and structural testing (NASA).

**DAT** 1 Damage-to-aircraft trials.

2 Digital audio tape.

**DATA** Defense Air Transportation Association (US).

**Data, Data** A MIL-STD-1553B bus carries Data in one channel and **Data** in the other.

**databus** Highway for digital data, most common linking aircraft sensors and other air or ground systems being MIL-STD-1553B or Arinc 419 (one-way) or Arinc 619 10base T (two-way).

**Datac** Digital-access terminal-area control, or communication [see *Datacs*].

**DATACOM, Datacom** Data compilation, large handbook and CD which attempts to give designers complete knowledge of effect on lift and moment of changes in design (USAF).

**Datacs** Digital autonomous terminal access communications system, became Arinc 629 (Boeing).

**data fusion** Integration and management of possibly billions per second of bits of information from recon sensors, C<sup>3</sup> and battle management systems.

**datalink** 1 Any highway or channel along which messages are sent in digital form.

2 Communications channel or circuit used to transmit data from sensor to computer, readout device or storage.

**data-logger** Short-term store for digital or analog information, eg for one flight or one week, periodically read back to build up service history of system, engines or other devices.

**data plate** Permanently fixed to aircraft, engine or other product, giving basic data, serial numbers and dates.

**Datar, DATAR** 1 Detection and tactical alert of radar (helicopter RWR).

2 Délégation de l'Amenagement du Territoire et à l'Action Régionale [aeronautical subcontract organization; Paris F-75007] (F).

**data reconstruction** Assembling correct bar-codes from brief any-angle glimpses (mainly in checking baggage).

**data recorder** Device, usually electronic, for recording data [previously analog, now mainly digital] for subsequent playback and analysis (see *flight recorder, maintenance recorder*).

**Datas** Data-link and transponder analysis system.

**Data-3** Inmarsat system enabling aircraft to link direct to ground networks.

**Datco** Duty air-traffic-control officer.

**DATF** Deployable air task force.

**DATIS, D-Atis, Datis** 1 Digital air-traffic information service, or system.

2 Digital automated, or automatic, terminal information service.

**DATM** Dummy air-training missile.

**Datmas** Danish air-traffic management system (2007-).

**DATS** Data-acquisition and telemetry system.

**Datsa** Depot automatic test system for avionics.

**DATT, DAtt** Defense Attaché (US).

**DATTS** Data acquisition, telecommand and tracking station.

**datum** 1 Numerical, geometric or spatial reference or base for measurement of other quantities.

2 Vertical (rarely, horizontal or other) reference line

from which all structural parts are measured and identified. Most \* lines are exactly at, or close in front of or behind, nose; thus, frame 443 is a nominal 443 in or mm behind\*; wing \* is often aircraft centreline.

**datum target** A point or straight line used to establish a datum.

**DAU** 1 Directly Administered Unit[s] (RAF).

2 Digital amplifier unit.

3 Data-acquisition unit.

**DAUG** Danger-area users group (NATS).

**Da Vinci** Departure and arrival integrated management system for co-operative improvement of airport traffic flow (Euret).

**Davis barrier** Retractable crash barrier across carrier (1) deck.

**Davis tables** List altitude and azimuth of astro-navigation targets.

**Davis wing** High-aspect ratio wing designed by David R. Davis; intended to cruise at low angle of attack with low drag.

**DAVSS** Doppler/acoustic vortex sensing system.

**DAVVL** Birdstrike committee, with several sub units (G).

**DAW (A)** Dedicated all-weather (aircraft).

**day** Mean solar \* is defined at  $8.64 \times 10^4$ s; sidereal \* is approximately  $8.616 \times 10^4$ s.

**Day-Glo** Family of dyes and paints with property of converting to visible light wavelengths outside normal visible spectrum, thus giving unnaturally bright hues.

**day/night** Equipment giving cheap and convenient IFR training, using tinted pilot goggles and complementary tinted cockpit transparency (eg blue goggles and amber canopy or red + green); pilot sees clear but tinted cockpit while outside world appears black.

**DB** 1 Development batch.

2 Direct broadcast. [S adds satellite, service or system].

3 Database.

4 Databus.

5 Double base (rocket propellant).

6 Diffusion bonding.

7 Day bombardment category (USA 1919–24).

8 Denied boarding.

**dB** Decibel, see *noise*.

**DBA** 1 Dominant battlespace awareness.

2 long-range bombing aviation (USSR, R).

**dBA** Decibels absolute, or A-weighted, see *noise*.

**d.b.a.** Doing business as.

**DBC** 1 Denied boarding compensation for bumped passengers; for pax reaching their destination within 4 h of original booked time 50% of flight-coupon value in Europe, 200% in US. No compensation for aircraft under 60 seats.

2 DCMS bus coupler.

3 Data-bank, Comecon.

**DBE** 1 Data bank, Eurocontrol.

2 Down between engines [rotation of handed propellers in four-engined aircraft].

**DBF** 1 Doppler beat frequency.

2 Digital beam forming.

3 Destroyed by fire.

4 Doppler blade flash.

**DBGS** Data-base generation system.

**DBFM** Defensive basic flight manoeuvres.

**DBI** 1 DCMS bus interface.

<b>2</b>	Downlink block identifier.	
<b>3</b>	Data-bus input.	
<b>dBi</b>	Decibels referenced to isotropic antenna or above isotropic circular.	
<b>dBm</b>	Decibel meter, unit of power referenced to 1 mW = dB × 10 <sup>-3</sup> .	
<b>DBM/C</b>	Data bus monitor/controller.	
<b>DBMS</b>	Database management system; also rendered as DBMX.	
<b>dBm<sup>2</sup></b>	Measure of radar cross-section using m <sup>2</sup> as reference.	
<b>DB/N</b>	Data-base No.	
<b>DBNS</b>	Doppler bombing/navigation system.	
<b>DBO</b>	Data-bus output.	
<b>DBPS</b>	Digital [electron] beam-positioning system.	
<b>DBR</b>	<b>1</b> Dual-band radar. <b>2</b> Damaged beyond repair.	
<b>DBS</b>	<b>1</b> Doppler beam-sharpening. <b>2</b> Direct-broadcast satellite, or service. <b>3</b> Database storage.	
<b>DBSA</b>	Directorate for Broadening Smart Acquisition (MoD, UK).	
<b>dBsm</b>	Decibel unit of radar beam cross-section referenced to 1 m <sup>2</sup> ; dBm <sup>2</sup> more common.	
<b>DBT</b>	Diffusion-bonded titanium.	
<b>DBTE</b>	Data-bus test equipment.	
<b>DBTF</b>	Duct-burning turbofan.	
<b>DBU</b>	Database unit.	
<b>DBUF</b>	Defence buildup plan, or programme (J).	
<b>DBV</b>	Diagonally braked vehicle, for runway friction measures.	
<b>DBVOR</b>	Doppler VOR with weather broadcast. Hence DBVortac.	
<b>DBW</b>	Differential ballistic wind.	
<b>dBw</b>	Decibels referenced to 1 Watt.	
<b>DBWS</b>	Database work-station.	
<b>DC</b>	<b>1</b> Depth charge. <b>2</b> Departure control. <b>3</b> Direct cycle. <b>4</b> Display controller. <b>5</b> Directionally cast. <b>6</b> Drag control. <b>7</b> Dead centre. <b>8</b> Detection centre (homing). <b>9</b> Dry chemical. <b>10</b> Direct cost. <b>11</b> Digital compass.	
<b>dc, d.c.</b>	Direct current.	
<b>DCA</b>	<b>1</b> Defense Communications Agency (US). <b>2</b> Directorate of Civil Aviation. <b>3</b> Defense Contre Avions (F, 1935–40). <b>4</b> Department of Civil Aviation (A, Braz.). <b>5</b> Dual-capable aircraft. <b>6</b> Document content architecture (IBM). <b>7</b> Defensive counter-air. <b>8</b> Design Chain Accelerator. <b>9</b> Drift correction angle. <b>10</b> Defense Certification Authority. <b>11</b> Defence Codification Agency (UK).	
<b>DCAA</b>	Defense Contract Audit Agency (US).	
<b>DCACMRM</b>	Defense and control airspace configuration/manufacturing resource management.	
<b>DCAOC</b>	Deployable combined air & space operations centre (NATO).	
<b>DCAPES</b>	Deliberate & Crisis Action Planning & Execution Segments [part of GCSS] (USAF).	
<b>D-carts</b>	Decoy cartridges.	
<b>DCAS</b>	<b>1</b> Deputy Chief of the Air Staff (UK). <b>2</b> Digital core avionics system.	
<b>DCC</b>	<b>1</b> Drone Control Center. <b>2</b> Direct computer control. <b>3</b> Digital computer complex. <b>4</b> Data collector correlator.	
<b>DCCA</b>	Direction Centrale du Commissariat de l'Air (F).	
<b>DCCR</b>	Display-channel complex rehost.	
<b>DCD</b>	<b>1</b> Data collector and diagnoster. <b>2</b> Data-collection device (helicopter). <b>3</b> Double-channel duplex. <b>4</b> Damage control deck [carrier].	
<b>DCDI</b>	Digital course deviation indicator.	
<b>DCDS</b>	Deputy Chief of the Defence Staff (UK).	
<b>DCDU</b>	<b>1</b> Datalink control and display unit (Fans). <b>2</b> Digital, or data, communications and display unit.	
<b>DCE</b>	<b>1</b> Data communications equipment. <b>2</b> Data-circuit terminating equipment.	
<b>DCEE</b>	Distributed continuous experimentation environment.	
<b>DCFS</b>	Digitally controlled frequency service.	
<b>DCG</b>	Direct-current generator.	
<b>DCGA</b>	Deck closed, go-around.	
<b>DCGF</b>	Data-conversion gateway function.	
<b>DCGS</b>	<b>1</b> Distributed common ground system [UAV]. <b>2</b> Distributed common group, or ground, station.	
<b>DCH</b>	Destination change (input button).	
<b>DCI</b>	<b>1</b> DCMS crew-member interface; replaced by PCC (5). <b>2</b> Defence-capabilities initiative (NATO), or interface. <b>3</b> Director of Central Intelligence (DoD).	
<b>DCIC</b>	Defence Capability Investment Committee (Australia).	
<b>DCIU</b>	Digital control and interface unit.	
<b>DCKG</b>	Docking.	
<b>DCL</b>	Defence Contractors List (UK).	
<b>DCM</b>	<b>1</b> Defense Contract Management; A adds Agency, C Command or Committee (US). <b>2</b> Data-conversion management; F adds function. <b>3</b> Diagnostic and condition monitoring.	
<b>DCMAA</b>	Direction Centrale du Matériel de l'Armée de l'Air (F).	
<b>DCMF</b>	Data communication management function.	
<b>DCMS</b>	<b>1</b> Digital, or data, communications management system. <b>2</b> Door control and monitoring system.	
<b>dcmsnd</b>	Decommissioned.	
<b>DCMT</b>	Defence College of Management and Technology [Shrivenham, Wilts.] (MoD, UK).	
<b>DCMU</b>	Digitally coloured map unit.	
<b>DCN</b>	<b>1</b> Drawing, or design, or document, change notice. <b>2</b> The Defence Contractors' Network [office, Bristol BS99 5ME] (UK)	
<b>DCNO</b>	<b>3</b> Diplomatic clearance number. <b>4</b> Deputy Chief of Naval Operations.	

- DCO** Duty carried out.
- DCOM** Distributed-component object model.
- DCoS** Deputy Chief of Staff.
- DCP** 1 Distributed communications processor.  
2 Display control panel.  
3 Data collection and processing, or pack.  
4 Defence Capability Plan (Australia).
- DCPG** Defense Communications Planning Group (DoD).
- DCPS** Data collection and processing system.
- DCPU** Display control power unit (IFF).
- DCR** 1 Digitally-coded radar.  
2 Direct-conversion receiver (radio).  
3 Digital-cartridge recording; S adds system.  
4 Previously DCRJ, dual-combustion ramjet.  
5 Decrease.  
6 Design certification review.
- DCRD** Dynamic-component repair and development [helicopter and V/STOL].
- DCRF** Director, or Directorate, for Construction and Research Facilities (UK, 1935–57).
- DCRJ** See DCR4.
- DCS** 1 Deputy Chief of Staff (DCoS preferred).  
2 Defense Communications System (US).  
3 Decompression sickness.  
4 Double-channel simplex.  
5 Departure control system.  
6 Double-correlated sampling.  
7 Digital or duplex communications system, or suite.
- dc** Data collection system.
- DCSA** Defence Communications [and] Services Agency (UK).
- DCSO** Deputy Commander for Space Operations (USAF).
- DCS/R&D** Deputy Chief of Staff for Research and Development.
- DCSU** Dual crew-station unit.
- DCSWI** Deputy Chief of Staff for Warfighting Integration (USAF).
- DCT** 1 Digital communications terminal.  
2 Direct.
- dtd** Directed.
- DTCE** Data circuit terminating equipment.
- DCTL** From DC to light, ie entire usable FM spectrum.
- DCTN** Defense Commercial Telecommunications Network, subset of DISN.
- Dctr** Director.
- DCTS** Data communications terminal system.
- DCTU** Digital calibration trim unit.
- DCU** 1 Digital [engine] control unit.  
2 Data concentration, or collection, unit.  
3 Gas-turbine deceleration control unit.
- DCV** 1 Demonstrated crosswind velocity.  
2 Directional control valve.  
3 Destination-coded vehicle (baggage handling).
- DCVR** Digital crystal video receiver.
- Dew** Crosswind drag component.
- DD** 1 Direct drive (servo valve).  
2 Dewpoint depression.  
3 Distress and Diversion.  
4 Destroyer ship class (USN).  
5 Differential Doppler.  
6 Data delivery.  
7 Defense display [cockpit].
- dD** Any component of drag; thus dDN could be drag of a nacelle; -dD is a forward thrust, such as negative drag of a winglet.
- DDA** 1 Design-deviation authorization, or authority.  
2 Defence Diversification Agency (UK).  
3 Digital differential analyser.  
4 Distance data adapter.
- DDAFCFS** Dual digital automatic flight-control system.
- DDAU** Digital-data acquisition unit.
- DDB** Dynamic database [fusion of input] (Darpa).
- DDBS** Distributed database system.
- DDC** 1 Digital display console.  
2 Distributed digital computer.  
3 Distress and Diversion call.  
4 Deducted damage computation.  
5 Design and development contract.
- DDCA** Dual-designated complex architecture.
- DDCU** Data display and control unit.
- DDD, D<sup>3</sup>** 1 Dynamic data display; S adds subsystem.  
2 Detail data display.  
3 Dual disk drive.
- DDF** Double-diaphragm forming.
- DDF, DD/F** Digital direction-finding.
- DDG** Guided-missile [-armed] destroyer (USN).
- DDI** 1 Digital display indicator; C adds control.  
2 Data display indicator (Awacs).  
3 Direct-dial indicator.
- DDL** 1 Down datalink.  
2 Dummy deck landing; see *Addls*.  
3 Drag due to lift.
- DDM** 1 Difference in depth of modulation.  
2 Distributed data management.  
3 Display diagonal measure [corner to corner].
- DDMS** DoD Manager for Space Shuttle (support) operations.
- DDN** Defense data network.
- DDNP** Diazodinitrophenol.
- DDOR** Deputy Director of Operational Requirements.
- DDP** 1 Declaration of Design and Performance [C adds Certificate], formal statement by manufacturer accompanying each functioning item or modification, (required by CAA).  
2 Digital data, or Doppler, processor.
- DDPE** Digital data-processing equipment.
- DDPS** Digital display, or data, processing system.
- DDR** 1 Depressed-datum reheat.  
2 Draft document review.
- DDR&E** Director of Defense Research and Engineering (DoD).
- DDMRI** DME/VOR radio-magnetic indicator, usually duplicated and partnered by two ADF/RMIs.
- DDS** 1 Display and debriefing subsystem.  
2 Digital-data set.  
3 Data distribution system.  
4 Dynamic directional stability.  
5 Direct digital synthesizer.  
6 Digital debrief[ing] station.
- DDT** 1 Direct digital targeting.  
2 Detail data display.  
3 Runway strength for double dual tandem [landing gear].  
4 Downlink data transfer.
- DDTC** Data-link delivery of [expected] taxi clearance[s].

## DDT&E

## decay time

**DDT&E** Design, development, test and evaluation.

**DDU** 1 Diagnostic display unit.

2 Disk drive unit.

**DDV** 1 Direct-drive valve (hydraulics/brakes).

2 Disciplinary design variable.

**DDVR** Displayed-data video recorder.

**DE** 1 Directed energy.

2 Direct-entry (RAF).

3 Weather map.

4 Deflection error.

**DE** Effective drag.

**d<sub>e</sub>** 1 Diameter of single jet or nozzle with area equal to total of system of multiple nozzles.

2 Distance between elements of an array antenna.

**DEA** 1 Delegated engineering authority.

2 Data encryption algorithm.

3 Drug Enforcement Agency [OAO adds Office of Air Operations].

**DEAD** Destruction of enemy air defence[s].

**dead centre** 1 In piston engine, with conrod aligned with cylinder axis [in normal designs], piston at end of stroke.

2 Precisely on target [esp. sport parachuting].

**dead engine** One that cannot be operated after IFSD.

**deadeye** Circular block pulled by surrounding cable or rope to exert tension on other cables passing through transverse holes.

**deadface** To cut off all system power by circuit interrupters at interface between modules, stages or spacecraft, prior to separation.

**dead foot** Failed engine of twin- [rarely more] engined aircraft.

**deadhead** 1 To fly to maintenance base off-route.

2 Of aircrew, to ride as passenger(s) while on duty.

**dead men** Masses [not necessarily anthropomorphic] simulating passengers.

**dead reckoning** Plotting aircraft position by calculations of speed, course, time, effect of wind, and previous known position.

**dead-rise** Difference in height from keel to chine of float or flying-boat hull.

**dead-rise angle** That between line joining keel and chine and transverse horizontal through keel.

**dead side** 1 Side away from aircraft formation, eg left seat when in echelon to right.

2 Side of airfield or active runway away from that of circuit [pattern] in use. It is usually the side from which arrivals join circuit.

**dead spot** In a system, region centred about neutral position where small inputs produce no response.

**dead-stick landing** Landing of powered aircraft with all engines inoperative.

**dead vortex** Remnants of vortex after breakup and decay.

**dead zone** 1 Surface area within maximum range of weapon, radar or observer which cannot be covered by fire or observation because of obstacles, nature of ground, or trajectory characteristics or pointing limitations of weapon.

2 Zone within range of radio transmitter in which signal is not received.

3 Region above gun or missile into which weapon cannot fire because of mechanical or electronic limitations.

4 Area(s) next to surfaces of aircraft plate for integrally machined parts which cannot be ultrasonically inspected

and for which ultrasonic-inspection thickness allowances can be removed.

**de-aerator** Static or centrifugal screen for removing air from circulating lubricating oil. Also called rotating separator, centrifugal breather.

**deal** Bad error by ATC controller.

**dealer plate No** Issued temporarily to a/c for export, often to several in succession, to avoid need for proper US registration (FAA).

**Deatac** Directed-energy applications in tactical airborne [or air] combat.

**DEB** Digital European backbone (major NATO programme).

**deboost** Retrograde or braking manoeuvre which lowers either perigee or apogee of orbiting spacecraft.

**debrief** To interrogate aircrew or astronauts after mission to obtain maximum useful information.

**debris** 1 Remains from catastrophic accident.

2 In particular, fragments from exploded engine.

3 Loosely, BFO(3).

**debug** To isolate, correct or remove faults or malfunctions, especially from computer program.

**DEC** 1 Data-Exchange Committee.

2 Digital engine [or electronic] control [S adds system, U unit].

3 Decrease.

4 Declination.

5 Decommissioned.

6 Digital electronic clock.

7 Defence; or Directorate of, equipment capability (UK).

**deca** Prefix, multiplied by 10, symbol  $\alpha$  (non-SI).

**Decade** DFS(4) Eurocontrol ATM(7) development.

**decal** Insignia or other mark applied by transfer, usually to a model.

**decalage** Difference in angles of incidence of wings of biplane or multiplane; angle between chord of upper plane and that of lower plane in section parallel to plane of symmetry. Negative when angle of lower plane is greater.

**decalescence point** Temperature, characterised by sudden evolution of heat, at which definite crystalline transformation takes place when heating steel.

**Decalm** Director of Equipment Capability for Air and Littoral Manoeuvre (UK).

**decametric** Having wavelengths in the order of 10 m.

**decanewton** 10 N of force or thrust, = 2.24809 lbf.

**decant** Drain dregs of fuel from lowest point of integral or other tank, hence \*hole, \*assembly.

**decarburising** Heating iron or carbon steel to temperature sufficiently high to burn out or oxidise carbon.

**decay** 1 Progressive, accelerating reduction in orbital parameters, esp. apogee and perigee, of body in orbit affected by an atmosphere.

2 Progressive reduction in intensity of many natural processes, eg radioactivity, phosphorescence.

**decay curve** Plot of radiation intensity against time.

**decay orbit** Usually, final orbit terminating in re-entry.

**decay product** Usually, radioactive nuclides.

**decay rate** Rate of disintegration with respect to time.

**decay time** 1 Time for electronic pulse to fall to 0.1 of peak.

2 Time for charge in storage tube to fall to given fraction of initial, usually  $1/e$  where  $e$  is e(5).

3 Estimated lifetime of satellite in low orbit.

**Decca chain** Single system of master and three slave Decca Navigator stations giving guidance over one geographic region.

**Decca Flight Log** Pictorial presentation of Decca Navigator inputs on roller-map display.

**Decca lane** In original Navigator, any hyperbolic region between two adjacent position lines.

**Decca Navigator** Pioneer hyperbolic navaid using CW.

**Decca Omnitrac** Airborne digital computer which eliminates Flight Log chart distortion, sets pen accurately after chart change and enables system to be coupled to autopilot.

**DEC'D** Digital expandable color display.

**deceleration limit** That sustained value allowed for fully equipped astronauts or aircrew, normally – 10 g.

**deceleron** Aileron which splits into upper/lower halves to serve as speed brake (originally Northrop patent).

**decentralised control** In air defence, normal mode whereby higher echelon merely monitors unit actions, making direct target assignments only when necessary.

**deception** Measure designed to mislead enemy by manipulation, distortion or falsification of evidence, eg by DECM (1).

**deci** Prefix, one-tenth, symbol d (non-SI).

**DECIBE** Defence equipment capability indirect battlefield effect (UK).

**decibel** Fundamental unit of sound pressure (see *noise*).

**decimetre**  $10^{-1}$  m = 3.937 in (contrary to SI).

**decimetric** Having wavelengths in the order of  $10^{-1}$  m (not recommended).

**decimillimetric** Having wavelengths in the order of  $10^{-1}$  mm (not recommended).

**decision height** Specified height AGL at which missed approach must be initiated if the required visual reference to continue approach to land has not then been established; normally but not exclusively ILS, PAR or MLS approach.

**decision height abuse** For test purposes, landing from points deliberately offset laterally or longitudinally at DH.

**decision speed** Usually, V<sub>1</sub>.

**deck** 1 Any ground or water surface (colloq.).

2 From 1966, FL just above such surface.

3 A wing [pre-1914] (US).

**deck alert** Ready for immediate takeoff from ship, normally by fighter.

**deck-edge elevator** Lift built into side of aircraft carrier for moving aircraft between decks.

**decking** Top surface of fuselage.

**deck letter** Identifying letter painted on flight deck of aircraft carrier (USN: *number*).

**deck park** Parking area for aircraft or other vehicles on aircraft carrier flight deck.

**deck plate[s]** Electroluminescent panel[s] recessed flush with deck of ship or oil rig or other platform marking helicopter landing area.

**deck run** Distance run along ship deck in free (non-cat.) takeoff.

**deck spot** Area allocated to, or occupied by, one aircraft on deck.

**declaration** Size of force committed by government to special purpose, esp. to support multinational alliance; hence declared force.

**declarative language** So-called ‘fifth generation’

computer language used for AI(2) which requires merely that programmer describes problem and declares facts and parameters necessary for solution; \* then decides how this information will be used in solution process.

**declared** Numerical or factual data published or filed before flight.

**declared alternate** Airfield specified in flight plan to which flight may proceed, should landing at original airfield become inadvisable.

**declared destination** Airfield specified in flight plan at which flight is intended to terminate.

**declared distance** See ASDA, ED, LDA, TODA, TORA.

**declared thrust** Generally, those ratings published by manufacturers.

**declared weight** Generally, that filed in flight plan.

**declassification** 1 Removal of item from security classification.

2 At public exhibition or display, removal of sensitive items prior to opening.

**declination** 1 Angular distance to body on celestial sphere measured north or south through 90° from celestial equator along hour circle of body. Comparable to latitude on terrestrial sphere.

2 Magnetic variation.

**DECM** 1 Deceptive ECM.

2 Defensive ECM.

**decode** To translate into plain language aeronautical telecommunications and other signals from ground to air, esp. in Notam and Q-code.

**Decometer** Original dial-type phase-meter display, one per lane, in Decca Navigator before 1953.

**decompression chamber** Capsule or chamber in which human beings or hardware can undergo process of decompression.

**decompression sickness** See *aeroembolism*.

**decompression stress** Human stress arising from decompression syndrome.

**deconfliction** In air display, arranging each slot to avoid scheduled traffic from same or nearby airfield[s].

**decoration** Extra manoeuvres, such as flick rolls, inserted into aerobatic routine while aircraft is being re-positioned.

**decoupler** Large-amplitude elastic connection separating two systems of masses which, if rigidly linked, would be prone to dangerous flutter; hence \* pylon for separating vibration of wing and heavy stores hung below it.

**decoy** Device or technique used to simulate attacking aircraft and their defensive systems. Usually operates at radar or IR wavelengths.

**DECR** Decrease.

**decrab** To yaw crabbing aircraft landing in crosswind to align wheels with track.

**decrement** Quantified decrease in value of variable.

**DECS** Defence Economic-Commerce Service (UK).

**DECT** Digital enhanced cordless telecommunications.

**Dectrac** Decca Navigator display for GA aircraft.

**DECU** Digital engine (or electronic) control unit.

**ded** Dedicated.

**DED** 1 Data entry display.

2 Directed-Energy Directorate (AFRL).

3 Directorate of Engineering Development (UK).

## **dedicated**

**dedicated** Available only for one declared application; thus a \* dock is tailored to one type of aircraft.

**dedicated runway** That permanently assigned as main instrument runway.

**DEE** 1 Di-ethyl ether.

2 Department of Education and Employment (UK).

**DEEC** Digital electronic engine control.

**DEEP** Dangerous-environment electrical protection system.

**deep** Far down the runway [said of a landing].

**deep cycling** Pre-delivery test of electronics (rarely, other hardware) by subjecting circuits to slightly excessive voltages.

**deepening** Decreasing pressure in centre of existing low.

**deep overhaul** Major overhaul, not normally performable by user.

**deep space** Not in vicinity of Earth.

**deep stall** Condition associated with T-tail, rear-engined configuration characterised by rapid increase in angle of attack to point where effectiveness of horizontal tail is inadequate for longitudinal control, and stable longitudinal trim point is reached with AOA up to 90°. Apparent synonyms are locked-in stall, superstall.

**deep surge** Operating condition [transient and violently unstable] in which air and possibly products of combustion are expelled from the inlet.

**DEEU** Data-entry electronics unit.

**DEF** Defensive systems (USAF).

**DEFA** Direction des Etudes et Fabrications d'Armement (F).

**Defaids** Defensive aids.

**Defamm** Development of demonstration facilities for airport movements guidance control and management (Euret).

**Defcon, DEFCON** Defence contracting (UK, MoD.).

**DEFCS** Digital electronic flight-control system.

**Defdars** Digital expandable flight-data acquisition and recording system.

**defence suppression** Secondary objective of air attack on enemy territory, to reduce or eliminate anti-aircraft defences.

**defense VFR** Filed by aircraft cruising at 180 kt or above intending to penetrate an ADIZ in VFR (US).

**defensive combat spread** Loose pair 1–2 miles (1.6–3.2 km) apart and slightly separated fore/aft and vertically.

**defensive electronics** Airborne ECM and EW equipment used to protect aircraft against hostile defences.

**defensive spiral** Accelerating high-g continuous-roll dive to negate attack.

**defensive split** Controlled separation of target element into different planes to force enemy interceptors to commit to one of them.

**defensive turn** Basic defensive manoeuvre to prevent an attacker from achieving a launch or firing position.

**deferment** Agreed postponement of delivery.

**deficiency** Fault condition (known or suspected), equipment shortage or other imperfection which may or may not render aircraft unairworthy.

**definition** 1 Clarity and sharpness of image in display.

2 In contract proposal, complete description by contractor of product offered.

**define** To complete the definition of (US usage).

**defl** Deflection.

## **degree of freedom**

**deflation port** Aperture in top of balloon gas envelope through which contents are [Ed. opinion, foolishly] dissipated after landing.

**deflected slipstream** Horizontal slipstream from propulsion system deflected downwards by mechanical means to augment lift for STOL or V/STOL performance.

**deflecting yoke** Mutually perpendicular coils around neck of CRT which control position of electron beam, enabling it to scan screen.

**deflection** 1 Bending or displacement of neutral axis of structural member due to external load.

2 Change in radius of pneumatic tyre, expressed as percentage.

**deflection angle** 1 In supersonic flight, that between longitudinal axis and outer surface of bow [nose] of body.

2 That between longitudinal axis and surface [esp. trailing edge of airfoil] determining angle of top and bottom shocks.

**deflection crash switch** One triggered by impact significantly changing shape of structure.

**deflection error** Lateral artillery error, as distinct from range error, usually problem with land rather than air targets.

**deflectometer** Instrument for measuring deflection under load of airfield surface. There are several species.

**Defra** Dept. of the Environment, Food and Rural Affairs, with many air-transport responsibilities [UK].

**defruiting** Elimination of fruiting by rejecting all non-synchronous replies; PRFs varying by  $2.5\mu s$  can be eliminated.

**Defstan, DefStan** Defence Standard (UK).

**DEFT** Directorate of Elementary Flying Training (UK, until 2003).

**DEFTS** Defence Elementary Flying Training School (replaced JEFTS 2003).

**defueller** Unit, usually vehicle-mounted, for draining fuel and condensate from aircraft.

**DEG** Dressed engine gearbox.

**DEG, Deg** Degree[s].

**degarbling** Elimination of garbling by trying to extract interleaved replies, differentiating between the exact leading and trailing edges of the pulses.

**degraded flight control** Usually means failure of surface power unit.

**degraded performance** Performance reduced by internal shortcomings, eg airframe tiredness, engine gas-path deposits, etc. Not normally used for external influences, eg hot-and-high conditions.

**degraded surface** Airfield covered with snow, ice or standing water.

**degreasing** Removal of grease, oil or related residue by solvent, either liquid such as naphtha or vapour such as trichlorethylene.

**degree** Non-SI unit of plane angle, =  $1.745329 \times 10^{-2}$  rad.

**degree of freedom** 1 Mode of motion, angular or linear, with respect to co-ordinate system; free body has six possible \*\*\*, three linear and three angular.

2 Specif., of gyro, number of orthogonal axes about which spin axis is free to rotate.

3 In unconstrained dynamic system, number of independent variables required to specify state at given moment. If system has constraints, each reduces \*\*\* by one.

**4** Of mechanical system, minimum number of independent generalised co-ordinates required to define positions of all parts at any instant. Generally, \*\*\* equals number of possible independent generalised displacements.

**DEI** Development engineering inspection.

**de-icing** Removal of ice accretion by thermal, mechanical or chemical means. Note: anti-icing prevents accretion.

**de-icing fluid** Glycol/alcohol mixtures are common for removing frost from parked aircraft. Fluids for use in flight include ethyl or isopropyl alcohol and ethylene or propylene glycols.

**DEIMS** Defense economic-impact modelling system (DoD).

**de-ionisation time** Time for gas-discharge tube to return to neutral condition after interruption of anode current.

**deka** Prefix,  $\times 10$  [non-SI].

**del** Delete.

**DEL** Delay, delay message; also DLA (ICAO code).

**de Laval nozzle** Con-di nozzle used in steam turbines, certain rockets, and some tunnels.

**delay** **1** Distance from point directly beneath aircraft to beginning of area visible to its radar.

**2** Electronic delay at start of time base used to select particular segment of total.

**3** Difference in phase between two EM waves of same frequency.

**delayed automatic gain control** Applied only to received signals above predetermined level, so permitting only weak signals to be fully amplified.

**delayed CCIP** CCIP for highly retarded bomb.

**delayed drop** Live parachute descent begun by prolonged free fall. Controlled by wearer, unlike *delayed opening*.

**delayed explosive tyre failure** Several aircraft have been destroyed by rupture in flight of an MLG tyre overheated by heavy or prolonged braking before takeoff.

**delayed flap approach** Otherwise conventional landing approach, usually by commercial jet, in which AFCS (TCC) or FMS is programmed to postpone final configuration until very late stage, typically near airport perimeter. Reduces noise and fuel burn.

**delayed opening** Opening of parachute canopy automatically delayed by barostat to allow rapid fall through stratosphere to safer altitude, usually 10,000–15,000 ft, 3050–4570 m.

**delayed repeater** Comsat which stores messages and retransmits later, usually at high rate in brief period of time.

**delay indefinite** ATC cannot yet estimate duration of delay; usually followed by Expect further clearance.

**delay line** Passive network, such as closed loop of mercury, capable of delaying signal without introducing distortion.

**delay parameter** Also called altitude \*, time that elapses between sharp nose-up command and start of climb or arrest of sink. Significant in large aircraft on landing, when sudden download at tail has opposite to desired effect [except canard aircraft].

**delay rate** Unusual measure of airline punctuality: number of delays (usually 5 min) per 100 scheduled departures.

**delivery error** Overall inaccuracy of weapon system resulting in dispersion of shots about aiming point.

**delphinopter** Class of micro air vehicles weighing c4.5g combining tail-flapping propulsion with a forward wing which twists for trajectory control. Most alternate between flapping and gliding.

**Delrin** UV-stabilized acetyl-resin adhesives.

**DELSC** Defence Electrical and Electronic Standardization Committee.

**delta ( $\delta$ )** **1** Surface deflection angle, thus  $e\delta$  = elevator deflection angle.

**2** Difference; thus \* 1700–1745 is 45 min.

**3** Delta wing, or delta-wing aircraft.

**Delta Gold** Top FAI rating for glider pilot, requiring flight of 300 km or closed circuit (landing back at start) of 200 km.

**delta h,  $\delta h$**  Quantified change in altitude or height above ground.

**delta hinge** Helicopter main-rotor flapping hinge, giving blade freedom to flap up/down vertically. Thus, \* is perpendicular to both blade axis and axis of rotation.

**Delta Silver** FAI qualification for glider pilot requiring distance flight 50+ km and [can be same flight] 5+ h duration.

**Delta-3** Helicopter tail rotor with two pairs of blades not crossing at 90°.

**delta-V,  $\delta V$ ,  $\Delta V$**  Quantified change in velocity, usually airspeed.

**$\Delta V_{whirl}$**  Change in whirl velocity, usually across a single stage of compression or expansion.

**delta wing** Wing of basically triangular plan-form with one apex at front and transverse trailing edge, usually with sharp leading-edge sweep giving low aspect ratio.

**deluge pond** Facility at site for testing or launching large vertically mounted rockets into which cooling water is flushed; also called skimmer basin.

**DEM** **1** Digital elevation model.

**2** Data-exchange model.

**3** Detector electronics module.

**demand breathing** See demand mask.

**demand mask** Mask through which oxygen or other therapeutic gas flows only on inspiration of wearer.

**demand mode** Acars mode initiated by either aircraft or ground processor.

**demand oxygen** See demand mask.

**demijohn** Fluid container of cylindrical form (F).

**Demiz** Distant early-warning military identification zone.

**demodulation** Detection of received signal by extracting modulating signal from carrier.

**Demon** Demodulation of noise.

**demonstrate** **1** To display new hardware according to detailed test schedule before certificating authority or sponsoring military customer.

**2** More specifically, to show compliance with numerical performance values, reliability or maintainability.

**demonstration flight** Made for potential customer [on board], normally not forming part of an airshow programme.

**demonstration lifejackets** Demo jackets are kept in a special locker, and are not normally considered part of actual emergency equipment.

**demonstrator programme** **1** Showing of new civil aircraft in visits to potential customers.

**2** Agreed schedule of tests of new hardware, including complete aircraft, before military customer in advance of

## demounting

any decision on procurement and often to establish what is possible.

**demounting** One meaning is to remove tyre from wheel; the wheel may include a demountable flange.

**Demoval, Demval** Demonstration and validation.

**Dempi** [pronounced dimpy]. Designated mean point of impact.

**Denalt** Density altitude.

**DENEБ, Deneb** Fog-dispersal operation.

**DEngRD** Directorate of Engine Research and Development (UK).

**denitrogenation** Removal of nitrogen dissolved in blood and body tissues, usually by breathing pure oxygen for extended period, to minimise aeroembolism. Also called preoxygenation.

**densified wood** Multiple laminates bonded under high pressure.

**densitometer** 1 Instrument for measurement of optical density, generally of photographic image.

2 Instrument for measuring fuel density, usually part of fuel measurement system.

**density** 1 Mass per unit volume; SI unit  $\text{kg/m}^3 = 0.062428 \text{ lb/ft}^3 = 0.01002 \text{ lb/lmp gal}$ ;  $1\text{g/cm}^3 = 0.036127 \text{ lb/in}^3$ ;  $1\text{lb/in}^3 = 27.6799 \text{ g/cm}^3 = 27,679.9 \text{ kg m}^{-3}$ ;  $1 \text{ lb/ft}^3 = 16.0185 \text{ kg/m}^3$  [reciprocal, 0.0624278]. Often needs qualifying for temperature and pressure (see *absolute\**, *relative\**).

2 Of aircraft, MTOW divided by total aircraft volume calculated from external envelope, or divided by both wing area and mean chord.

**density altitude** Pressure altitude corrected for non-ISA temperature.

**density error** Correction to EAS to give TAS (see *airspeed*).

**deorbit** Deliberately to depart from spacecraft orbit, usually to enter descent phase or change course.

**DEOS** Digital engine operating system.

**DEP** 1 Department of Employment and Productivity (UK).

2 ICAO code for depart, departure, departure message.

3 Departure airfield.

4 Design eye position (usually of pilot).

5 Direct-entry pilot.

6 Data-entry panel.

**departure** 1 Any aircraft taking off from airport (as distinct from other airfields) under departure control.

2 In air navigation, distance made good in E/W direction, usually expressed in nm.

3 General term for uncontrolled flight beyond the stall; see *divergence* (1) or *disturbance* (2).

**departure alternate** Alternate airfield specified in flight plan filed before takeoff.

**departure control** Function of approach control providing service for departing IFR aircraft and, on occasion, VFR aircraft in such matters as runway clearances, vectors away from congested areas and radar separations, all at nominated time.

**departure pattern** That flown in 3-D by departure (1).

**departure point** Navigational check point, such as VOR or visual fix, used as a marker for setting course.

**departure procedures** ATC procedures (usually SID) flown by departing aircraft during climb-out to minimum en route altitude.

**departure profile** Flight profile flown by departure (1) to

## depth

suit needs of vertical and horizontal separation, noise abatement, obstacle clearance, etc.

**departure runway** That from which departures (1) are cleared.

**departure stall** On attempted takeoff from small field, pilot avoids obstacle ahead by steep bank and sharp turn, then applying top rudder, stalling upper wing.

**departure strip** Flight progress strip recording callsign, ETD and route of departure.

**departure tax** Imposed by most states at flat rate per passenger.

**departure track** That followed by departure (1).

**departure traffic** Total number of departures, scheduled and non-scheduled, from one airport, usually expressed in movements per hour or per day.

**DEP CON** Departure control.

**Depcos** Departure co-ordination system (Airsys); see Depos.

**depigram** Plot of variation of dewpoint with pressure for given sounding on tephigram.

**deplane** Normally transitive verb, to ask all occupants to leave aircraft, especially because of fault or potential danger.

**depleted uranium** Dense metal [see uranium] removed in spent fuel rods from nuclear reactors, used in flight-control surface balances and gun ammunition.

**depletion layer** In semiconductor, region in which mobile carrier charge density is insufficient to neutralise net fixed charge density of donors (N-type) and acceptors (P-type). Also known as depletion barrier or zone.

**deployable simulator** Installed at front-line airbase or aboard carrier.

**deployment** 1 Strategic relocation of forces to desired area of operation.

2 Extension or widening of front of military unit.

3 Change from cruising approach, or contact disposition, to formation for battle.

4 Process from pulling ripcord to fully opened parachute.

5 Extension of solar panels from spacecraft.

6 Basic meaning of word: to use a military or naval aircraft operationally.

**deploy range** Range of combat aircraft on transfer from one theatre to another, if necessary with internal or external auxiliary fuel.

**DEPM** Data evaluation program manager[s] (ATOS).

**Depos** Departure co-ordination system (ATC).

**depot-level maintenance** Performed at a specialized overhaul facility, remote from user unit.

**depreservation run** Test run of machinery after storage, to validate performance.

**depressed-datum reheat** Engine control mode for jet STOVL giving reheat operation at low (dry) thrust levels, giving smooth auto control to max. thrust.

**depressed-sightline attack** Shallow dive.

**depressed trajectory** Flight profile of ballistic missile, esp. SLBM, fired over relatively short range with altitude kept low to reduce exposure to defending radars.

**depression** 1 Region of relatively low barometric pressure, also known as cyclonic area or low; secondary \* is small low accompanying primary.

2 Negative altitude, angular distance below horizon.

**DEPS** Directed Energy Professional Society (US).

**depth** Aerospace meanings include \* of depression, \* of

## Dept[s]

modulation and distance down runway; \* of wing profile is *thickness*.

**Dept[s]** Department[s].

**DER** 1 Designated engineering representative.

2 Departure end of runway.

**DERA** Defence Evaluation and Research Agency, in 2001 renamed *DRA* (UK).

**derated engine** One whose maximum power is governed at a lower than normal value. Hence derating.

**Derd, DERD** 1 Display of extracted radar data.

2 Incorrectly used to mean DEngRD.

**deregulation** Removal of rules regarding admission to air-transport industry of new carriers, routes and equipment.

**derisking** Self-explanatory procedure of basing a new design on known technology.

**derivative** Not precisely defined, but taken by certifying authority to mean that new aircraft or engine is so similar to the original version that no new certification programme is needed.

**derivatives, resistance** 1 Lateral \*\* give variation of forces and moments caused by small changes in lateral, rolling and yawing velocities.

2 Longitudinal \*\* give variation of forces and moments caused by small changes in longitudinal, normal and pitching velocities.

**derivatives, stability** Quantities expressing variation of forces and moments on aircraft due to any disturbance to steady motion.

**derotation** To put nose gear on runway after landing.

**DES** 1 Design environmental simulator (USAF).

2 Design engineering support.

3 Data encryption standard.

4 Descend, descent.

**DESC** 1 Defense Electronic Support Center (US).

2 Defense Energy Supply Center [concerned with fuels].

**DesCat** Data-exchange system for control and targeting.

**descending node** Longitude or time at which satellite crosses Equator from N to S.

**descent fuel** Fuel burned from TOD until either hold or approach.

**descent idle** Engine setting to optimise parameters in near-glide.

**descent indicator** See *VSI*.

**descent orbit insertion** Start of lunar or planetary landing procedure from orbit, with retrograde thrust into descent transfer orbit.

**descent propulsion** That providing trajectory control for soft lunar or planetary landing.

**descent stage** Lower part of two-way lunar or planetary lander which, when mission is completed, acts as launch pad for ascent stage.

**descent transfer orbit** Highly elliptical around Moon, can be circular around planet, in which soft lander is placed before descent to surface.

**Descr.** Description.

**deselect** 1 To switch off.

2 Eliminate contender from competition.

**desensitization** Reduction in TCAS threat volume.

**design** Entire process of translating hardware requirement or specification into final production drawings and NC tapes.

**designate** To point out a target by aiming a laser.

## despun antenna

**designated flying course** Prior to carrier landing, 15 seconds before turning downwind.

**designated target** One at which friendly designator (2) is pointed.

**designation marking** Use of laser or other designator.

**designator** 1 Letter/number code identifying each flight by a scheduled carrier.

2 Number/letter code identifying each runway, thus 26L = 260° left runway of pair.

3 Laser or other device pointed at target to make latter emit signals on which missile can home.

**Design Chain Accelerator** One of the first commercially offered clusters (1) for simulating complex systems (Intel/MSC/HP).

**design envelope** See *gust envelope*.

**design gross weight** Anticipated MTOW used in design calculations; design takeoff weight.

**design landing weight** Anticipated MLW used in design calculations.

**design leader** 1 Individual leading design team.

2 Nation in collaborative project said to have political dominance.

**design load** Specified load below which structural member or part is designed not to fail, usually expressed as probable maximum limit load, unfactored.

**design load factor** Maximum repeated vertical acceleration which an aircraft structure is designed to withstand without accretion of damage. Typical values for a jet transport are +2.5/-1g (with flaps extended reduced to +2), and for a fighter +12/-6.

**design maximum weight** Assumed weight used in stressing structure for flight loads.

**design office** That in which design takes place, and authority vested therein.

**design points** Specific combinations of variables upon which design process is based; together these cover every combination of air density, airspeed, Mach, dynamic pressure, structural loads (including free or accelerated take-off and normal or arrested landing) and system demands aircraft can encounter.

**design verification** First item built to new design to prove compliance with drawings and demonstrate correct functioning (see *DVA*).

**design weight** No standard meaning, but with most design/certification authorities is less than MTOW.

**design wing area** Area enclosed by wing outline (including flaps in retracted position and ailerons, but excluding fillets or fairings) on surface containing wing chords, extended through nacelles and fuselage to plane of symmetry.

**Desir** Direct English statement information retrieval (EDP).

**desmodromic** Mechanical drive giving perfect *SHM* to/fro action, esp. of cam drive to piston-engine valve.

**Deso, DESO** Defence Export Services Organization [former agency of the MoD, disbanded July 2007, replaced by UKTI].

**de-spin** To rotate part or whole of satellite or other spacecraft to neutralise spin previously imparted (see *next*).

**despun antenna** One mounted on satellite spun for reasons of stability which, because it must point continuously towards an Earth station, must rotate relative to satellite.

**dessyn** Synchro (trade name).

**dest** Destination airport.

**destage** To redesign an engine by removing one stage of blading from an axial compressor (usually the last stage).

**destretch** To produce new version of transport aircraft with fuselage of reduced length.

**destruct** To destroy vehicle after launch because of guidance or other failure making it dangerous.

**destructive test** One which destroys specimen.

**destruct line** Map boundaries which vehicle must not cross; any which does is immediately destructed.

**destructor** 1 Device, explosive or incendiary, for intentionally destroying all or part of vehicle such as wayward missile or aircraft down in enemy territory.

2 NW for undersea use.

**DESU** Digital electronic sequence unit (APU).

**deswirl** Deliberate reduction in swirl velocity, for whatever reason. Hence \*tubes, \*vanes.

**DET** 1 Direct energy transfer.

2 Double-element thermocouple.

3 Or Det, detachment.

**DETA** Di-ethylene triamine.

**detachable** Capable of being removed from aircraft with normal hand tools.

**detachable pack** Parachute held to the harness by quick-release clips.

**detached shockwave** One proceeding ahead of body causing it.

**detail** 1 To design small part such as attachment bracket.

2 Drawing (can be inset on main design drawing) giving graphical representation of features.

3 Small military detachment for particular task.

4 To assign to special task or duty.

**detail part** One not normally broken down during service or storage.

**Datasheet** Plastic explosive based on RDX/PETN.

**detectable crack** Nominal length 100 mm, 4 in.

**detector** Sensitive receiver for observing and measuring IR.

**detent** A spring-loaded catch permitting linear movement in one direction only.

**deterrence** Prevention of aggression through fear of consequences.

**DETF** 1 Data-exchange test facility.

2 Delayed explosive tyre [tire] failure.

**detolerancing** The principal meaning is to open out (relax) dimensional limits on airframe structure.

**detonating cord** Flexible explosive [usually shaped-charge] pipe for emergency severing of doors, canopies, etc. More recently spelt chord.

**detonation** 1 Violent and irregular combustion in piston engine cylinder resulting from excessive compression ratio or supercharging, or using inferior fuel; also known as knocking or pinking.

2 Correct triggering of explosive.

**detonator** Explosive device usually sensitive to mechanical or electrical action and employed to set off larger charge of explosive.

**detotalizing counter** Indicates total remaining of substance being measured, such as rounds for a gun or kg of fuel.

**DETR** Department of the Environment, Transport and the Regions [in 2002 became DfT] (UK).

**Detresfa** Distress phase of a search/rescue operation.

**DEU** 1 Display electronic unit.

2 Decoder/encoder unit (CIDS).

**deuce** Two fighter or attack aircraft, usually in loose echelon formation.

**deuteron** Nucleus of deuterium.

**deuterium** Isotope of hydrogen (heavy hydrogen) whose nucleus contains a neutron as well as a proton; used as projectile in nuclear processes. Forms heavy water ( $D_2O$ ) with oxygen.

**deuteride** Compound of deuterium. Lithium-6 deuteride is a standard fusion material in NW.

**DEV** Deviation.

**Devo** Development Committee (ISO).

**development** 1 Process of converting first flight article into mature product ready for delivery.

2 Ongoing process of improving production aircraft to carry heavier load, fly farther, accomplish new tasks, etc.

3 Determining by mathematical calculation, computer graphics or drafting methods, size, shape and other pertinent characteristics of non-flat parts.

4 Opening of parachute canopy.

5 Generally not precisely quantifiable, process in which aircraft becomes locked-in to stall, superstall or spin.

**development contract** Calls for development (1) of particular hardware item.

**development stage** Begins as soon as hardware to new design is available; main phase complete at service (production) release or certification, but continues throughout active life of aircraft.

**deviation** 1 Distance by which impact misses target.

2 Angular difference between magnetic and compass headings caused by magnetic fields other than that of Earth.

3 In statistics, difference between two numbers (also known as departure), difference of variable from its mean (esp. standard \*), or difference of observed value from theoretical.

4 In meteorology, angle between wind and pressure gradient.

5 In radio, apparent variation of frequency above and below unmodulated centre frequency.

6 In flying, sudden excursion from normal flightpath.

7 Any significant variation from plan.

**deviation card** Records compass courses corresponding to desired magnetic headings.

**devil** Dust devil.

**deviation light[s]** Warn pilot or ground controller of excessive departure from ILS beam.

**DEW** 1 Distant early warning.

2 Directed-energy weapon.

3 Dressed engine weight.

**dew** Atmospheric moisture condensed upon cold objects, esp. at night.

**dewar** Thermally insulated container, eg for cryogenics.

**DEWD** Dedicated electronic-warfare display.

**DEWIZ** Distant early-warning identification zone, extends from surface north of DEW line and around Alaska.

**DEW Line** Distant early-warning radar stations at about 70th parallel across North American continent (1955–58).

**dewpoint** Temperature at which, under ordinary conditions, condensation begins in cooling mass of air.

**Dews** Digital electronic-warfare simulator.  
**DF, D/F** 1 Direction-finding (or finder).  
   2 Digital filter.  
   3 Directed-flow (reverser).  
   4 Methylphosphonic difluoride, component of GB Sarin.  
   5 Data fusion.  
   6 Deutsche Flugsicherung [ATC] (G), also DFS.  
   7 Dong Feng = east wind, family designations of strategic ballistic missiles (China).  
   8 Double-fuselage.  
   9 Diesel fuel.  
 10 Defensive [or direct].  
 11 Downlink format.  
 12 Direct to fix.  
**D.F.** Helicopter rotor damping factor.  
**DF** Zero-lift drag, usually of whole aircraft.  
**DF-1, DF-2, DF-A** GA specifications for diesel fuel.  
**DFA** 1 Deutsche Flug-Ambulanz Gemeinnützige GmbH (G).  
   2 Delayed-flap approach.  
   3 Direction-finding antenna.  
   4 Design for assembly.  
**DFAC** Data-fusion analysis convergence.  
**DFAD** Digital-feature analysis data.  
**DFAR** Defense Federal Acquisition Regulations (US).  
**DFAS** Defense Finance and Accounting Service (US).  
**DFBW** Digital fly-by-wire.  
**DFC** 1 Distinguished Flying Cross.  
   2 Direct force control, eg on F-16.  
   3 Digital fuel control [S adds system].  
   4 Duty-free confederation.  
**DFCC** Digital flight-control computer.  
**DFCL** Director(ate) of flight-crew licensing.  
**DFCS** Digital flight – [or fuel] – control system.  
**DFCT** Directorate of Foreign and Commonwealth Training (UK, multiservice).  
**DFD** 1 Digital frequency discriminator.  
   2 Data flow diagram (real time).  
   3 Digital flight data.  
**DFDA** Defence Force Discipline Act (UK).  
**DFDAF** Digital flight-data acquisition function.  
**DFDAMU** DFD(3) acquisition management unit.  
**DFDAU** Digital [or distributed] flight-data acquisition unit.  
**DFDR** Digital flight-data recorder; S adds system.  
**DFDS** Digital fire-detection system.  
**DFDU** DFD(3) unit.  
**DfES** Dept. for Education and Skills (England).  
**DFF** Display failure flag.  
**DFG** 1 Digital flight guidance [C adds computer, S system, U unit].  
   2 Defence Fuels Group.  
   3 Deutsche Forschungsgemeinschaft [D-53175 Bonn] (G).  
**DF/GA** Day fighter/ground attack.  
**DFGC** Digital flight-guidance computer.  
**DFI** Direction-finding interferometer.  
**DFIC** Duty-free import certificate.  
**DFIDU** Dual-function interactive display unit.  
**DFIR** Deployable flight-incident recorder.  
**DFIU** Digital flight-instrument unit.  
**DFL** Dry-film lubricant.  
**DFLCC** DFCC.

**DF loop** Direction-finding aerial consisting of one or more turns of wire on vertically pivoted frame, giving maximum response in plane of frame, and thus PL through ground station (see *Adcock, ADF*).  
**DFLS** Day Fighter Leaders' School (RAF).  
**DFM** 1 Distinguished Flying Medal.  
   2 Digital frequency measurement.  
   3 Distortion-factor meter.  
   4 Direct-force mode.  
   5 Design for manufacture.  
**DFMS** Digital fuel-, or flight-, management system.  
**D<sub>form</sub>** Form drag.  
**DFQI** Digital fuel-quantity indicator.  
**DFR** 1 Dynamic flap restraint.  
   2 Departure flow regulation, or regulator.  
   3 Digital flight recorder.  
**DFRC** Dryden Flight Research Center [previously Facility] (NASA, at Edwards).  
**D<sub>frie</sub>** Total frictional drag, at low speeds almost equal to D<sub>F</sub>.  
**DFRR** Data-fusion risk reduction.  
**DFS** 1 Directorate of Flight Safety (UK).  
   2 Digital frequency synthesis, or select.  
   3 Deutsche Forschungsanstalt für Segelflug [glider research institute] (G).  
   4 Deutsche Flugsicherung GmbH [air-traffic control; office D-63067 Offenbach] (G).  
   5 Dynamic fuel-slosh measure.  
   6 Detailed functional specification.  
**DFSC** Defense fuel supply center (DoD).  
**DFT** 1 Distance from threshold.  
   2 Discrete Fourier transform.  
   3 Demand flow technology.  
   4 Defence fixed telecommunications [S adds system] (UK).  
**DfT** Department for Transport [May 2002-; office, London SW1P 4DR] (UK).  
**DFTDS** Data-fusion technology demonstrator system.  
**DFTI** Distance-from-touchdown, or threshold, indicator.  
**DFU** 1 Digital function unit.  
   2 Deployable flotation unit.  
   3 Exhortation, Don't f\*\*\* up!  
**DFV** Deutsche Flugdienstberater Vereinigung (G).  
**DFVLR** Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, now DLR (G).  
**DFW** Dedicated field work (USN).  
**DFWD** Discrete flight warning display.  
**DFWF** Direct-fire weapons effects; S adds simulator or simulation.  
**DG** 1 Directional gyro, = DI (2).  
   2 Dichromated gelatin.  
**Dg** Maximum growth of tyre [tire] outside diameter.  
**DGA** 1 Dispersed ground alert.  
   2 Délégation Générale pour l'Armement (F).  
   3 Director-General Aircraft, (N) adds Navy (UK).  
   4 Displacement gyro assembly.  
**DGAA** Director-General for Aeronautical Armaments (I, for NATO).  
**DGAC** 1 Direction Générale de l'Aviation Civile (F).  
   2 Directorate-General of Air Communications (Indonesia).  
   3 Direzione Generale dell'Aviazione Civile (I).  
   4 Direccao-General da Aviacao Civil (Portugal).

- DGES** 5 Dirección General de Aviación Civil (Spain etc).  
**DGES** Director-General Equipment Support; can have suffix (Air). (UK).
- DGI** Directional gyro instrument or indicator.
- DGIA** Dirección General de Infraestructura Aeronáutica (Uruguay).
- DGIA** Defence Geographic and Imagery Intelligence Agency (UK).
- DGLR** Deutsche Gesellschaft für Luft- und Raumfahrt [office, Bonn] (G).
- DGLRM** Deutsche Gesellschaft Für Luft- und Raumfahrtmedizin (G).
- DGM** 1 Distance-gone meter (Doppler).  
   2 Digital-group multiplexer.
- DGMS** Director-General of Medical Services (RAF).
- DGNS** Differential global navigation system.
- DGNSS** Differential global nav-sat system; U adds unit.
- DGON** Deutsche Gesellschaft Für Ortung and Navigation (G).
- DGPDM** Data-gathering, processing and display manager.
- DGPS** Differential GPS.
- DGR** Dangerous-goods requirements (1ATA).
- DGRR** Deutsche Gesellschaft Für Raketentechnik und Raumfahrt (G).
- DGSM** Director-General of Support Management (RAF).
- DGRST** Direction Générale à la Recherche Scientifique et Technique (F).
- DGS** 1 Disc-generated signal.  
   2 Digital-generation subsystem (ECM).  
   3 Docking guidance system.  
   4 Deployable ground system [various suffixes] (USAF).
- DGSI** Drift and groundspeed indicator (Doppler).
- DGT** Digital GPS translator.
- DGTA** Dirección General de Transporte Aéreo (Peru, etc).
- DGTE** Director-General Test & Evaluation (UK).
- DGU** Display generator unit.
- DGV** Doppler ground velocity system.
- DGW** Design gross weight.
- DGZ** Desired ground zero; point on Earth's surface nearest to centre of planned nuclear detonation (see *actual ground zero, ground zero*).
- DH** 1 Decision height.  
   2 Dataflash Header.
- DHA** Display head assembly.
- DHB** Dynamic hot bench.
- DHDA** Digicon header diode array.
- DHFS** Defence Helicopter Flying School, (RAF Shawbury, UK).
- DHHKHH** Aeronautic Association (S. Korea).
- DHMI** Airports authority (Turkey).
- DHO** Damped harmonic oscillator.
- DHS** 1 Data-handling system.  
   2 Department of Homeland Security [2002–] (US).
- DHSA** Defence Helicopter Support Authority (UK).
- DHUD** Diffraction, or diffractive-optics, HUD.
- DHV** 1 Deutscher Hubschrauber Verband, [helicopter association; office, D-56581 Melsbach] (G).  
   2 Deutscher Hängegleiterverband, [hang gliding and sport parachuting; office, D-83703 Gmund] (G).
- DI** 1 Daily inspection.
- 2** Direction indicator.
- 3** Director of Intelligence.
- 4** Duty instructor.
- 5** Direct-injection.
- 6** Data interrupt.
- 7** Dynamic inversion [control of linear system].
- D<sub>i</sub>** Induced drag.
- DIA** 1 Documentation Internationale des Accidents (DocIntAcc).  
   2 Defense Intelligence Agency (US).  
   3 Document interchange architecture (IBM).  
   4 Data-interaction architecture; DEM adds demonstrator.  
   5 Digital interface adaptor card.
- diabatic process** Process in thermodynamic system with transfer of heat across boundaries.
- diabolo** Landing gear with two wheels side-by-side on centreline of aircraft [esp. MLG].
- DIAC** Data-Interpretation Analysis Center (US).
- diagnostic routeing equipment** Automatic or semi-automatic fault-isolating tester with ability progressively to narrow down location of fault.
- diagonal-flow compressor** One in which air flows diagonally to plane of rotation, centrifugal with axial component.
- Dial** Differential-absorption lidar.
- dial-a-STOL** Notional method of operating CTOLs from bomb-damaged runways in which weapon/fuel load is selected according to length of undamaged runway available.
- Dialmet** Automated Metar and TAF service.
- Dials** Digital integrated automatic landing system.
- dial your weight** Small computer on whose keyboard is manually inserted all fuel, crew, payload and other on-board items, displaying MTOW and c.g. position (colloq.).
- diamagnetic** Reacting negatively to magnetic field, developing magnetic moment opposed to it, with permeability less than 1; includes aluminium, non-ferrous alloys and corrosion and heat-resistant steels.
- diameter** 1 That of any circular arcs making up fuselage external cross-section.  
   2 In optics, unit of linear measurement of magnifying power.  
   3 Of parachute canopy, that while fully spread out on flat surface.
- diametral clearance** The total free movement in the radial direction between the inner and outer races of a ball or roller bearing.
- diametral pitch** Ratio of number of teeth on gearwheel divided by pitch diameter.
- Diamond C** Highest proficiency award for which sailplane pilots can qualify.
- diamond landing gear** Tandem centreline mainwheels, and outriggers.
- diamond roll** Precision machine tool for dressing grinding wheels.
- diamonds** See *shock diamonds*.
- diamond-wing aircraft** Has swept-back front wing merged at tips into forward-swept rear wing; also called *twin-wing*.
- Diane** 1 Digital integrated attack navigation equipment.

**2** Détection identification analyse des nouveaux émetteurs [helo threat warning] (F).

**DIAP** Defense Information Assurance Program (DoD).

**diaphragm** Fabric partition within aerostat; may be gastight (ballonet \*) or non-gastight (stabilizer \*).

**diathermy** Generation of heat by HF power, usually at 0.5/1.5 MHz.

**Diatms** DISN interim asynchronous transfer services.

**DIB** *1* De-icer boot.

*2* Digital, or DCGS1, integration backbone.

*3* Dry-ice blasting.

**dibber** Weapon intended to penetrate concrete runway before exploding.

**DIC** *1* Defence Industries Council (UK member of EDIG).

*2* Dynamic-inversion controller.

**Dicarps** Digital cassette recorder for passive sonar.

**Dicass** Directional command-activated sonobuoy system.

**dice** *1* Semiconductor chips or IC after scribing and separation.

*2* To fly, esp. in exciting manner or on operations (collog. RAF, WW2). Hence, **dicing**: ‘op’ is on, not scrubbed.

**dichroic mirror** One coated with molecular-thickness layer of reflector, usually metal, so as to transmit some EM wavelengths (esp. visible colours) and reflect others.

**DICU** Display interface control unit.

**DID** *1* Data-item description [S adds sheet(s)].

*2* Digital-image design.

*3* Data-insertion device.

**diddler** CRT auxiliary electrostatic plates which can collapse elongated blips to sharp spots.

**DIE** Defense [defence] information environment.

**die** *1* Press tool, often in mating male/female halves, which cuts sheet or imparts three-dimensional shape to workpiece.

*2* Shaped tools used in \*-casting.

*3* Shaped tools used in \*-forging.

*4* Shaped female mould used in explosive or magnetic forming.

*5* Shaped male tool used in ultrasonic, ECM and related mechanical, chemical or electrochemical shaping.

*6* Tool with shaped aperture used in extrusion.

**dielectric** Substance capable of supporting electric stress, sustaining electric field and undergoing electric polarization; includes all insulators and vacuum.

**dielectric constant** Ratio of capacitance of material to same condenser using air or vacuum, or of ratio of flux densities in the two media. Also called **permittivity**. Symbol  $\epsilon$ , but  $\Delta$ ,  $\chi$  and other symbols can be found.

**dielectric heating** Generated in dielectric subjected to HF field, resulting from molecular friction due to successive reversals of polarization; power dissipated is **dielectric loss**.

**dielectric strength** Measure of resistance of dielectric to electrical breakdown under intense electric field; SI unit is  $V\text{m}^{-1}$ ; also known as breakdown potential.

**dielectric tape camera** TV recording camera (Vidicon) giving output on tape in form of varying electric field.

**DIELI** Direction des Industries Electroniques et de l’Informatique (F).

**DIEPS** Digital imagery exploitation and production system.

**diergolic** Non-hypergolic, thus requiring an igniter system.

**diesel** IC engine utilising heat of compression to ignite fuel oil injected in highly atomised state direct into cylinder, with piston nearly at TDC.

**dieseling** Any spontaneous ignition of combustible gaseous mixture due solely to temperature caused by compression.

**diesel ramjet** Ramjet operating at Mach number high enough for fuel to ignite by heat of air compression.

**DIF, dif** Diffuse weather.

**Difar** Directional acoustic frequency analysis and recording (ASW).

**difference in depth of modulation** Modulation of stronger [usually ILS] signal minus that of weaker, both expressed as percentages, divided by 100.

**differential ailerons** Ailerons interconnected so that upgoing aileron travels through larger angle than down-going. This increases drag of wing with upgoing aileron and minimises extra drag of the other wing.

**differential ballistic wind** In bombing, hypothetical wind equal to difference in velocity between ballistic and actual winds at release altitude.

**differential controls** Control surfaces on opposite sides of body or fuselage which move in opposition to cause or arrest roll.

**differential fare** Difference in airline fare levels usually reflecting time-saving and passenger appeal of new aircraft.

**differential GPS** Operates by placing a receiver at a point precisely referenced to a point on a runway. It then makes satellite measurements, from which error signals are transmitted to the airborne receiver which then corrects the signals received from the satellite, esp. for precision approach.

**differential laser gyro** Two lasers of opposite polarization operate in same cavity; comparison of outputs gives twice angular-measure sensitivity of normal laser gyro.

**differential pitch** Original term for *cyclic pitch*.

**differential positioning** See *differential GPS*.

**differential pressure** Pressure difference between two systems or volumes (abb. dP). That of fuselage or cabin is maximum design figure for pressurization system, beyond which point spill valves open.

**differential spoilers** Wing spoilers used as primary or secondary roll control.

**differential tailplane** See *taileron*.

**differential tracker** Radar that can simultaneously measure angular separation of target and friendly missile, so that guidance system can reduce this value to zero.

**differentiating circuit** Circuit delivering output voltage in approximate proportion to rate of change of input voltage or current.

**diffraction** Phenomena which occur when EM wave train, such as beam of light, is interrupted by opaque object(s). Rays passing through narrow slit, or a grating made of slits, are bent slightly as they pass edges; thus waves can ‘bend’ around obstacle.

**diffraction grating** Several forms of grating with lines so close that they diffract EM wavelengths.

**diffraction-optics HUD** Uses a precise 3-D array of

## diffuser

microminiature grids, or light apertures, to create a volume hologram which makes possible a wide-angle HUD suitable for all-weather low-level navigation and weapon-aiming.

**diffuser** Expanding profiled duct or chamber, sometimes with internal guide vanes, that decreases subsonic velocity of fluid, such as air, and thus increases its pressure, downstream of compressor or supercharger, upstream of afterburner, and in some wind tunnels. In contrast, supersonic flow through a \* is reduced in pressure and increased in velocity, hence con/di nozzle.

**diffuser area ratio** 1 Ratio of outlet to inlet cross-section area of diffuser, esp. of ramjet.

2 Ratio of area of jet-lift mixed-flow nozzle divided by that of primary jet.

**diffuser, compressor** Ring of fixed vanes or expansion passages in compressor delivery of gas turbine to assist in converting velocity of air into pressure.

**diffuser efficiency** Ratio of total energy at exit to entry or achieved/theoretical pressure rise.

**diffuser tunnel** Wind tunnel containing section in which velocity is converted into pressure.

**diffuser vanes** Guide vanes inside diffuser that assist in converting velocity into pressure.

**diffusion** 1 In atmosphere or gaseous system, exchange of molecules across border between two or more concentrations so that adjacent layers tend towards uniformity of composition.

2 Of stress, variation along length of structure of transverse distribution of stress due to axial loads.

3 In materials, movement of atoms of one material into crystal lattice of adjoining material.

4 In ion engines, migration of neutral atoms through porous structure prior to ionisation at emitting surface.

5 Of light, scattering of rays, either when reflected from rough surface or during transmission through translucent medium.

6 In electronic circuitry, method of making p-n junction in which n- or p-type semiconductor is placed in gaseous atmosphere containing donor or acceptor impurity.

7 Of uranium, repeated gaseous-phase concentration of fissile U-235.

**diffusion bonding** Use of diffusion (3) to join solids with high surface finish in uncontaminated intimate contact.

**diffusion coefficient** Absolute value of ratio of molecular flux per unit area to concentration gradient of gas diffusing through gaseous or porous medium, evaluated perpendicular to gradient.

**Diflis** Digital flight-strip system.

**DIFIM** Digital instantaneous frequency-measurement; R adds receiver.

**DIFOT** Duty involving flight operations and training.

**DIG** 1 Display/indicator group.

2 Directional gyro (usually DG).

3 Digital image generator (or generation).

**Digest** Digital international geographic[al] exchange standard (NATO).

**digibus** Any digital multiplex data highway.

**digicon** Diode array giving a light input to electrical signals which are then amplified and analysed.

**Digilin** Digital plus linear functions on one chip (trade name).

**Digitac** Digital tactical aircraft control (USAF).

## dimpling

**digital** Operating on discrete numbers, bits (0s and 1s) or other individual parcels of data.

**digital/analog converter** Device which converts analog inputs (eg. varying voltages) into digits. Also known as **digitiser**.

**digital display** Usually means numbers instead of needle/dial.

**digital phase coding** Basic radar technique for hi-PRF and LPI.

**Dignu** Deeply integrated guidance and navigation unit.

**DIGS** Digital generation simulator.

**DIH** Department of Information Handling (ESOC).

**dihedral** Acute angle between left (port) and right (starboard) mainplanes or tailplanes (measured along axis of centroids) and lateral axis. See *anhedral, cathedral*.

**dihedral effect** 1 Roll due to sideslip.

2 Extra dihedral due to flexure of wing [esp. of sailplane] under load.

3 Sideslip effect in variable-sweep aircraft that causes change in rolling moment; too much augments roll response while too little (adverse sideslip) opposes it.

**DII** 1 Defense information infrastructure [COE adds common operating environment, F adds future, FD future deployed, IC adds integration contract] (UK MoD, US DoD).

2 DCMS interphone interface.

**DIL** 1 Digital integrated logic.

2 Dual in-line.

**Dilag** Differential laser gyro.

**DILS** Doppler ILS.

**diluter control** In an oxygen breathing system, regulates the ratio of oxygen to air.

**dilution holes** Precisely arranged air holes in combustion-chamber liner or flame tube.

**dilution of precision** Degrading factor caused by the often very small angle at which a GPS customer sees a satellite; GDOP adds geometric \*.

**dilution zone** The downstream end of a gas-turbine combustion chamber, where combustion should be complete and air is added for cooling.

**DIM** Dispense interface microprocessor.

**dim** RAF slang, 1, stupid; 2 to disagree, as 'to take a \* view of'.

**DIMA** Darpa interference multiple access.

**Dimas** Distributed information management and administration system.

**Dime** 1 Dynamic IR missile evaluation.

2 Distributed integrated modular electronics.

**dimensional similarity** Of physical quantities, made up of same selection of fundamental M (mass), L (length) and T (time) raised to same indices.

**Dimes** Descent image-motion estimation subsystem (planetary landers).

**diminishing manufacturing source[s]** Redesign of obsolete parts [esp. avionics] to ensure continued procurement.

**DIMM** Dual-part integrated memory monitor.

*Dimp* *Demp*.

**dimpled tyre** Landing-wheel tyre whose contact surface is covered with small recesses, mainly to provide visual index of wear.

**dimpling** Countersinking thin sheet metal by tool which dimples (recesses) without cutting, so that rivethead is flush with surface.

## DIMSS

**DIMSS** Dynamic interface modeling and simulation system.

**DIN** 1 Deutsches Institut für Normung eV [equivalent of BSI, NBS; office D-10787 Berlin] (G).

2 Digital inertial navigation.

**DINA** Direct noise amplification.

**DINAS, Dinas** Digital inertial nav/attack system.

**DINFIA** Dirección Nacional de Fabricaciones e Investigaciones Aeronáuticas (Arg.).

**dinghy** Small boat, usually of inflatable rubberised fabric, for use by crew and passengers after aircraft has ditched. Correct term is liferaft.

**dinghy drill** Procedure for unpacking, inflating and entering dinghy.

**dining-in night** Formal dinner, usually once per month, attended by all members of mess and invited guests (RAF).

**dinking** Use of thin blade-like shaped die(s) to cut soft sheet materials such as leather, cloth, rubber or felt, and to cut lightening holes in thin sheet-metal; inexpensive die is used, and cutting action is by steady pressure or hand hammer.

**DINS** Digital inertial navigation system.

**DIO** 1 Defence Industry Office [Sydney, NSW 2000] (Australia).

2 Distributed Information Operation (USN).

**diode** Two-electrode thermionic valve containing cathode and anode, or semiconductor device having unidirectional conductivity.

**diode lamp** Semiconductor diode which, when subject to applied voltage, emits visible light. Smaller than most switchable light sources. Also known as light-emitting diode (LED).

**DIOT & E** Dedicated initial operational test and evaluation, requires four primary aircraft plus backup, all close to production configuration.

**DIP** 1 Digital image processing.

2 Defense industrial plant (US); EC adds 'equipment center'.

3 Defense industrial participation.

4 Defence Industrial Policy (UK, October 2002).

5 Debtor in possession.

6 Dual inline package [ICs].

7 Data-interrupt program.

8 Diplexer.

**dip** 1 Angle between magnetic compass needle perfectly poised or on horizontal axis and local horizontal plane. Also known as magnetic inclination.

2 Vertical angle at eye of observer between astronomical horizon and apparent line of sight to visible horizon.

3 Angle between local horizontal and lines of force of terrestrial magnetic field (indicated by [1]).

4 Salutation by briefly rolling aircraft towards observer, to \* wing in salute.

**DIPA** Defence Industrial Program Authorization.

**diplexer** Device permitting antenna (aerial) system to be used simultaneously or separately by two transmitters.

**DIP/LNA** Diplexer and low-noise amplifier.

**diplomatic authorization** Authority for over-flight or landing obtained at government level.

**diplomatic clearance** The number and callsign allocated to a military aircraft to permit it to overfly foreign territory.

## direct force control

**diplomatic locker** Secure compartment used solely for documents and other items being carried on behalf of the government to which the aircraft is registered.

**dipole** 1 System composed of two separated and equal electric or magnetic charges of opposite sign.

2 Antenna (aerial) composed of two conductors in line, fed at mid-point. Total length equal to one half wavelength.

**DIPP** Defense/industry partnership program (Canada).

**dipper** See *fuel dipper*.

**dipping sonobuoy** One designed to be suspended but not released from helicopter and immersed in selected places in sea.

**DIPR** Directorate of Intellectual Property Rights (UK).

**DIPS** Dipole inches per second (chaff dispenser).

**dipstick** Graduated quasi-vertical gauge of fluid level in container, usually disconnected for reading.

**dipsydoode** Official term for rollercoaster manoeuvre performed by SR-71 and some other supercruise aircraft following inflight refuelling, comprising dive to supersonic speed followed by accelerating climb back to operating height.

**DIQAP** Defence Industries Quality-Assurance Panel (UK).

**DIR** 1 Diagnostic imaging radar.

2 Distributed IR.

3 Direct, direction, director.

4 Digital instant recall.

5 Dwell illumination region.

**Dircen** Direction des Centres d'Expérimentations Nucléaires (F).

**Dircm** Directional, or directed, IR countermeasures (said as a word, USAF).

**direct-action fuze** See *DA fuze*.

**direct approach** Unflared landing.

**direct broadcast** Satellite powerful enough to transmit TV direct to terrestrial recipient or subscriber.

**direct coupling** Association of two circuits by having an inductor, condenser or resistor common to both.

**direct-cranking starter** Hand crank or starter geared to crankshaft to start engine.

**direct current** Electric current constant in direction and magnitude.

**Directd** Digital imaging reconnaissance demonstrator.

**direct damage assessment** Examination of actual strike area by air or ground observation or air photography.

**directed-energy weapon** One whose effect is produced by a high-power beam, normally of EM radiation, having essentially instantaneous effect at a distance. Most important are lasers and HPM.

**directed-flow reverser** Reverser whose discharge in the reverse mode is confined within limited angular limits to avoid the airframe or FOD/reingestion problems.

**directed mode** DME mode allowing FMCS to select one to five DMEs for interrogation.

**directed slipstream** Means of achieving STOL in which slipstream created by propellers or fans is blown over entire wing. Also known as deflected slipstream.

**direct flight** 1 Portions of flight not flown on radials or courses of established airways.

2 Point-to-point space flight, without rendezvous, docking or other manoeuvre.

**direct force control** Control of aeroplane trajectory by application of force normal to flightpath without prior

## direct frontal

need to rotate to different attitude; eg lateral force by combined rudder and chin fin, vertical by tailerons/flaps/spoilers or vectored thrust.

**direct frontal** Air-combat tactic for double attack in which one interceptor closes head-on on each side of enemy force.

**direct injection** Precise metered doses of fuel sprayed directly into cylinder combustion space, not into eye of supercharger.

**direction** See *azimuth, bearing, course, heading, track*.

**directional aerial, antenna** Aerial which radiates or receives more efficiently in one direction than in others.

**directional beacon** Transmitter emitting coded signals automatically to enable aircraft to determine their bearing from the beacon with a communications receiver.

**directional gyro** Free-gyro instrument for indicating azimuth direction. Usually free from turning errors but prone to precess/wander.

**directional instability** Tendency to depart from straight flight by a combination of sideslipping and yawing.

**directional marker** Ground marker indicating true north and direction and names of nearest towns.

**directional network waveform** A high-speed net linking mobile stations throughout a theater of operations.

**directional solidification** Casting metal alloys in such a way that all transverse grain boundaries are eliminated, leaving long columnar crystals aligned with direction of principal stress.

**directional stability** Tendency of an aircraft to return at once to its original direction of flight from a yawing or sideslipping condition; also known as weathercock stability.

**direction-finder** Automatic or manually operated airborne receiver designed to indicate bearing of continuous-wave ground radio beacon (see *ADF*).

**direction indicator** See *directional gyro*.

**directivity** Antenna radiant energy per unit solid angle in a given direction [usually main axis] divided by that averaged over all directions.

**direct lift control** Use of aerodynamic surfaces, esp. symmetric spoilers, to provide instantaneous control of rate of descent without need to rotate aircraft in pitch.

**direct operating cost** Costs of operating transport aircraft, usually expressed in pence or cents per seat-mile, per US ton-mile or per mile, and including crew costs, fuel and oil, insurance, maintenance and depreciation. Excluding indirect expenses, such as station costs or advertising; usually taken as 100 per cent of direct costs.

**director** 1 Aircraft equipped to control RPV or missile.

2 In air traffic control, a radar controller.

3 Fire-control tower in warships.

**director horizon** One name for a panel instrument combining an artificial horizon with radio inputs, especially ILS and VOR.

**direct shadow photo** Simplest and oldest shadow photography: bright point source of light (in former days, spark) throws shadow of body and shockwaves on to photographic plate.

**direct side-force control** DFC (2) flight-control system in which aircraft (heavier than air) can be translated sideways without yaw or change of heading by application of direct lateral force.

**direct transit** Special rules under which aircraft may pause [eg, to refuel] in a Contracting state.

## disc loading

**direct-view storage tube** CRT storage tube needing no visor in bright sunshine.

**direct-vision optics** See next.

**direct-vision panel** Flight-deck window or part of window that can be opened.

**direct voice input** Control of function [eg. panel display, weapon selection, radio channel] by spoken command.

**dirigible** Capable of being guided or steered; thus an airship but not a balloon.

**Dir/Intc** Direct intercept.

**DIRP** 1 Defense industrial reserve plant (US).

2 Defense Industrial Research Program (Canada).

**DIRS** 1 Damage information reporting system.

2 Distributed IR system.

**dirty** 1 Aircraft configuration in which aerodynamic cleanliness is spoilt by extension of drag-producing parts, eg landing gear, flaps, spoilers, airbrakes.

2 NW whose detonation releases large quantity of toxic radiological material or emissions.

**dirty bird** Stealth aircraft coated [especially freshly] with ferrite paint.

**dirty duty** On intercept-ready status (USAF aircrew).

**DIS** 1 Distributed-intelligence system (MMI).

2 Defense Investigative Service (US DoD).

3 Defence Intelligence Service (UK MoD).

4 Distributed interactive simulation.

5 Data-intensive system[s].

6 Drawing-introduction schedule.

7 Defence Industrial Strategy [December 2005–] (UK).

**DISA** Defense Information Systems Agency (US).

**disabled aircraft** Damaged, or otherwise unairworthy, aircraft which could interfere with an airfield's operation.

**DISC** Defence Intelligence and Security Centre (Chicksands, UK).

**Disc** 1 Disconnect.

2 Direct [defense injection, reception and emergency action message command and control terminal] improvement and sustainment contract (NMCC).

**disc** 1 Ring on which one stage of compressor blades is carried. There is no defined boundary between this and a ring.

2 Hub carrying blades of fan or turbine.

3 Circular area swept by propeller or lifting rotor.

**disc area** Of propeller or helicopter rotor, area of circle described by tips of blades.

**Disch** Discharge.

**dischargeable weight** 1 All masses which may be jettisoned overboard in emergency.

2 Of airship, total weight that can be consumed or jettisoned and still leave ship in safe condition with specified reserves of fuel, oil, ballast and provisions.

**discharge coefficient** The ratio of actual to theoretical mass flows, symbol  $C_d$ .

**discharge correction factor** Of rocket nozzle, ratio of mass flow to that of ideal nozzle which expands identical working fluid from the same initial conditions to same exit pressure.

**discharge valve** Manually operated and opened sparingly to release hot air from balloon envelope. Generally = dump valve (3).

**discing** Operation of propeller in ground fine pitch to cause aerodynamic drag.

**disc loading** Helicopter weight, or rotor thrust, divided by main-rotor disc area, T/A.

**Disco** Directional composite whose resin-impregnated fibres can slip past each other, giving highly deformable product which retains directional strength properties.

**Discon** Defence integrated secure communications network (Australia).

**disconnect** Inadvertent or deliberate severance of flow during boom-type air refuelling.

**disconnect bolt** Manually removed link in nose landing gear to permit sharper turns when under tow on ground.

**discontinuity** 1 Sudden break in the continuity of mathematical variable.

2 In meteorology, zone within which there is rapid change, as between two air masses.

**discontinuous fibre** Chopped roving as distinct from yarn or tow.

**discount carrier** Despite next entry, one that [often in partnership with another] legally offers permanent low-cost travel, principally for tourists.

**discounting** Illegal selling of airline tickets, for affinity group and other promotional fares, at below agreed tariffs.

**discourager** A form of gas sealing insert closely related to honeycombs and labyrinths.

**Discr** Discrepancy.

**discrete code** Any of the 4096 xpdr codes available to ATCRBS except those ending with a zero.

**discretion** Flight time outside normal crew duty limits but legally permitted with concurrence of captain or PIC.

**discrimination** 1 Of radar, minimum angular separation at which two targets can be seen separately.

2 Precision with which satellite antenna can focus in particular direction.

**discriminator** Stage of FM receiver which converts frequency deviations of input voltage into amplitude variations.

**discus** Of variable-geometry wing, part-circular portion of upper surface of fixed glove on which swinging portion can slide.

**disembark** To step down from COD aircraft.

**dish** Reflector for centimetric radar waves whose surface forms part of paraboloid or sphere.

**dishing** 1 Pressing regular depressions in thin sheet to increase stability and resistance to bends.

2 In formation aerobatics, unwanted distortion of planar formation into dish shape [e.g. in formation roll].

**disk** Disc, except for compact \*.

**dismounted flight training** Hands-off training on ground using hand-held model aircraft, particularly for air-combat tactics.

**DISN** Defense Information System Network (DoD).

**Disney bomb** Armour-piercing free-fall bomb weighing 4,500 lb (2041 kg) finally accelerated to 2,400 ft/s ( $1089 \text{ ms}^{-1}$ ) by rocket (UK WW2).

**DISOSS, Disoss** Distributed office support systems (SNA).

**DISP** Displaced.

**dispatchable** Cleared to fly despite deficiencies [e.g. engines in N<sub>1</sub> instead of EPR mode].

**dispatch** 1 To supervise exit of parachutists, or to unload stores with parachutes attached, from aircraft in flight.

2 Process of supervising readiness of civil transport for next flight, with departure on schedule.

**dispatch deficiency** Malfunction, failure, breakage,

missing equipment item or other irregularity which does not prohibit on-time departure.

**dispatch delay** Any notifiable delay, measured variously from either 5 or 15 min, in departure of scheduled flight.

**dispatch deviation** Any reportable irregularity other than deficiency which does not prohibit on-time departure.

**dispatcher** One who is responsible for despatching an airline flight See *air\**.

**dispatch reliability** 1 Essentially self-explanatory, the quantified record of an aircraft in repeatedly fulfilling its design mission. It can be plotted graphically with probability of dispatch as the ordinate [the axis typically extending from 0.95 to 1] and the number of days without maintenance action as the abscissa. Thus, for each failure the aircraft shall be able to operate for a specified number of days with the stipulated likelihood of a second failure not occurring.

2 Percentage of all scheduled flights by particular aircraft or all aircraft of that type, often over specified period or for particular operator, that departed on time (measured as within 5 or 15 min).

**dispensation** Agreement to waive a rule without affecting safety.

**dispenser** 1 Container from which objects [e.g., ECM chaff cartridges, flares and active emitters] can be ejected in predetermined sequence.

2 Externally carried container for bomblets or other small multiple munitions.

**dispensing** 1 Release of ECM payloads in controlled manner.

2 Supply of fuel to aircraft via hydrant.

**dispensing sequence** Graphical or tabular plan for ECM to meet expected threats.

**dispersal** 1 Geographical spreading out of aircraft, material, establishments or other activities to reduce vulnerability to enemy action.

2 Dispersal area.

3 Parking area, usually paved, accessible from perimeter track, on which one aircraft could be parked. Some WW2 airfields had over 100.

**dispersal airfield** Potential operating platform for strategic aircraft, especially bomber with NW, which could within hours become an operating base following political crisis or actual attack [1957–90].

**dispersal area** Area usually on remote parts of airfield to which aircraft and support equipment can be dispersed in wartime.

**dispersant oil** Lubricating oil with additives which slow or even prevent formation of sludge and other solid deposits.

**dispersion** 1 Average distance from aim point of bombs dropped under identical conditions or by projectiles fired from same weapon or group of weapons with same firing data.

2 In AAA, scattering of shots about target.

3 In chemical operations, dissemination of agents in liquid or aerosol form from bombs and spray tanks.

4 In rocketry and AAM testing, deviation from prescribed flight path; circular dispersion.

5 Measure of scatter of data points around mean value or around regression curve, usually expressed as standard-deviation estimate or standard error.

6 Process in which EM radiation is separated into its components.

## dispersion error

## distributor

**7** Measure of resolving power of spectroscope or spectrograph, usually expressed in A/mm.

**8** Tendency over long period of commercial traffic to move from primary to secondary airports.

**9** Scatter of actual touchdown points on runway over a period.

**dispersion error** Distance from aim point to mean point of impacts.

**dispersion hardening** Scattering of fine particles of different phase within metallic material, resulting in overall strengthening.

**dispersion pattern** Distribution of series of rounds fired from one weapon or group of weapons on fixed aim under conditions as nearly identical as possible.

**dispersion warhead** Discharging bomblets, FAE or other multiple or dispersed payloads.

**displaced threshold** Threshold not at downwind end of full-strength runway pavement. It is usually beyond it, and is available for takeoff or for end of landing roll, but not for touchdown.

**displacement** **1** In air interception, separation between target and interceptor tracks to provide interceptor acquisition space.

**2** Distance from standard point (usually origin) measured in given direction.

**3** Of IC engine, total volume swept by pistons during crankshaft rotation from BDC to TDC. Also known as swept volume.

**4** Of airship or balloon, mass of air displaced by gas, expressed as weight or volume.

**5** Lateral, vertical or angular \* of any point of zero DDM from localizer or glidepath.

**displacement thickness** Dimension characteristic of all boundary layers and equal to thickness of completely stagnant fluid having same overall effect. Equal to distance through which each streamline is displaced from position it would have assumed had fluid been inviscid.

$$\delta^* = \int_0^\infty \left(1 - \frac{u}{V}\right) dy \approx \sqrt{\frac{3vI}{V}}$$

where  $u$  is local boundary layer velocity,  $V$  free-stream velocity,  $y$  distance from solid surface,  $v$  kinematic viscosity and  $I$  characteristic length; actual boundary-layer thickness is nearly three times  $\delta^*$ .

**display** Graphic presentation of data for human study.

**Display Authorisation** Document required from national aviation authority before pilot can take part in airshow.

**display datum** Also called display centre, the mid-point of the crowd-line.

**disposable lift** Gross lift less fixed weight of an aerostat.

**disposable load** Maximum ramp weight minus OEW.

**DISR** **1** Descent imager [and] spectral radiometer.

**2** Department of Industry, Science and Resources (Australia).

**disreef system** Timing system for automatically releasing reef of parachute.

**disrupter-type spoiler** Maximises local turbulence.

**disruptive threat** Pentagonese for a totally unpredicted threat that 'comes out of left field' to tilt the balance of power (DoD).

**dissimilar air-combat training** Mock air combat with friendly fighters of different type(s) acting part of enemy

aircraft, chosen for performance similar to that of enemy types and usually painted to resemble them.

**dissimilar redundancy** Use of different teams of engineers and programmers to design and code the software in different channels or control lanes in an attempt to avoid sudden multiple failure.

**dissipation trail** Rift in clouds caused by passage of [jet] aircraft. Abb. **distail**.

**Dist** Distance or district (ICAO).

**distance** Standard airline unit is nm (contrary to SI); up to 1,200 nm airline \* calculated as  $D$  (great-circle distance) +  $(7 + 0.015D)$ ; above 1,200 nm measure is  $D + 0.02D$ .

**distance bar** Rigid bar linking tow vehicle with aircraft.

**distance marker** **1** Numbers painted on runway side to indicate thousands of feet to upwind end.

**2** Reference marker on radar display; usually one of series of concentric circles. Also known as range marker.

**distance-measuring equipment** Airborne secondary radar sending out paired pulses (interrogation) received at ground transponder; time for round trip is translated into distance. DME offers 252 frequencies from 962 to 1,213 MHz at 1 MHz spacing, providing 126 channels each comprising two frequencies 63MHz apart.

**Distant Marshal** At gliding championship, official charged with arranging tugs and gliders in correct start sequence.

**distillate** **1** Any petroleum product.

**2** Fuel oil, eg for diesels.

**distortion** **1** Undesired change in shape.

**2** Undesired change in waveform.

**3** In radio or sound reproduction, failure exactly to transmit or reproduce received waveform.

**4** Variation of flow velocity or temperature across transverse plane through gas turbine.

**distraction** ECM mode in which hostile missile locks-on to decoy before it can see real target.

**Distress & Diversion** ATC cells [or in UK RAF units] which maintain 24-h monitor on v.h.f./u.h.f. emergency frequencies to offer assistance.

**distress frequency** Internationally 121.5 kHz.

**distress signal** Signal transmitted by vehicle in imminent danger.

**distributed-aperture system** EO sensors providing a protective sphere around aircraft for missile warning, navigation support and night operations.

**distributed data-processing** Distribution of EDP (1) capability among a number of positions in a geographically large system.

**distributed jet system** Any arrangement in which a power source is arranged to augment lift along the length of an aerofoil, examples being the jet flap, augmentor wing, EBF, IBF, CCW and USB.

**distributed load** One which has no single point of application but is distributed over a line or area, such as air load on a surface.

**distributed mass-balance** One distributed along span of control surface.

**distributed mission training** Creating realistic battlespace for aircrew by using networked simulators.

**distributor** **1** Rotary switch feeding HT in sequence to spark plugs.

**2** Circumferential gallery connecting engine fuel manifold[s] to burner nozzles, probably incorporating a \*

**disturbance**

valve, to compensated for gravity head and ensure all burners receive same supply.

*3 See spreader 2.*

**disturbance** 1 Upset to normal flight involving uncommanded change in AOA ( $\alpha$ ), normally quantified as change in  $C_L = \Delta\alpha$ .

2 Situation involving unpremeditated loss of control, eg pitch-up or stall/spin.

3 Local departure from normal wind conditions; often used to mean cyclone or depression.

**disturbance motion** Uncommanded movement of cockpit caused by turbulence, vibration or other input beyond pilot's capacity to counter.

**disturbed-state concept** Advanced yet simplified modelling of the mechanics of materials and interfaces.

**disturbing moment** Moment which tends to rotate aircraft about an axis.

**Ditacs** Digital tactical system.

**DITC** Department of Industry, Trade and Commerce (Canada).

**Ditco** Defense Information Contracting Organization; E adds Europe (Int.).

**ditching** Emergency alighting of aircraft, especially landplane, on water; thus verb to ditch.

**ditching characteristic** Way in which aircraft behaves on being ditched, dynamically and structurally.

**ditching device** Causes RPV to land or crash land when control has been lost.

**ditching drill** Emergency procedures for aircraft crew and passengers, performed before and after ditching.

**Ditco** Defense Information Technology Contracting Organisation.

**dither** Signal applied to keep servo motor or valve constantly quivering and unable to stick in null position.

**DITS** Data information transfer system [or set], centralised control of military aircraft communications.

**dits** Digital information transport standard.

**ditty bag** Container for AC(2)'s personal items and mission documents carried aboard combat aircraft.

**DITU** De-icer timer unit.

**DIU** Data interface unit.

**diurnal** Adjective generally meaning daily, or in 24h cycles.

**DIV** Divert, diverting, division.

**DIVC** Digital imagery and video compression.

**DIVADS** Division air-defense system (USA).

**dive** Steep descent with or without power.

**dive bomber** Aircraft designed to release bombs at end of steep dive towards objective.

**dive brake** Extensible and retractable surface designed to enable aircraft to dive steeply at moderate airspeed.

**dive-recovery flap** Simple plate flap hinged at leading edge on underside of wing at about 30% chord and opened to assist recovery from dive by changing pitching moment, removing local compressibility effects and increasing drag. Common c1942–50.

**divergence** 1 Disturbance which increases without oscillation.

2 Expansion or spreading out of vector field; considered to include convergence, or negative divergence.

3 Aeroelastic instability which results when rate of change of aerodynamic forces or couples exceeds rate of change of elastic restoring forces or couples.

**divergence, lateral** Divergence in roll, yaw or sideslip;

tends to a spin or spiral descent with increasing rate of turn.

**divergence, longitudinal** Non-periodic divergence in plane of symmetry; leads to nose dive or stall.

**divergence Mach No** Value higher than  $M_{crit}$  beyond which there is rapid drag rise.

**divergence speed** Lowest EAS at which aeroelastic divergence occurs.

**divergent oscillation** One whose amplitude increases at accelerating rate.

**diversion** 1 Change in prescribed route or destination made because of weather or other operational reasons.

2 Traffic diverted or claimed to be diverted from one airline by another, or to non-scheduled, charter or supplemental operators on same route. Frequently called material \*.

**diversity receiver** See *spaced diversity*.

**divided landing gear** Traditional fixed main gear but with no axle or horizontal member linking wheels.

**divided shielding** Nuclear radiation shield in two or more separated layers.

**divider** 1 Logic circuit which performs arithmetical division.

2 Bulkhead or non-structural panel separating flight deck from passenger cabin.

**dividing streamline** That which eventually separates a flow into two parts, such as that which impacts the dividing line along the leading edge of a wing.

**division, air** 1 Air combat organization normally consisting of two or more wings of similar type units (US).

2 Tactical unit of naval aircraft squadron, consisting of two or more sections.

**DIWS** Digital-imagery workstation.

**Dixie cup** Simple continuous-supply drop-down oxygen mask for passengers.

**DJ** Detector-jammer.

**DJE** Deception-jamming equipment.

**DJRP** Digital joint reconnaissance pod.

**DJTF** Deployable Joint Task Force (NRF).

**DK** Docked.

**DKATMS** Danish air-traffic management system.

**DL** 1 Delay line.

2 Deck landing.

3 Downlink, or datalink.

**DLA** 1 Delay message.

2 Defense Logistics Agency (US).

3 Dedicated lease agreement.

4 Helicopter rotor disc loading.

**DLAD** Delayed.

**DLAIND** Delay indefinite (DLI more usual).

**DLAND** Development of Landing Areas for National Defense (US, 583 airfields 1941–44)

**DLAP** Downlink application processor.

**DLARS** Data-link automated response system (USAF).

**DLB** Datalink buffer.

**DLC** 1 Direct-lift control.

2 Downlink communication (sonobuoy).

3 Datalink control; DU adds display unit, I identifier.

4 Diamond-like carbon.

5 Domestic labor cost [usually per ASM2] (US).

**DLCO** Deck-landing control officer.

**DLCRJ** Detect, locate, classify, record and jam.

**DLE** Datalink entry.

**DLF****DMMF**

<b>DLF</b>	Design load factor.	<b>DMMF</b>
<b>DLFA</b>	Deutsche Luftundraumfahrt ForschungsAnstalt (G).	<sup>4</sup> Defence Manufacturers' Association of Great Britain [500+ members; office, Grayshott. GU26 6LG] (UK).
<b>DLGF</b>	Data-load gateway function.	<sup>5</sup> Dimethylamine.
<b>DLGS</b>	Datalink ground station, for reconnaissance pods (RAF).	<sup>6</sup> Descent-mode annunciator.
<b>DLI</b>	<sup>1</sup> Deck-launched intercept.	<sup>7</sup> Directorate of Military Aeronautics (UK 1914–17).
	<sup>2</sup> Delay indefinite.	<b>DMAAC</b> Defense Mapping Agency Aerospace Center (US).
	<sup>3</sup> Datalink interface, or interpreter.	<b>DMAB</b> Defended modular-array basing.
<b>DLIR</b>	Downward-looking IR.	<b>DMATC</b> Defence Mapping Agency Topographic Centre.
<b>DLJ</b>	Downlink jammer, or jamming.	<b>DMAW</b> Deployable Multinational Air Wing (NATO).
<b>DLK</b>	Datalink (AEC).	<b>DMB</b> Digital multi-broadcasting.
<b>DLL</b>	<sup>1</sup> Design limit load.	<b>DMC</b> <sup>1</sup> Direct manufacturing, or maintenance, cost[s].
	<sup>2</sup> Datalink library.	<sup>2</sup> Dynamic metal compaction, by EM pulses.
<b>DLLR</b>	Deutsche Liga für Luft- und Raumfahrt (G Munich).	<sup>3</sup> Disaster-monitoring constellation.
<b>DLM</b>	<sup>1</sup> Declarative language machine.	<sup>4</sup> Display[s] and mission computer.
	<sup>2</sup> Depot-level maintenance (US, NATO).	<sup>5</sup> Display management computer.
<b>DLME</b>	<sup>1</sup> Direct lift and manoeuvre enhancement.	<sup>6</sup> Digital-map computer.
	<sup>2</sup> Datalink and message engineering.	<b>DMD</b> <sup>1</sup> Deployment manning document[s] (USAF).
<b>DLMS</b>	Digital land-mass simulation, common though superseded by MIL-STD protocols.	<sup>2</sup> Digital message, or <i>micromirror</i> , device.
<b>DL/MSU</b>	Data-loader mass storage unit.	<sup>3</sup> Digital map display; G adds generator.
<b>DLMU</b>	Datalink management unit.	<b>DMDR</b> Digital mission-data receiver.
<b>D/LNA</b>	Diplexer/low-noise amplifier.	<b>DME</b> <sup>1</sup> Distance-measuring equipment; suffixes /N, /P, /T and /W signify normal, precision, Tacan or time, and wide-spectrum.
<b>DLO</b>	Defence Logistics Organization (UK); ES(A) adds Equipment Support (Air).	<sup>2</sup> Designated maintenance examiner.
<b>DLOC</b>	Datalink operations centre (RAF).	<b>DMEA</b> <sup>1</sup> Defect-mode and effect[s] analysis.
<b>DLODS</b>	Duct leak and overheat detection system.	<sup>2</sup> Defense Micro-Electronics Activity (DoD).
<b>DLP</b>	<sup>1</sup> Deck-landing practice.	<b>Dmean</b> Dynamic management of the European airspace network (Eurocontrol).
	<sup>2</sup> Datalink processor.	<b>DMED</b> Digital-message entry device.
	<sup>3</sup> Directional lethal package.	<b>DME distance</b> Slant range.
	<sup>4</sup> Digital light projector.	<b>DME fix</b> Geographical position determined by reference to navaid which provides distance and azimuth information.
	<sup>5</sup> Defence learning portal.	<b>DMEP</b> Data-management and entry panel.
<b>DLPP</b>	Datalink pre-processor.	<b>DME-P</b> DME, precision.
<b>DLPU</b>	Datalink processor unit.	<b>DMES</b> Deployable mobility execution system.
<b>DLQ</b>	Deck-landing qualification.	<b>DME separation</b> Spacing of aircraft on airway in terms of distance determined by DME.
<b>DLR</b>	Deutsches Zentrum für Luft-und Raumfahrt [D-51147 Köln] (G).	<b>DMET</b> DME with respect to time.
<b>DLS</b>	<sup>1</sup> DME landing system.	<b>DMF</b> <sup>1</sup> Digital matched filter.
	<sup>2</sup> Datalink splitter.	<sup>2</sup> Département Militaire Fédéral (Switz.).
	<sup>3</sup> Data-load[er] system.	<sup>3</sup> Database, menu, function (software).
	<sup>4</sup> Defect-location system.	<sup>4</sup> Date of manufacture.
<b>DLSM</b>	Depot-level software maintenance.	<b>DMFS</b> Distributed-mission fighter station.
<b>DLST</b>	Datalink surface terminal[s].	<b>DMFV</b> Deutscher Modellflieger Verband eV (G).
<b>DLT</b>	Digital linear tape.	<b>DMG</b> <sup>1</sup> Deutsche Meteorologische Gesellschaft eV (G).
<b>DLTS</b>	<sup>1</sup> Datalink and tracking system.	<sup>2</sup> Digital map generator.
	<sup>2</sup> Datalink test set.	<b>DMI</b> <sup>1</sup> Department of Manufacturing Industry (Australia).
<b>DLU</b>	<sup>1</sup> Data-logger unit.	<sup>2</sup> Meteorological Institute [and service] (Denmark).
	<sup>2</sup> Download unit.	<b>DMICS</b> Design methods for integrated control systems.
	<sup>3</sup> Dual laser unit.	<b>DMIF</b> Dynamic multi-user information fusion.
<b>DLV</b>	Deutsche Luftsport Verband (1919–45).	<b>DMIR</b> Designated manufacturer [or manufacturing] inspection representative.
<b>DLW</b>	Design landing weight.	<b>DML</b> Decision and modeling/modelling language.
<b>DLY, dly</b>	Daily.	<b>DMLS</b> Doppler microwave landing system.
<b>DLZ</b>	Dynamic launch zone.	<b>DMM</b> <sup>1</sup> Dama modem module.
<b>DM</b>	<sup>1</sup> Data management.	<sup>2</sup> Data memory, or management, module.
	<sup>2</sup> Disconnected mode.	<sup>3</sup> Digital multimeter.
	<sup>3</sup> Docking module.	<b>DMMF</b> Developmental manufacturing and modification facility.
	<sup>4</sup> Double Master (Loran station).	
<b>dm</b>	Decimetre.	
<b>DMA</b>	<sup>1</sup> Defense Mapping Agency, now part of NIMA (US).	
	<sup>2</sup> Délégation Ministérielle pour l'Armement (F).	
	<sup>3</sup> Direct memory access, or addressing.	

**DMMH/FH** Direct maintenance man-hours per flight hour.

**DMN** Data multiplexing network.

**DMO** 1 Dependent meteorological office.  
2 Development Manufacturing Organization (modifies aircraft as system development vehicles).  
3 Defense Materiel Organization (US).  
4 Defence Material [now increasingly spelt materiel] Organization (Australia).  
5 Defence Management Office (central procurement body, Australia).  
6 Distributed mission operations [C adds Center, at Kirtland AFB] (USA).

**DMOR** Digest of mandatory occurrence reports.

**DMOS** 1 Double-diffused MOS.  
2 Diffusive mixing of organic solutions (spaceflight).

**DMP** 1 Display management panel.  
2 Direct-manning personnel.

**DMPI** Desired mean point of impact.

**DMPP** Display and multi-purpose processor.

**DMR** 1 Delayed multipath replica.  
2 Dual-mode radar.  
3 Digital modular radio.  
4 Development material release.

**DMS** 1 Defensive management system, or subsystem.  
2 Defense Mapping School.  
3 Data, or database; management system. [**DMSS**, subsystem].  
4 Data multiplexer subunit.  
5 Domestic military sales.  
6 Display mode selector.  
7 Diminishing manufacturing sources [or service, or support], obsolete spare parts.  
8 Diminishing materiel shortage[s].  
9 Debris monitoring sensor, or system.  
10 Dual-mode seeker.  
11 Digital-map system.  
12 Defense Message Service (US).  
13 Docket management system.

**DMSH** Diminishing.

**DMSK** Differential-minimum shift keying.

**DMSMS** Diminishing manufacturing resources and material shortages.

**DMSO** Defense Modeling and Simulation Office.

**DMSP** Defense Meteorological Satellite Program (DoD).

**DMSS** 1 Deployable mission support system [can go overseas on detachment].  
2 See *DMS*[3].

**DMT** Distributed mission trainer [or training].

**DMTI** Digital moving-target indicator, or indication.

**DMU** 1 Distance-measurement unit.  
2 Data-management unit.  
3 Digital master unit.  
4 Digital mock-up.

**DMV** See *DMFV*.

**DMWH** Direct-maintenance working hour[s].

**DMZ** Demilitarized zone.

**DNA** 1 Defense Nuclear Agency (US).  
2 Do not approach area.  
3 Direction de la Navigation Aérienne (SGAC,F).  
4 Does not apply.

**DNAC** Direction Nationale de l'Aviation Civile (Mali).

**DNAPS** Day/night adverse piloting system.

**DNATS** Day/night airborne thermal sensor.

**DNAW** Director[ate] of Naval Air Warfare (UK).

**D/NAW** Day/night adverse weather.

**DNC** Direct (or digital, or direction[al], or distributed) numerical control (NC machining).

**DNCO** Duty not carried out.

**DND** Department of National Defense (Canada).

**DNG** Danger[ous].

**DNI** Director of National Intelligence.

**DNIA** Duty not involving alert.

**DNIF** Duty not involving flying.

**DNL** Day/night sound level.

**DNMI** Meteorological Institute [and service] (Norway).

**DNS** 1 Direct numerical simulation.  
2 Dense.  
3 Doppler navigation system.  
4 Direct Navier-Stokes.

**DNSARC** Department of the Navy System Acquisition Review Council (US).

**DNSLP** Downslope.

**DNTAC** Dirección Nacional de Transporte Aéreo Civil (Arg.).

**DNV** Audit [certification] bureau (Neth.).

**DNVT** Digital non-secure voice terminal.

**DNW** 1 Deutsch-Niederländischer Windkanal [wind tunnel] (G/Neth.).  
2 Directional network waveform.

**DO** 1 Drawing office.  
2 Drop-out (mask).  
3 Director of Operations.

**D<sub>o</sub>** 1 Wing profile drag.  
2 Maximum outside diameter of tyre [tire].

**DOA** 1 Delegation option authorization; FAA document authorizing company to do its own aircraft type-certification.

**DOE** 2 Defence Operational Analysis Establishment (UK).  
3 Direction of arrival (ECM).  
4 Dominant obstacle allowance.

**DO** 5 Department of Aviation (several countries, e.g. Thailand).  
6 Design organization approval [-JA adds joint airworthiness].

**DOB** 1 Dispersed [or deployment] operating base.  
2 Deployed Operating Base [2006–] (RAF).

**DOC** 1 Direct operating cost[s].  
2 Delayed-opening chaff.  
3 Designed operational capability.  
4 Designated operational coverage.

**DoC** Department of Commerce (US 1926–38).

**Doc** Document [ation].

**DOCC** Deep-operations co-ordination cell.

**DOCCT/S** Dama orderwire channel controller trainer/simulator.

**dock** 1 Structure surrounding whole or portion of aircraft undergoing maintenance, to provide easy access for ground crew to reach all parts.  
2 Large volume in factory, usually extending well below floor level, for installation of giant tools (jigs) and master tools.

**docking** 1 Mechanical linking of two spacecraft or payloads.  
2 Forward movement of airliner to nose-in stand at terminal.

## documentation

- 3 Process of manoeuvring airship into its shed after landing.
- documentation** 1 In EDP (1), formal standardized recording of detailed objectives, policies and procedures.
- 2 Any hard-copy media, such as aircraft servicing manual, illustrated parts catalogue, repair manual, servicing diagram manual, cross-servicing guide, aircrew or flight manual (usually three volumes), flight reference cards, equipment manuals, servicing cards, and possibly checklists. In aircraft restoration \* is required to authenticate every part.
- DoD** Department of Defense (US, from 1947).
- Dodac** DoD ammunition code.
- Dodaf** DoD architecture framework.
- DODIIS** DoD intelligence information system.
- DoE** 1 Department of the Environment, now DETR (UK).
- 2 Department of Energy (US).
- 3 Design of experiment[s].
- DoETR** See *DETR*.
- DOF** 1 Designated overhaul facility.
- 2 Date of flight (ICAO).
- DoF, DOF** Degree[s] of freedom.
- DofA** Department of Aviation (Australia).
- dog** 1 Bad individual example of particular aircraft type.
- 2 Aircraft type all examples of which exhibit bad flying qualities (both meanings colloq.).
- dogbone** Bone-shaped tie, eg linking rigid-rotor blade to hub, or reacting engine thrust on testbed.
- dogfight** Air-to-air combat at close visual range.
- doghouse** 1 Fairing for instrumentation, esp. on rocket (colloq.).
- 2 Balloon landing which results in basket being overturned.
- dogleg** 1 Track over several waypoints away from direct route.
- 2 Directional turn in space launch trajectory to improve orbit inclination.
- dogship** Repeatedly modified developmental prototype a/c [no reflection on handling qualities].
- dogtooth** Discontinuity at inboard end of leading-edge chordwise extension, generating strong vortex.
- DOHC** Double overhead camshaft.
- Dohud** Diffractive-, or diffraction-, optics head-up display.
- DOI** Descent (or docking) orbit insertion.
- Dol** Department of Industry (UK, now DTI).
- DOL** Dispersed operating location.
- DOLE** Detection of laser emitters.
- doll's eye** Cockpit magnetic indicator which when triggered clicks to a white warning aspect. Increasingly used to mean *blinker*.
- dolly** 1 Airborne data-link equipment.
- 2 Metal back-up block used in hand riveting or hammering out dents in sheet.
- 3 Pneumatic-tyred truck tailored to elevate and grasp engine, skid-equipped helicopter, radar or other item, and transport it on ground.
- 4 Vehicle or trolley equipped with ballmats, rollers [can be powered] or other interfaces for ULDs. Other names: pallet transporter or trailer, container trailer or carrier or even cargo trailer.
- 5 Each truck in airport baggage train.
- dolly roll** Dolly with payload carried on two roller-

## Doppler beam sharpening

- supported rings for rotation to any desired angle to facilitate inspection and maintenance.
- Dolram, DOLRM** Detection of laser, radar and millimetre (millimetric) waves.
- DOM** 1 Domestic, within US.
- 2 Director of maintenance.
- dome** 1 Flight simulator [esp. for combat a/c] with replica cockpit at centre of hemisphere on which images projected.
- 2 Convex pressure bulkhead.
- 3 Astro\*.
- dome compartment** Space allocated within convex pressure bulkhead for cargo or other removables.
- dome rivet** Rivet with deep head, curved top and almost parallel sides.
- domestic** Involving one's own country only.
- domestic brief** Before combat or training mission, portion of briefing which allocates aircraft (and explains where they are parked) and call-signs.
- domestic reserves** Fuel reserves for scheduled domestic flight.
- domestic service** Airline service within one country.
- domicile** Country in which air carrier is registered.
- Domsat** Domestic (usually communications) satellite.
- donk** Aircraft engine[s] or power (colloq. noun or transitive verb).
- DO-160** 'Environmental conditions and test procedures for airborne equipment' (RTCA).
- DO-178** 'Software considerations in airborne systems and equipment certification' (RTCA).
- DO-178B** Design and certification procedure for software [civil aviation]. Level A is most comprehensive, Level E cheapest. See DO-254. (RTCA).
- door bundle** Para-dropped load immediately preceding stick of parachutists.
- door-hinge rotor** Articulated blades on flapping hinges visually similar to door hinge.
- Doors** Dynamic-object oriented requirements system.
- DOP** 1 Dioctyl phthalate [air-filter measures].
- 2 Defence and overseas policy (UK).
- 3 Detailed operation[al] procedure.
- 4 *Dilution of precision*.
- 5 Digital on-board processor.
- DoPAA** Description of proposed actions and alternatives.
- dope** 1 Liquid applied to fabric to taunt it by shrinking, strengthen it and render it airtight by acting as filler. Usually compounded from nitrocellulose or cellulose acetate base, and soluble in thinners.
- 2 Ingredient added to fuel in small quantities to prevent premature detonation (colloq.).
- doping** 1 Treatment of fabric with dope.
- 2 Addition of impurities to semiconductor to achieve desired electronic characteristics.
- 3 To prime piston engine with spray of neat fuel prior to starting from cold. Hence\* pump, usually operated manually.
- doploc** Doppler phase lock; active tracking system which determines satellite orbit by measuring Doppler shift in radio signals transmitted by satellite.
- Doppler Doppler effect**.
- Doppler beam sharpening** As aircraft radar aerial points anywhere other than dead-ahead, computer breaks each reading into small pieces and reassembles them as high-

## Doppler blade flash

resolution map using Doppler correction to eliminate background clutter.

**Doppler blade flash** Transient bright spots on radar display caused by returns from rotating helicopter rotor.  
**Doppler correction** Numerical correction to observed frequency or wavelength to eliminate effect of relative velocity of source and observer (eg removal of sea wave velocity from Doppler groundspeed).

**Doppler effect** Increase or decrease in frequency of wave motion, such as EM radiation or sound, sensed by observer or receiver having relative speed with respect to source. Thus, police-car siren seems to drop in pitch as it passes stationary observer at high speed. Approximate figures for X (I/J)-band: 34.3 Hz per kt, 30 per mph, 19 per km/h, 20 per ft/s. Also known as Doppler shift.

**Doppler error** In Doppler radar, error in measurement of target radial velocities due to atmospheric refraction.

**Doppler groundspeed** Groundspeed output from Doppler.

**Doppler hover** VTOL, esp. helicopter, hover controlled over desired geographical spot by Doppler coupler to AFCS.

**Doppler navigation** Dead reckoning by airborne navaid which gives continuous indication of position by integrating along-track and across-track velocities derived from measurement of Doppler effect of radar signals sent out (usually in four diagonal directions) and reflected from ground.

**Doppler radar** Radar which measures Doppler shift to distinguish between fixed and moving targets, or serve as airborne navaid by out-putting groundspeed and track.

**Doppler ranging (Doran)** CW trajectory-measuring system which uses Doppler effect to measure velocities between transmitter, vehicle transponder and several receiving stations; obviates necessity of continuous recording by making simultaneous measurements with four different frequencies.

**Doppler shift** 1 See *Doppler effect*.

2 Magnitude of Doppler effect measured in Hz or (astronomical) in terms of visible-light spectrum.

**Doppler spectrum** Output of Doppler radar with finite beam width.

**Doppler velocity and position (Dovap)** CW trajectory-measuring using Doppler effect; ground transmitter interrogates a frequency-doubling transponder and output is received at three or more sites for comparison with interrogation frequency, intersection of ellipsoids formed by transmitter and each receiver providing spatial position.

**Doppler VOR** Point-source navaid suffering all the faults of VOR but using wide-angle ground aerial which reduces errors due to local terrain. It uses an AM reference signal.

**DOR** 1 Directorate of Research (previously of Operational Research), under Chief Scientist (CAA, UK).

2 Dynamic observation report (ATOS).

**DORA** Directorate of Research and Analysis (UK).

**Dora** New technology for aerospace digital computers (R).

**Doran** *Doppler ranging*.

**Dorca** Directive on occurrence-reporting in civil aviation (CAA, UK).

**dorsal** 1 Pertaining to the back, interpreted as upper surface of vehicle body.

## double designation

2 Structural member running longitudinally along centreline at top of flying boat hull.

**dorsal fin** Shallow vertical surface on upper centreline sloping upwards to blend with main fin.

**dorsal spine** Ridge running along top of fuselage from cockpit to fin for aerodynamic or system-access purposes.

**dorsal turret** Powered gun turret on top of fuselage, normally able to cover upper hemisphere.

**DOS** 1 Disk operating system.

2 Denial of service (cyber attack).

**DoS** 1 Department of Supply (Australia).

2 Department of Space (India).

**DOSAAF** Voluntary society for support of Army, Air Force and Navy (USSR).

**DOSAV** Voluntary society for assisting Air Force (USSR, 1948–51).

**DOSC** Direct oil-spray cooled.

**dose rate** Incident rate of ionising radiation, measured in röntgens or mrem per hour.

**dose rate contour line** Line joining all points at which dose rates at given times are equal.

**dosimeter** 1 Instrument for measuring ultra-violet in solar and sky radiation.

2 Device worn by persons which indicates dose to which they have been exposed (each Apollo astronaut wore four passive \* and carried a fifth personal-radiation \* in sleeve pocket).

**DoT** 1 Department of Transportation (US, 1967), Canada and UK.

2 Designating optical tracker.

3 Day of training.

4 Details of task [unofficially “Dream of today”] (RAF).

**dot** Electronic dot displayed on CRT for cursive writing, providing steering guidance or other information.

**NOTE** Director, operational test and evaluation.

**DoTI** Department of Trade and Industry (UK, DTI is preferred).

**Dotram** Domain-tip random-access memory.

**DOTS** Dynamic ocean[ic] track system [flexible routing responsive to PDWC].

**DO-254** Design and certification procedure for avionics hardware. See DO-160, 178 and 178B (RTCA).

**double attack** Co-ordinated air/air operation by two partners making repeated synchronized yoyos (lo and hi-speed) and BRA(2)s as an effective ACM system.

**double-base propellant** Solid rocket propellant using two unstable compounds, such as nitrocellulose and nitroglycerine, which do not require a separate oxidiser.

**double blank** Parachute with two gores removed.

**double-bubble** Fuselage cross-section consisting of two intersecting arcs [almost complete circles] with floor forming common chord.

**double-channel simplex** Two RF channels, one being disabled while the other is used to transmit.

**double curvature** Curvature in more than one plane; also known as compound curvature.

**double delta** Delta wing with sharply swept leading edge inboard changing at about mid-semi-span to less sharply swept outer section.

**double designation** Nomination by a national government of two of that country's airlines as national flag-carriers operating scheduled service on same international route.

## double drift

**double drift** Method of determining wind velocity by observing drift on three true headings flown in specific pattern.

**double-end feed** Cooling air fed under pressure to both inner and outer radii of a turbine nozzle guide vane, to emerge through [possibly hundreds of] surface holes.

**double engine** Power unit containing two engines driving co-axial propellers; usually one half can be shut down for cruising flight.

**double-entry compressor** Centrifugal or radial-flow compressor that takes in fluid on both sides of impeller.

**double farval** Aerobatic routine by section of four in diamond with 1 (box) and 4 (lead) inverted with respect to 2 and 3; thus at times it would be 2 and 3 that were inverted, 1 and 4 then being upright.

**double-flow engine** Usually, bypass turbojet or turbofan.

**double-fluxe** Bypass or turbofan engine (F).

**double-headed** Warship having SAM systems both fore and aft of central superstructure.

**double-hinged rudder** Rudder with additional hinge near mid-chord for maximum effectiveness at low speeds with large camber and total angle.

**double horn** Dangerous ice accretion on LE forming two LEs, with channel between them.

**double lift** Winchman and rescuee together.

**double manned** Two crews per aircraft.

**double modulation** Carrier wave of one frequency is first modulated by signal wave and then made to modulate second carrier wave of another frequency.

**double notch** Flight-control system giving reduced surface movement for given input.

**double propulsion** Use of two independent sources of thrust, one for lift and the other for propulsion, in an aerodyne. Historical examples include Rotodyne and Mirage III-V.

**double-protection honeycomb** Honeycomb structure protected by chemical surface conversion process and then varnish dip.

**doubler** Additional layer of sheet or strip to reinforce structural joint.

**double-root blade** Rotating blade or vane with root fitting at each end to enable it to be fitted into disc either way.

**double-row aircraft** Cargo airlifter able to carry unit loads (military vehicles, pallets, etc) side-by-side.

**double-row engine** See *twin-row*.

**double sideband** AM signal with carrier removed [still needs some bandwidth].

**double slot** Passive-suction system in upper surface of wing of high-subsonic aircraft in which air is continuously extracted immediately downstream of shockwave (to stabilize and weaken it) and discharged immediately upstream of it. Improves  $C_L$  and buffet boundary.

**double-slotted flap** Flap with vane and thus two slots, one between wing and vane, and the second between vane and flap.

**double-T** Tail comprising a vertical surface above each of two booms joined at top by a horizontal.

**doublet** 1 In fluid mechanics, source and sink of equal strength whose distance apart is zero.

2 Violent uncommanded stop-to-stop rudder movement.

## downlink data

3 Any precisely timed commanded pulse of  $\pm n^\circ$ , usually on the elevator.

**doublet antenna** Antenna (aerial) composed of two similar elements in line but separated and fed in centre, and having total length equal to half wavelength; half a dipole.

**double taper** Taper of aerofoil which incorporates change in angle at part-span.

**Double Tumble** Aerobatic manoeuvre comprising 720° rotation in pitch about the transverse axis, AOA alternately positive and negative.

**double-wedge aerofoil** Section suitable for straight supersonic wings and blades of supersonic axial compressors, characterised by sharp wedge-like taper and sharp leading and trailing edges.

**double wing** See Junkers.

**doughnut** 1 Common shape for plasma contained in toroidal bottle.

2 Low-pressure tyre on small wheel for soft airfields.

3 Figurative representation of a thermal, in which central upflow can rise no further and turns over into surrounding downflow.

**Douglas protractor** Transparent square covered with precise rectilinear grid and degrees around the edge.

**Douglas scale** Table of numerical values of sea state [nine, from calm to confused] as one axis and swell [again nine] as the other.

**DOV** 1 Data over voice.

2 Discrete operational vehicle (low-profile, does not appear to be military or para-military), usually non-flying.

**Dovap** Doppler velocity and position.

**Dover control** Patented linkage permitting all engines of multi-engine aircraft to vary power in unison or with any desired differences [obs.].

**DOW** Dry operating weight.

**Dowgard** Aviation ethylene glycol (Dow Chemicals).

**down** Faulty and unusable.

**downburst** Local but potentially dangerous high-velocity downward movement of air mass, eg when arrested by sea-breeze front; chief cause of windshear.

**down-conversion** To lower EM frequency-band.

**downcutting** Milling so that teeth enter upper surface of workpiece.

**downdraft** Bulk downward movement of air such as commonly found on lee side of mountain or caused by descending body of cool air.

**downdraft carburettor** One in which air is taken in at top and travels downwards; reduced fire hazard, and less risk of foreign-object ingestion.

**downed aircraft** Aircraft that has made forced landing or ditching, esp. because of battle damage.

**Downey cycle** A standard product life cycle, used by the British MoD.

**down-45 line** Straight sustained dive at inclination of 45°.

**downgrade** To reduce security classification of a document or item of classified material.

**downlink** Radio transmission from air- or spacecraft to Earth.

**downlink data** Transmissions to Earth from spacecraft giving such information as astronaut respiration or cabin temperature; computers alert flight controllers to any deviation (7).

**download** 1 Any load acting downwards, eg on wing at negative angle of attack.

2 To remove unexpended ordnance or camera magazines from aircraft after operational sortie or aborted mission.

**downlock** Locks landing gear in extended position.

**down-look radar** Radar capable of detecting targets close to ground when seen from above.

**downrange** Away from launch site in direction of target or impact area.

**downselect** To select [Pentagonese].

**downsize** 1 Of manufacturer, to reduce payroll.

2 Of air-carrier, to switch to smaller aircraft.

**downspring** Long-travel coil spring imparting near-constant force on lightplane elevator control which at low airspeeds makes pilot pull stick back, effect fading as airspeed rises.

**downstage** From upper stages of multi-stage vehicle downwards (signals, vibration, fluid flow, pressure, etc).

**downstairs** At a lower altitude (UK colloq.).

**downstroke** In a piston engine, movement of the piston from top dead centre to bottom dead centre.

**downtilt** Downward tilt of thrust axis, normally of single-engine tractor propeller aircraft, to maintain adequate longitudinal stability, esp. in high-power climb.

**downtime** Period during which hardware is inoperative

following technical failure or for maintenance.

**downward identification light** White light on underside of aircraft for identification, with manual keying for Morse transmission.

**downwash** 1 Angle through which fluid stream is deflected down by aerofoil or other lifting body, measured in plane parallel to plane of symmetry close behind trailing edge; directly proportional to lift coefficient.

2 Angle through which fluid stream is deflected by a propeller, or a rotor of rotary-wing aircraft, measured parallel to disc.

3 Some authorities consider it not as an angular measure but as a rate of change of momentum, equal but opposite to lift. It is increasingly being taken to mean the induced velocity in the airflow through a propeller, hence the need for the term \* angle, symbol  $\epsilon$ .

4 Not least, often taken to mean linear velocity of flow through helicopter main rotor in hovering flight.

**downwind** Direction away from source of wind; G/S = TAS + W/V.

**downwind leg** Leg of circuit flown downwind, 180° from landing direction.

**downwing side** Inner side of aeroplane in banked turn.

**DP** 1 Direction des Poudres (F).

2 Data (or display) processor.

3 Differential protection.

4 Dual-purpose (in case of artillery, against air and surface targets).

5 Dew point.

6 Departure, or departure procedure.

7 Deep.

8 Deep penetration.

**D<sub>p</sub>** Parasite drag.

**dP** Differential pressure.

**DPA** 1 Defence Procurement Agency [of the MoD, managing 1,000+ projects, Bristol BS34 8JH] (UK).

2 Data Protection Act.

3 Diphenylamine.

4 Digital pressure altimeter.

5 Digital pre-assembly.

6 Defense Production Act (USAF).

**DPAC** Direction des Programmes Aéronautiques Civiles (F).

**DPAO** Defence Public-Affairs Organization [Canberra, ACT2600] (Australia).

**DPB** 1 Dual-purpose bomblet, for soft- or hard-skinned targets.

2 Defence Procurement Board (India).

**DPBAC** Defence Press and Broadcasting Advisory Committee (UK).

**DPBV** Disabled-passenger boarding vehicle.

**DPC** 1 Defence Planning Committee (NATO).

2 Defence Production Committee (J).

3 Departure control.

4 Digital phase coding.

**DPCM** Differential, or digital, pulse-code modulation.

**DPD** Data-processing device.

**DPDS** Distributed, or digital, processing and display system (maritime sensors).

**DPDT** Double-pole, double-throw.

**DPDU** Data protocol data, or display, unit.

**DPE** 1 Designated pilot examiner.

2 Department of Public Enterprise [runs Irish civil aviation].

3 Duration of present emergency, the notional period of service for members of the armed services conscripted or volunteered in WW2 (UK).

**DPEE** Directorate of Proof and Experimental Establishments (UK, MoD formerly).

**DPELS** Dual-pack Evolved Sea Sparrow launch system.

**DPEM** Direct-purchased equipment maintenance.

**DPEO** Dispersant piston-engine oil.

**DPews, D-pews** Design-to-price electronic-warfare suite.

**DPF** Data-processing facility.

**DPFG** Data-processing functional group.

**DP.47** See *Silcodyne*.

**DPG** 1 Data-processor, or processing, group.

2 Defense Planning Guidance, policy directive underlying the budget process (DoD).

**DPH** Dew-point hygrometer.

**DPI** Direct petrol-injection.

**dpi** Dots per inch.

**DPICM** Dual-purpose improved conventional munition.

**DPKO** Department of Peacekeeping Operations (UN).

**DPL** 1 Disabled-passenger lift.

2 Dewpoint line.

3 Denied Parties List [with whom no US industrial supplier is permitted to trade] (US).

4 Diode-pumped laser.

**DPLA** RPV or UAV (R).

**DPLL** Digital phase-lock loop.

**DPM** 1 Digital pulse-modulation.

2 Digital processing module.

3 Digital plotter map.

4 Development program manual.

**DPMA** Data Processing Management Association (US).

**DPMAA** Direction du Personnel Militaire de l'Armée de l'Air (F).

## DPMC

**DPMC** Digital-plotter map computer.

**DP/MC** Display processor and mission computer.

**DPMO** Department of Defense POW/missing personnel office (US).

**DPNG** Deepening.

**DPOC** Deep and persistant offensive capability (UK).

**DPOI** Desired point of impact, or interest.

**DPP** 1 Deferred-payment plan.

2 Development and production phase.

**DPPDB** Digital point-positioning database (NIMA DoD).

**DPR** 1 Dual-port RAM(1).

2 Aeronautical Association (N. Korea).

**DRAM** See preceding.

**DPRE** Designated parachute rigger/examiner.

**DPRK** Central aeronautical association [N Korea].

**DPS** 1 Differential phase-shift.

2 Dynamic pressure sensor (brake pedals).

3 Descent propulsion system (LM or planetary lander).

4 Deorbit propulsion stage.

5 Data-processing system, or set.

**DPSK** Digital, or differential, or differentially coherent, phase-shift keying.

**DPT** 1 Durability proof test.

2 Depth.

**DPTAC** Disabled Persons Transport Advisory Committee (DTLR).

**DPTCA** Director, project technical cost-analysis.

**DPU** 1 Display processor unit.

2 Digital, or data, processing unit.

**DQ** Design qualification, demo of required reliability.

**DQA** Directorate of Quality Assurance; TS adds Technical Support.

**DQAB** Defence Quality Assurance Board; E adds Executive (UK).

**DQ&R** Durability, quality and reliability.

**DQAR** Digital quick-access recorder.

**DQI** Digital-quality inertial.

**DQTS** Data-quality tool set.

**DR** 1 *Dead reckoning*.

2 Dispense rate (mass/time) of chaff or aerosol (ECM).

3 Dispatch reliability.

4 Deck run.

5 Direct.

6 Data record[ing], or receptacle.

7 Design Review [followed by number].

**Dr** Drift.

**DR** Receiver antenna directivity.

**dr** 1 Increment of radius, e.g. helicopter rotor blade.

2 Radar resolution in range.

3 Maximum depth of a rib.

**DRA** 1 Defence Research Agency (part of Qinetic/DSTL, previously DERA).

2 Direct radar access.

3 Dual-rail adapter.

4 Dual-row airdrop.

5 Direct radiating array.

**dracone** Large inflatable fluid (eg fuel, water) container, towable through sea and usable on soft land (strictly, Dracone).

**Drads, DRADS** Degradation of radar defence systems (active jamming by MIRVs).

**DRaFT** Digital radio-frequency tag (USAF).

**drag** Retarding force acting upon body in relative

## drag rudder

motion through fluid, parallel to direction of motion. Sum of all retarding forces acting on body, such as induced \*, profile \*. Basic equation is  $D = C_D \frac{1}{2} \rho V^2 S$  where  $C_D$  is drag coefficient,  $\rho$  fluid density,  $V$  relative speed (e.g., TAS) and  $S$  total area, or total wing area.

**drag area** Area of hypothetical surface having absolute drag coefficient of 1.0.

**drag axis** Straight line through centre of gravity parallel to direction of relative fluid flow.

**drag bracing** Internal bracing commonly used in fabric-covered wings to resist drag forces; may consist of adjustable wires, rod or tubes between front and rear spars or between compression ribs.

**drag chute** Parachute streamed from aircraft to reduce landing run, or steepen diving angle. Also called brake or braking parachute, deceleration drogue parachute or parabrade.

**drag-chute limit** Maximum EAS at which drag chute may be deployed.

**drag coefficient** 1 Non-dimensional coefficient equal to total drag divided by  $\frac{1}{2} \rho V^2 S$  where  $\rho$  is fluid density,  $V$  relative speed and  $S$  a representative area of the body, all units being compatible.

2 Coefficient representing drag on given body expressed in pounds on one square foot of area travelling at speed of one mile per hour (arch.).

**drag creep** The [undefinable] point at which drag starts to rise prematurely before  $M_{DD}$  is reached. The usual cause is formation of small shocks round a blunt leading edge, cured by root extension.

**drag curve** Plot of lift coefficient against drag coefficient, also known as drag polar.

**drag-divergence Mach number** Loosely, that at which shock formation becomes significant from viewpoints of drag, buffet and control. A common precise definition is  $M$  at which  $dD/dM = 0.05$ ; NASA Langley chooses 0.1, while another definition is simply  $M$  1.2. Also called drag-rise  $M$ ,  $M_{DD}$  and  $M_{div}$ .

**drag hinge** Approximately vertical hinge at root of helicopter main-rotor blade, allowing limited freedom to pivot to rear in plane of rotation.

**drag index** Usually means profile drag at 100 ft/s divided by total wetted area.

**drag link** Structural tie bracing a body, such as landing gear, against drag forces.

**drag manoeuvre** Air-combat manoeuvre in which one of a pair draws hostile aircraft into a firing position for his partner; can be used as verb.

**drag member** Structural component whose purpose is to react drag forces.

**Dragn** Dead-reckoning augmented GPS navigator.

**Dragon** Deployable ram-air glider with on-board navigation (UAV).

**drag parachute** 1 See *drag chute*.

2 See *drogue* (3).

**drag polar** Plot of  $C_D$  against  $C_L^2$ .

**drag rib** See *Compression rib*.

**drag rise** Sudden increase in wing drag on formation of shockwaves.

**drag rope** Thrown overboard from balloon to act as brake or variable ballast when landing; also called trail rope or guide rope.

**drag rudder** Wing-tip surface capable of imparting drag

## drag strut

[e.g. by splitting into upper/lower halves] on tailless aircraft.

**drag strut** Strut reacting drag forces, esp. one incorporated in a wing.

**drag-weight ratio** Ratio of total drag at burnout to total weight of missile or rocket.

**drag wires** 1 Wires inside or outside wing(s) to react drag.

2 Wires led forward from car or other nacelle of airship to hull or envelope to react drag.

**drain mast** Pipe, usually telescopic through which liquid [fuel, water from cabin environmental system, grey water] can be extracted. No relevance to toilet servicing.

**drains tank** May be provided to collect fuel that escapes from any part of the [gas-turbine] engine, often continuously emptied by suction into the combustion chamber. Fuel is drained here after shutdown, and an ejector pump may transfer it back on engine start.

**DRAM, Dram** Dynamic random-access memory.

**draping code** Virtual processing tool [simulation] for composite structure in which dry preform[s] are wrapped around smooth tool.

**Drapo** Dessin et réalisation d'avions par ordinateur (F).

**drawing introduction schedule** Checks details for compliance with authorities.

**DRB** Defense Resources Board (US).

**DRC** 1 Defense Review Committee (NATO).

2 Data-recording cartridge.

**DRD** 1 Dry-runway distance.

2 Digital radar display.

**DRDB** Dual-redundant data bus.

**DRDC** Defense Research and Development Canada (Valcartier, Quebec).

**DRDF** VHF/UHF radio D/F (UK).

**DRDL** Defence R & D Laboratory (Hyderabad) or Laboratories (India).

**DRDO** Defense R & D Organization (US, India).

**DRDPS** Digital radar data-processing system.

**DREA** Defence Research Establishment Atlantic (Canada).

**DRED** Ducted-rocket engine development.

**Dreem** Drone radar electronic enhancement mechanism.

**Drem lighting** Visual landing approach aid with red, amber and green lights in accurately inclined tubes pointing up glidepath (from RAF Drem, Scotland, 1937).

**DREO/P/S** Defense Research Establishments: Ottawa/Pacific/Suffield (Canada).

**DRER** Designated Radio Engineering Representative (FAA).

**Dress** Distributed and redundant electrical nose-gear steering system.

**dressed** Equipped with all externally attached accessories, piping and control systems, esp. of an aircraft engine or accessory gearbox.

**DRET** Direction des Recherches, Etudes et Techniques (F).

**DREV** Defense Research Establishment, Valcartier [Québec G3R 1X5] (Canada).

**DRF** 1 Dual-role fighter.

2 Deutsche Rettungsflugwacht eV, air rescue service (G).

3 Data-recording facility.

## dripshield

**DRFM** Digital RF memory; S adds system[s], TG techniques generator.

**DRFT** Drift

**DRG** During.

**DRIC** Defence Research Information Centre (UK, Glasgow).

**DRI/DRO** Dolly roll-in to dolly roll-out; engine-change elapsed time.

**Drier, DRIER** Dial-up rate IP [internet protocol] over existing radios (USAF).

**drift** 1 Lateral component of vehicle motion due to crosswind or to gyroscopic action of spinning projectile.

2 Slow unidirectional error movement of instrument pointer or other marker.

3 Slow unidirectional change in frequency of radio transmitter.

4 Angular deviation of spin axis of gyro away from fixed reference in space.

5 In semiconductors, movement of carriers in electric field.

6 Drag (until 1915).

7 Outward flow of boundary layer over swept wing, drawn towards tips by peak suction.

**drift angle** Angle between heading (course) and track made good.

**drift climb** Gentle climb after takeoff through noise-sensitive area at power just sufficient for ROC to be positive.

**drift correction** Angular correction to track made good to obtain correct track (for navigation, bombing, survey etc).

**drift-down** Gradual en route descent from top of flight profile (now rare).

**drift error** Change in output of instrument over period of time, caused by random wander.

**drift indicator** See *drift meter*.

**drift meter** Instrument indicating drift angle; in simple optical form a hair line is rotated until objects on ground travel parallel with it.

**drift sight** See *drift meter*.

**drill** 1 Correct procedure to be followed meticulously, eg in particular phase of flight such as takeoff.

2 Training flight by a formation, including formation changes.

**drill card** Checklist for correct procedures to be followed in particular phase of flight.

**drill round** Dummy missile or gun ammunition used for training.

**D-ring** 1 Ring in shape of capital D to which suspension ropes from balloon or other lighter-than-air craft are attached.

2 Handle for pulling parachute ripcord.

**drink [the]** Open sea or ocean (RAF colloq., equivalent to *oggie*).

**drip flap** Strip of fabric secured by one edge to envelope or outer cover of balloon or other lighter-than-air craft to deflect rain from surface below it and prevent it from dripping into basket or car; also helps to keep suspension ropes dry and non-conducting. Sometimes called drip band or drip strip.

**drip loop** Inserted in wiring loom to allow for future extra length, and to direct condensation to drip in harmless place.

**dripshield** Any tray for collecting fluid under machinery.

## drip strip

## drops

**drip strip** See *drip flap*.

**DRIR** Direct-readout infra-red.

**DRIRU** Dry-rotor inertial reference unit.

**DRISS** Digital read-in sub-system.

**Drive** Documentation review into video entry.

**driveline** Long essentially two-dimensional transmission of rotation, power or position, e.g. rotary flap-drive torque shaft along rear part of wing from a central actuator.

**driver, airframe** Pilot, especially in tanker/transport community (RAF colloq.).

**drive surface** In NC machining or GPP, real or imaginary surface that defines direction of cutter travel.

**driving band** Band of soft metal around projectile fired from rifled gun which deforms into barrel rifling to impart spin.

**Drivmatic riveter** Patented power-driven riveter which closes aircraft rivets at high speed; can drill, countersink, insert rivet, close and mill head in sequence.

**DRIW** Data redundancy in information warfare (USAF).

**drizzle** In international weather code, precipitation from stratus or fog consisting of small water droplets.

**DRK Flugdienst** Red Cross flying service (G).

**DRL** Data-reduction laboratory.

**DRLMS** Digital radar land-mass simulation (for TFR, GM, Nav-weaps, EW).

**DRM** 1 Ducted rocket motor (USAF).

2 Digital recording module.

**DRME** Direction des Recherches et Moyens d'Essais (F).

**DRN** Document release notice.

**DRO** 1 Daily routine orders.

2 Drone Recovery Officer.

**drogue** 1 Conical funnel at end of in-flight refuelling hose used to draw hose out and stabilize it, and guide probe of receiver.

2 Fabric cone used as windsock, or towed behind aircraft as target for firing practice, or as sea anchor by seaplanes.

3 Conical parachute attached to aircraft, weapon or other body to slow it in flight, to extract larger parachute or cargo from aircraft hold, or for stabilizing the towing mass such as a re-entry body or ejection seat.

4 Part of connector on a spacecraft (eg Apollo lunar module) into which a docking probe fits.

**drogue parachute** Drogue (3), tautological.

**drogue recovery** Recovery system for spacecraft in which one or more small drogues are deployed to reduce aerodynamic heating and stabilize vehicle so that large recovery parachutes can be safely deployed.

**drone** 1 Pre-programmed pilotless aircraft, usually employed as airborne target; either pilotless version of obsolete combat aircraft or smaller aircraft designed as a target. Totally different species from RPVs.

2 Loosely and unfortunately used as synonym for RPV or UAV.

**droneway** Runway dedicated to UAV operations.

**droop** 1 Downward curvature of leading edge of aerofoil to provide increased camber.

2 See *droop leading edge*.

3 Limited downward movement under gravity of door or access panel on underside, sufficient to have measurable effect on total aircraft drag.

**droop balk** Mechanical interlock prohibiting (a) selection of all engines at takeoff power with droops (2) up, or (b) selection of droops up in flight at above a specified angle of attack.

**drooping ailerons** Ailerons arranged to droop about 15° when flaps are lowered to increase lift while preserving lateral control.

**droop leading edge** Wing leading edge hinged and rotated down to negative angle relative to wing for high-lift low-speed flight (esp. takeoff and landing); colloquially called droops.

**droop nose** Nose designed to hinge down for low-speed flight and landing of slender delta aircraft and to provide crew forward vision at high angles of attack. Also called droop snoot.

**droops** Droop leading-edge sections.

**droop snoot** 1 Droop nose (colloq.).

2 Aircraft (esp. modification of familiar type) having extended down-sloping nose.

**droop stop** Buffer incorporated in helicopter rotor hub to limit downward sag of blades at rest.

**drop** 1 Dropping of airborne troops, equipment or supplies on specified \* zone.

2 Correction used by airborne artillery observer or spotter to indicate desired decrease in range along spotting line.

**drop altitude** 1 Altitude above MSL at which air drop is executed (DoD, NATO, CENTO).

2 Altitude of aircraft above ground at time of drop (see *drop height*).

**drop forging** Forcing of metal or other materials in hot and plastic state to flow under pressure of blow(s) from drop hammer into mould or die to form parts of accurate shape.

**drop height** Vertical distance between drop zone and aircraft (in SEATO, drop altitude).

**drop interval** Time interval between drops (1).

**drop line** Rope by which ground crew can walk balloon or other aerostat to new location.

**dropmaster** 1 Person qualified to prepare, perform acceptance inspection, load, lash and eject items of cargo for air drop. Also called air dispatcher.

2 Air crew member who, during drop, will relay required information between pilot and jumpmaster (USAF).

**drop message** Written message dropped from aircraft to ground or surface unit (probably arch.).

**drop model** Aerodynamically and dynamically correct model of fixed-wing a/c, originally balsa, dropped in still air or vertical tunnel.

**drop-out** 1 Discrete variation in signal level during reproduction of recorded data which results in data-reduction error.

2 Of systems, automatic off-line disconnection following fault condition.

3 Disconnection of non-faulty autopilot in severe turbulence.

4 Oxygen mask which drops out automatically for passengers and crew following sudden loss of cabin pressure.

**dropping angle** In level bombing, the angle between the line of sight to the target at the moment of release and the local vertical.

**drops** Drop tanks [more than one, carried by one a/c].

**dropsonde**

**dropsonde** Radiosonde dropped by parachute from high-flying aircraft to transmit atmospheric and weather measures at all heights as it descends. Used over water or other areas devoid of ground stations.

**drop tank** Auxiliary fuel tank carried externally and designed to be jettisoned in flight when empty.

**drop test** 1 Test of landing gear by dropping it from a height under various loads, with wheels at landing rpm.

2 Of models of future aircraft, free drop from balloon, helicopter or in spinning tunnel to check spinning or other characteristics.

3 Structural test of (usually unconventional) airframe by dropping on to hard surface.

4 Test of aerodynamics of spaceplane by drop from aircraft, eg NASA NB-52.

**drop-test rig** Rig designed to drop-test (1) any structure.

**drop zone** Specified area upon which airborne troops, equipment and supplies are dropped by parachute (abb. DZ).

**DRP** Design review panel.

**DRPC** Descending ring-plane crossover (planet Saturn).

**DR plot** Chart on which successive fixes, winds, positions and courses of an aircraft calculated by dead reckoning are shown.

**DR position** Position of aircraft calculated by dead reckoning; symbol, dot in small square.

**DRPS** Data receiving and processing station (Satcoms).

**DRR** Data refresh rate.

**DRS** 1 Detection and ranging set (radar, US).

2 Dead-reckoning subsystem.

3 Data-relay satellite.

4 Data-registration system (air cargo).

5 Design requirement specification.

**DRS/CS** Digital range safety/command system.

**DRSN** Drifting snow.

**DRSS** Doppler radar scoring system.

**DRTS** Detecting, ranging and tracking system (IR + laser).

**DRU** 1 Data-retrieval unit.

2 Direct-reporting unit.

3 DGNSS reference unit.

**drum** 1 Cylinder or series of discs upon which rotating blades of axial compressor are mounted; rotor minus its blades.

2 Portion of fuselage of broadly circular section, bounded by frames. Usually synonymous with plug or barrel section.

**drum-and-disc construction** Axial compressor rotor in which some stages of blading are held in single-piece multi-stage drum and remainder in discrete discs.

**drum test** Pressure test of fuselage section [or similar structure], normally in water tank.

**DRV** Deutscher Reisebüro-Verband eV, travel-agents association (G).

**DRVS** Doppler radar (or radial) velocity system.

**DRVSM** Domestic RVSM, less than international (US).

**DRX** Data reconstruction.

**dry** 1 Without afterburner/augmentor in use.

2 Without charge for fuel (aircraft hire).

**dry adiabatic lapse rate** Rate of decrease of atmospheric temperature with height, approximately 1°C per 100 m (1.8°F per 328 ft). This is close to rate at which ascending

body of unsaturated air (clean air) cools due to adiabatic expansion.

**dry bay** Structural compartment which, for a specific reason, is not used as an integral tank [it is normally surrounded by integral tankage].

**dry-bulb thermometer** Ordinary thermometer to determine air temperatures, as distinct from wet-bulb type; has glass capillary of uniform bore and bulb partially filled with a fluid (usually mercury) and sealed with vacuum above.

**dry contact** ARR hook-up between tanker and receiver without transfer of fuel.

**Dryden** See DFRC.

**dry cranking** Rotating main shaft[s] of gas turbine by external power, fuel system inoperative.

**dry emplacement** Rocket or missile launch emplacement without provision for water cooling during launch.

**dry film** Traditional film for optical camera, not digital smart card or video [originally to distinguish from wet film].

**dry filter** One on which filtration is effected by a dry matrix, without oil.

**dry fog** Haze due to dust or smoke.

**dry fuel** See *solid propellant*.

**dry gyro** Rotor has mechanical bearings and is not floated in fluid.

**dry hub** Rotor hub with elastomeric bearings needing no lubrication.

**dry hydrogen bomb** One without heavy water or other deuterium compounds.

**dry ice** Solid CO<sub>2</sub>, MPt -78.5C.

**dry lease** Transport-aircraft lease by one airline to (usually) another, without flight or cabin crew or supporting services. Sometimes called barehull charter.

**dry plug** Dry contact.

**dry power** See *dry rating*.

**dry rating** Of engine fitted with afterburner or augmentor, maximum thrust without these being ignited; usually same as MIL, maximum cold thrust.

**dry run** Pre-firing operation and actuation of engine (esp. liquid-propellant rocket motor) control circuits and mechanical systems without causing propellants to flow or combustion to take place. This enables instrumentation and control circuits to be checked.

**dry side** Especially in a long banana-shaped accessory gearbox, the position mounting starter, alternator, generator and other non-fluid items.

**dry squeeze** Simulated operation of a system or device (from \*\* of gun trigger to operate combat camera only).

**dry stores** Food and non-alcoholic beverages.

**dry sump** Engine lubrication system in which oil does not remain in crankcase but is pumped out as fast as it collects and passed to outside tank or reservoir.

**dry thrust** Dry rating.

**dry weight** 1 Weight of engine exclusive of fuel, oil and liquid coolant, and including only those accessories essential to its running. [There are many more complex definitions].

2 Weight of liquid rocket vehicle without fuel, sometimes including payload.

**Drzewiecki theory** Treatment of propeller blade as infinite number of chordwise elements; idealised, assumes each blade has no losses and meets undisturbed air.

**DRZL** Drizzle.

<b>DS</b>	<i>1 Data sheet.</i>	<i>2 Departure-slot monitor.</i>
2	Directionally solidified alloy.	3 Digital scene-matching.
3	Documented sample.	4 Director of Support Management (RAF).
4	Dynamic simulator.	<b>DSMAC</b> Digital scene-matching area-correlation, or correlator.
5	Dust storm (ICAO).	<b>DSMC</b> 1 Direct seat-mile cost.
6	Drone, anti-submarine (USN 1958–62).	2 Direct simulation Monte Carlo.
7	Decision support.	<b>DSM/YOF</b> Distinguished Staffel Member/Ye Olde Fokker (US).
8	Discarding sabot.	<b>DSNA</b> Département de Satellite Navigation Aérienne, member of ESSP (F).
9	Double Slave[Loran station].	<b>DSMS</b> Digital stores-management system.
<b>Ds</b>	Maximum shoulder diameter (aircraft tyre/tire).	<b>DSN</b> 1 Deep-Space Network, comprising DSIF and SFOF.
<b>DS1</b>	Digitization Stage 1 (UK MoD).	2 Defense switched network.
<b>DSA</b>	<i>1 Distributed system architecture.</i>	<b>DSNS</b> Division of Space Nuclear Systems (AEC).
2	Defense Supply Agency (US).	<b>DSNT</b> Distant, = 30+ miles.
3	Disposal[s] Sales Agency (US DoD and UK MoD).	<b>DSO</b> 1 Defence Sales Organization (UK).
<b>DSAC</b>	Defence Scientific Advisory Council (UK).	2 Defense-, or defensive-, systems operator, or officer (US).
<b>DSACT</b>	Deputy Supreme Allied Commander Transformation (NATO).	3 Distinguished Service Order (UK).
<b>DSAD</b>	Digital service access device.	4 Device software optimization.
<b>DSAG</b>	Direction du Service Aérien Gouvernemental [Québec G2E 5W1] (Canada).	5 Design search and optimization.
<b>DSARC</b>	Defense Systems Acquisition Review Council [or cycle] (US).	<b>DSP</b> 1 Defense support program; O adds office (DoD).
<b>DSASO</b>	Deputy senior air staff officer (RAF).	2 Digital signal processor, or processing.
<b>DSB</b>	Defense Science Board (US).	3 Departure spacing, or sequencing, program.
<b>DSB, d.s.b.</b>	Double sideband.	4 Display select panel.
<b>DSC</b>	<i>1 Defect-survival capability.</i>	5 Day surveillance payload.
2	Distinguished Service Cross (UK).	6 Domain specific part.
3	Digital selective calling.	7 Defence system[s] partnership[s] (UK).
4	Digital scan convertor.	<b>DSPDRV</b> Display driver.
5	Disturbed-state concept.	<b>Dspled</b> Displaced.
6	Defence Study Centre [B-1020 Brussels] (Int.).	<b>DSPS</b> Defense support program satellite[s].
<b>DSCA</b>	Defense Security [and] Co-operation Agency (US, approves weapons for export).	<b>DSR</b> 1 Director of Scientific Research.
<b>DSCE</b>	Display select control equipment.	2 Display-system replacement (FAA).
<b>DCS</b>	Defense Satellite Communications System (US).	3 Directed-stick radiator (acoustics).
<b>DSD</b>	1 Defence Support Division (NATO).	4 Dynamic super resolution.
2	Data signal display [U adds unit].	5 Dansk Selskab for Raumfartsforskning [astronautical society; office, DK-2860 Søborg] (Denmark).
<b>DSDC</b>	Digital signal data convertor.	<b>DSRTK</b> Actual track between two waypoints.
<b>DSEAD</b>	Distributed suppression of enemy air defence.	<b>DSS</b> 1 Department of Space Science (Estec).
<b>DSEDM</b>	Departure-sequenced engineering development model (FAA).	2 Dipping sonar system.
<b>DSDU</b>	Data signal display unit.	3 Dynamic-signage system.
<b>DSEO</b>	Defense Systems Evaluation Office (US).	4 Decision support system.
<b>DSES</b>	Defense Systems Evaluation Squadron (simulates hostile bombers attempting to penetrate Norad/ADC).	5 Data-storage set.
<b>DSF</b>	<i>1 Domestic supply flight (RAF).</i>	6 Digital sequence/sequencer switch.
2	Display systems function.	<b>DSSP</b> Deep-Submergence System Program.
<b>DSFC</b>	Direct side-force control.	<b>DSSS</b> Direct-sequence spread-spectrum.
<b>DSG</b>	Design service goal [flight hours].	<b>DS<sup>3</sup>L, DSSL</b> Document-style semantics and specification language.
<b>Dsg</b>	Maximum shoulder diameter growth of tyre (tire).	<b>DST</b> 1 Daylight-saving time.
<b>DSIF</b>	Deep Space Instrumentation Facility, stations at Cape Kennedy, in California (2) at Goldstone, in S Africa (2) and Woomera (NASA/JPL).	2 Dry specific thrust.
<b>DSIR</b>	Department of Scientific and Industrial Research (NZ, UK).	3 Defense and space talks, or treaty (drafted 1988).
<b>DSIS</b>	Digital software integration station (fighter radar).	4 Direction de la Surveillance du Territoire (F border security).
<b>DSL</b>	<i>1 Digital simulation language.</i>	<b>DS-T</b> Discarding sabot, tracer.
2	Depressed sightline.	<b>Dstl, DSTL</b> Defence Science and Technology Laboratory [created 2001 when US refused to share classified information; Porton Down, Wilts. SP4 0JQ] (UK).
3	Deutsche Schätzstelle für Luftfahrtzeuge eV (G).	<b>DSTN</b> Double super-twist nematic.
4	Digital subscriber line.	<b>DSTO</b> Defence Science & Technology Organization [main office, Canberra ACT2600] (Australia).
<b>DSLc</b>	Dynamic-scattering liquid crystal.	<b>DSTS</b> Data storage and transfer set.
<b>DSM</b>	<i>1 Dynamo situation modelling.</i>	<b>DSTU</b> Digital-signal transfer unit.

- DS200** A directionally solidified HPT material.
- DSU** 1 Direct Support Unit (USAF).
- 2 Dynamic-sensor unit; gas-bearing yaw gyro and normal and lateral accelerometers.
  - 3 Digital switching unit.
  - 4 Data-storage unit; R adds receptacle.
  - 5 Defense-systems upgrade; P adds Program (USAF).
  - 6 Domain service unit.
  - 7 Data, or digital, signalling unit.
- DSVT** Digital secure, or subscriber, voice terminal.
- DSWA** Defense Special Weapons Agency.
- DT** 1 Displaced threshold.
- 2 Dual-tandem landing gear.
  - 3 Development test.
  - 4 Day TV (TADS).
  - 5 Damage-tolerant, or tolerance.
- DT<sub>T</sub>** 1 Pressure drag.
- 2 Trim drag.
  - 3 Radar transmitter antenna directivity
- D/T, D-T** Deuterium/tritium (NW fusion material).
- DTA** 1 Direction des Transports Aériens, now Service des Transports Aériens (F).
- 2 Dynamic, or drop, test article.
  - 3 Design and Technology Association (UK).
  - 4 Directorate of Technical Airworthiness (Canada).
  - 5 Deep-target attack.
- DTAD** Demonstrated technology availability date.
- DTAM** Descend to and maintain.
- DT&E** Development, test and evaluation.
- DTASS** Digital terrain-aided survival system.
- DTAT** Direction Technique des Armements Terrestres (F).
- DTC** 1 Design to cost.
- 2 Distortion-tolerant control.
  - 3 Data-transfer cartridge.
  - 4 Defence Technology Centre[s] (UK MoD think-tank).
- DTCA** Direction Technique de Constructions Aéronautiques (F).
- DTCN** Direction Technique de Constructions Navales (F).
- DTCS** Drone tracking and control system.
- DTD** 1 Directorate of Technical Development (UK).
- 2 Data-transfer device.
  - 3 Damage-tolerant design.
  - 4 Doppler turbulence detection.
  - 5 Data terminal display.
  - 6 Document type definition.
- DTDMA** Distributed (or distributive) time-division multiple access.
- DTE** 1 Data terminal, or transfer, equipment.
- 2 Digital target extractor.
  - 3 Development, test [and] evaluation.
- DTEB** Defence Test and Evaluation Base (EDA).
- DTEC** Direct thermal to electric conversion.
- DTED** Digital, or doppler, terrain elevation data.
- DTE/MM** Data-transfer equipment, mass memory.
- DTEn** Direction Technique des Engins (F).
- DTEO** Defence Test and Evaluation Organization (Boscombe Down, UK).
- DTF** 1 Data transfer facility (software).
- 2 Digital tape format.
  - 3 Direct tether forward (Sigint).
- DTG** 1 Distance to go.

- 2 Dynamically tuned gyro.
  - 3 Date/time group.
- DTH** Direct to home.
- D-Thr, D THR** Displaced threshold.
- DTI** 1 Department of Trade and Industry [Aerospace-Defence, 471 Yellow Zone, London SW1W 9SS] (UK).
- 2 Digital timebase interval.
  - 3 Distance to incident.
  - 4 Dial test indicator.
  - 5 Data-transfer interface; M adds module, U unit.
  - 6 Digital targeting information.
- DTIC** Defense Technology Information Center (US).
- DTIG** Deployed theater information grid.
- DTK** Desired track.
- DTL** Diode/transistor logic.
- DTLCC** Design to life-cycle cost.
- DTLR** Department for Transport, Local Government and the Regions (UK, includes civil aviation and aviation safety, became DETR).
- DTM** 1 Data-transfer module.
- 2 Digital terrain-management; -D adds and display.
  - 3 Digital terrain modelling.
  - 4 Demonstration test milestone.
- DTM pt** Decision-to-miss point.
- DTMC** Direct ton[ne]-mile cost.
- DTMF** Dual-tone multi-frequency.
- DTMMM, DTM<sup>3</sup>** Data-transfer module/mass-memory.
- DTN** Data-transfer network.
- DTO** 1 Desired test objective.
- 2 Defense-technology objective.
- DTOA** Difference in, or differential, or delta, time of arrival.
- DT/OT** Development test[ing]/operational test[ing].
- DTP** Design to price.
- DTPC** Defense Technical Procedures Committee.
- DTR** 1 Damage-tolerant rating.
- 2 Defense Training Review (UK).
- DTRA** Defense Threat-Reduction Agency (DoD, Dulles).
- DTRD** Two-shaft turbojet; F adds with afterburner (USSR, R).
- DTRI** Direction des Télécommunications du Réseau International (F).
- DTRM** Dual-thrust rocket motor.
- DTRS** Department of Transport and Regional Services (Australia).
- DTRT** Deteriorate, deteriorating.
- DTS** 1 Data-transfer system, or set.
- 2 Dynamic test station.
  - 3 Desk-top simulator.
  - 4 Digital terrain system.
  - 5 Data terminal set.
  - 6 Diplomatic telecommunications system.
  - 7 Development and Trials Squadron (AAC, UK).
  - 8 Defence technology strategy [2006–] UK).
- DTSA** Defense Technology Security Administration (DoD).
- DTSB** Direct tether split-based (Sigint).
- DTSC** Digital Transmissions Standards Committee (UK).
- DTSI** Defense-Trade security initiative (US).
- DTSP** 1 Democratization transition systems program.
- 2 Division TUAV Sigint Program (USA).

**DTU** 1 Display terminal unit.

2 Data terminal, transfer or transmission unit.

**DTUC** 1 Design to unit cost.

2 Data-transfer-unit cartridge.

**DTUPC** Design to unit production cost.

**DTV** 1 Day, daylight or daytime TV.

2 Development[al] test vehicle.

3 Damage-tolerance verification.

**DTVOR** Doppler-terminal VOR.

**DTW, d.t.w.** Dual tandem wheels; usually means bogie, DT is more common.

**DTWA** Dual trailing-wire antenna[s].

**DU** 1 Depleted uranium.

2 Display unit.

3 Dust (ICAO).

**Duad, DUAD** Dual air defence, battery consisting of only two fire units able to operate completely independently.

**dual** 1 Duplication of cockpit controls permitting either pilot or co-pilot, instructor or pupil, to fly manually.

2 Pilot instruction in dual aircraft.

3 Airtime logged under \* instruction.

**dual-alloy disc** Turbine rotor comprising powder-metallurgy disc diffusion-bonded to outer cast blade ring.

**dual-annular combustor** Gas-turbine combustion chamber comprising two coaxial elements at different radii, each with its own ring of fuel nozzles; one is used only for takeoff or other occasions demanding high power.

**dual architecture** FCS(1) in which each surface is driven by its own local hydraulic systems and EHAs.

**dual-axis rate transducer** Gyro based on electrically spun sphere of mercury, in which floats cruciform crystal sensor with 98% buoyancy; future rate sensor capable of operating at up to  $\pm 60$  g.

**dual-capable** 1 Equally good at fighter and attack missions.

2 Can carry both conventional and nuclear bombs.

**dual-combustion** Air-breathing engine, usually ramjet, which normally operates on two different fuels at different times. DCR feeds hot jet to main combustor burning JP-10.

**dual compressor** Compressor split into low-pressure and high-pressure parts, each driven by separate turbine; also known as two-shaft or two-spool compressor.

**dual-control aircraft** Provided with two sets of [usually interconnected] flight-control interceptors, usually for instructor and pupil.

**dual designation** Right of two or more airlines of same nation to compete with each other on international route(s).

**dual ignition** Piston engine ignition system employing two wholly duplicate means of igniting mixture.

**dual-lane slide** Escape slide able to convey two separated streams of passengers simultaneously.

**dual magneto** Single magneto with dual HT outputs to duplicate harness and plugs.

**dual-mode DME** Can process /N or /P signals.

**dual-mode EPU** Emergency power unit plus bleed from main engine.

**dual-mode radar** Usually means MTI + SAR.

**dual-mode seeker** Able to operate at either IR or RF frequencies.

**dual persistence** CRT coated with phosphors giving bright display and dim previous indications.

**dual-plane separation** Space vehicle staging in which interstage(s) falls away separately.

**dual propellant** Ambiguous, can mean liquid bipropellant, double-base solid, or different propellants in two stages.

**dual-purpose** Designed or intended to achieve two purposes, eg gun or missile (esp. on surface warship) intended to destroy surface or aerial targets.

**dual-rail adapter** Interface enabling two AAMs to be carried on one pylon.

**dual-rotation** Two-spool engine in which LP and HP shafts rotate in opposite directions.

**dual-row airdrop** Use of slight (usually 4°) aircraft tilt to despatch pallets side-by-side.

**dual-thrust motor** Solid rocket motor giving two levels of thrust by use of two propellant grains. In single-chamber unit boost grain may be bonded to sustainer grain, with thrust regulated by mechanically changing nozzle throat area or by using different compositions or configurations of grain. In dual-chamber unit, chambers may be in tandem or disposed concentrically.

**dual-use technology** Military but can have civil applications [increasingly, perhaps, the other way round].

**DUAT** Direct-user access terminal [S adds service].

**dubler** Second prototype [doubler] (R).

**DUC** 1 Dense upper cloud.

2 Distinguished unit citation (US).

**Ducat** Duct acoustics and radiation.

**DUCK, Duck** DCMS universal configuration key.

**duck soup** Easy, no problem (US flying colloq.).

**duct** 1 Passage or tube that confines and conducts fluid.

2 Channel or passage in airframe through which electric cables are run.

3 Portion of atmosphere (see \* propagation).

**ducted cooling** System in which cooling air is constrained to flow in duct(s) to or from power plant.

**ducted-fan engine** Aircraft propulsor incorporating fan or propeller enclosed in duct; more especially jet engine in which enclosed fan is used to ingest ambient air to augment propulsive jet, thus providing greater mass flow. Most forms are better known today as turbofans.

**ducted propulsor** Multi-bladed fan (usually with 5 to 12 variable-pitch blades) running in propulsive duct integrated with engine and airframe to give efficient and quiet low-speed propulsion. Source of power, piston engine or gas turbine.

**ducted radiator** One installed in duct, esp. to give propulsive thrust.

**ducted rocket** See *ram-rocket*.

**duct heater** Burning additional fuel in the bypass flow [turbofan].

**ductility** Property of material which enables it to undergo plastic elongation under stress.

**duct propagation** Stratum of troposphere bounded above and below by layers having different refractive indices which confines and propagates abnormally high proportion of VHF and UHF radiation, giving freak long-distance communications. Can be on surface or at height up to 16,000 ft (5 km); thickness seldom greater than 330 ft (100 m).

**DUEO** Deputy Unit Executive Officer (UK Police helos).

**Dufaylite** Airframe sandwich material with core of light plastics honeycomb.

**duff gen** Unreliable or incorrect information (RAF, WW2, colloq.).

**dull switch** Cockpit push-switch with dull appearance because never used.

**DUM** Dominant unstable mode, degree of freedom of aeroelastic or aeracoustic instability.

**Dumas** Dual-mode active IR and imaging IR seeker.

**dumb** Of munition, unguided or "iron"; not smart or brilliant.

**dumb-bell** 1 Manoeuvre in vertical plane resembling \*, usually by helicopter, in making repeated low-level passes over same point.

2 Sign [usually white] in signals area denoting 'use paved areas only'. When ends have black bars = no restriction on taxiing but use runway for landing or TO.

**dumb bogie** Unimpressive opponent in air combat.

**dummy deck** Facsimile of aircraft carrier deck marked out on land.

**dummy round** Projectile, usually air-to-air or air-to-ground missile, fitted with dummy warhead for test or practice firing.

**dummy run** 1 Simulated firing practice, esp. air-to-ground gunnery or dive-bombing approach without release of a bomb. Also called dry run.

2 Trial approach to land, to release or pick up a load, as practice before actually performing operation.

**dump** 1 Emergency deactivation of whole system.

2 Of computer operation, to destroy, accidentally or intentionally, stored information, or to transfer all or part of contents of one section into another.

3 To jettison part of aircraft's load for safety or operational reasons, eg \* fuel.

4 Of spacecraft, overboard release of waste water, astronaut waste products, etc.

5 Temporary storage area for bombs, ammunition, equipment or supplies.

6 To open \* valve of balloon.

**dump and burn** Awesome airshow entertainment in which a fighter makes a flypast in full afterburner and jettisoned fuel ignites in the hot jet[s].

**dumper** Lift dumper.

**dump door** Quick-acting hatch under hopper or tank for emergency release of chemicals, or under water tank for firefighting.

**dump valve** 1 Automatic valve which rapidly drains fuel manifold when fuel pressure falls below predetermined value.

2 Large-capacity valve fitted to any fluid system to empty it quickly for emergency or operational reasons.

3 Pilot-controlled valve which releases hot air or gas from balloon in controlled manner.

**dunk** To lower [e.g. sonobuoy] into water on tether or communication cable.

**dunker training** How to escape from helicopter underwater.

**duo** Co-ordinated aerobatics by two aircraft.

**duo-tone** 1 Colour of camouflage scheme with two main hues.

2 Two notes emitted by variometer.

**Dupe** Duplicate (Message).

**duple burner** Basically simple gas-turbine injector which

covers wide flow range by having two fuel chambers and two nozzles. See *duplex burner*.

**duplex** 1 Circuit or channel which permits telegraphic communication in both directions simultaneously.

2 The opposite: a radio system requiring separate T/R channels.

**duplex burner** 1 Gas-turbine fuel injector with alternative fuel entries and single exit orifice.

2 Small primary nozzle, used continuously, plus larger [often annular, surrounding primary] used only at T-O or other high-power regime.

**duplexer** Device which permits single antenna to be used for both transmitting and receiving, with minimal losses. (See *diplexer*).

**Düppel** Chaff (G, WW2).

**DUR** Duration, during [C adds climb, D descent, also expressed as **DURGC**, **DURGD**].

**Durabond** Metallic-composite adhesives for joining aluminium or stainless steel.

**duralumin** Wrought alloy containing 3–4.5 per cent copper, 0.4–1.0 per cent magnesium, up to 0.7 per cent manganese and the rest aluminium. Originally trade name.

**Duramold** Low-density structural material of thermo-setting plastic-bonded wood (Clark, Fairchild, 1936).

**duration** 1 Maximum time aircraft can remain in air.

2 Time in seconds of operation of rocket engine.

**duration model** Traditional rubber-powered model aeroplane designed for flight endurance.

**Durestos** Composite structural material comprising asbestos fibres bonded with adhesive, usually formed by moulding under pressure (Aero Research/Ciba).

**dustbin** 1 Gun turret lowered through aircraft floor to provide ventral defence (colloq., arch.).

2 Similar retractable container for sensor, esp. radar.

**dust devil** Small local whirlwind, dangerous to light aircraft.

**dusting** Controlled spreading of powder insecticide, fertiliser or other chemical by agricultural aircraft.

**Dustoff** Dedicated, unhesitating service to our fighting forces (US).

**DUT** Delft University of Technology.

**Dutch door** Upper portion hinges up, lower portion hinges down.

**Dutch roll** Lateral oscillation with both rolling and yawing components; fault of early swept-wing aircraft. Especially dangerous at high altitude, when damping is insignificant. Can be stable [self-decaying], neutral, or dangerously divergent [unstable].

**DUTE** Digital universal test equipment (computer-guided probes check circuit boards).

**duty crew** Crew detailed to fly specific mission.

**duty cycle** Ratio of pulse duration time to pulse repetition time.

**duty factor** 1 In EDP (1), ratio of active time to total time.

2 In carrier composed of pulses that recur at regular intervals, product of pulse duration and PRF.

3 Several meanings in electronic jamming, usually fractions of unit time set is emitting or receiving.

**duty ratio** In radar, ratio of average to peak pulse power.

**duty runway** Runway designated for use by aircraft landing or taking off.

**DUV** Data under voice.

- DV** 1 Distinguished visitor (US).  
 2 Direct-vision (window).  
 3 Digital voltmeter.  
 4 Demonstrator/validation [also Demval].
- DVA** 1 Design verification article.  
 2 Doppler velocimeter/altimeter; often DV/A.  
 3 Diverse vector area [prescribed route not required].  
 4 Dynamic vibration absorber.
- DVB** Digital video broadcast, or broadband.
- DVC** 1 Direct voice control.  
 2 Digital voice communication[s].  
 3 Digital video conversion.
- DVD** 1 Direct-vendor delivery.  
 2 Direct-view display.  
 3 Digital versatile disk.
- DVE** 1 Design verification engine.  
 2 Degraded visibility environment.
- DVF** Demonstration and validation facility.
- DVFR** Defense Visual Flight Rules; procedures for use in an ADIZ (US).
- DVG** Display video generator.
- D/VHF** Doppler/VHF.
- DVI** Direct voice input.
- DVI/O** Direct voice input/output.
- DVIT** Digital video image [or imaging] transmission [S adds system].
- DVK** Deutsche Versuchsanstalt für Kraftfahrzeug und Fahrzeugmotoren (G).
- DVL** 1 Deutsche Versuchsanstalt für Luft- und Raumfahrt.  
 2 Data/voice logger.
- DVLP** Develop.
- DVLS** Digital voice-logging system.
- DVM** Digital voltmeter.
- DVMC** Digital video map computer.
- DVMS** Direct-voice management system.
- DVO** 1 Direct-view, or vision, optics (or optical or option).  
 2 Direct voice output, synthesized speech confirming correct acceptance of DVI, and sometimes giving spoken warnings.
- DVOF** Digital vertical obstruction file, for terrain-referenced nav.
- DVOR** *Doppler VOR*, hence DVortac. Confusingly, this is now also being translated as “direct VOR”.
- DVR** 1 Direct-view radar [D adds display, I indicator].  
 2 Design verification review.
- DVRS** 1 Display, or digital, video recording system.  
 2 Digital voice recorder, or recording system.
- DVS** 1 Doppler velocity sensor.  
 2 Deutscher Verband für Schweißtechnik (G).
- DVST** Direct-vision, or view, storage tube.
- DVT** 1 Deep-vein thrombosis.  
 2 Delta voice terminal.
- DW** 1 Double wedge (aerofoil).  
 2 Drop weight.  
 3 Dual wheels.
- D/W** 1 Depth-to-width ratio in electron-beam hole drilling.  
 2 Drag-to-weight ratio.
- DWan** Direct wide-area network.
- dwarf sonobuoy** Smallest size, same 124 mm diameter as A-size but length only 305 mm (12 in.).
- DWC** Distributed weapons co-ordination (CC&D).
- DWD** Deutscher Wetterdienst [meteorological service; D-63004 Offenbach/M] (G).
- DWDF** Delta-wing dual-fuselage.
- DWDM** Dense wavelength division multiplexing, or multiplexed].
- DWE** Doppler wind experiment.
- dwell** 1 Brief rest period at end(s) of sinusoidal or other oscillatory motion, eg spot scanning CRT tube, bottom of drop-forging stroke, TDC and BDC in piston engine.  
 2 Period when scanning [eg, radar] beam remains looking at a particular target, to enhance resolution.
- dwell illumination region** Operator-selectable region of sky on which a surveillance radar can concentrate, ignoring remaining coverage.
- dwell mark** Caused by skin-mill, routing or similar tool remaining too long over one spot.
- dwell time** Among other meanings, the time spent in US between overseas tours (US armed forces).
- DWG** Digital word generator.
- DWI** Installation for generating giant magnetic pulses to explode mines (from cover name Directional Wireless Installation).
- DWN** Downdraughts.
- DWP** Digital wave processing.
- DWPNT** Dewpoint.
- DWR** Drag/weight ratio.
- DWS** Dispenser weapon system.
- DWT** Deutsche Gesellschaft für Wehrtechnik eV (G).
- DWV** Seaplane association (G).
- DX** 1 See *duplex*.  
 2 Distance.
- dyadics** Sets of generalised vectors of aircraft motion [with not the usual three but nine components].
- Dycoms** Dynamic coherent measuring system.
- DYN** Dynamic pressure (EDP code).
- dyn** see *dyne*.
- Dynafoam** Polyurethane elastomer becoming almost standard as seat filling.
- dynamic** Frequently refreshed [computer memory].
- dynamic amplifier** Audio amplifier whose gain is proportional to average intensity of audio signal.
- dynamic aquaplaning** Landplane tyres running at high speed over shallow standing water and riding up out of contact with runway.
- dynamic balance** Rotating body in which all rotating masses are balanced within themselves so that no vibration is produced.
- dynamic clash detection** Vital part of design process in which 3-D computer imaging is used to confirm that all parts of an assembly can be removed and replaced as in future maintenance.
- dynamic component** See *dynamics*.
- dynamic damper** Device intended to damp out vibration by setting up forces opposing every motion.
- dynamic directional stability**  $C_{n\beta_{dyn}}$ , refinement of divergence treatment of a/c, esp. supersonic fighters, by Moul/Paulson 1958.
- dynamic factor** Ratio of load carried by structural part in accelerated flight to corresponding basic load (see *load factor*).
- dynamic flight simulator** Normally, flight simulator whose cabin is mounted on a centrifuge.
- dynamic head** See *dynamic pressure*; also called kinetic head.

**dynamic heating** Heating of the surface of an aircraft by virtue of its motion through the air. Heat is generated because the air at the surface is brought to rest relative to the aircraft, either by direct impact in the stagnation region or by the action of viscosity elsewhere. For practical purposes, synonymous with *aerodynamic heating* and kinetic heating.

**dynamic hot bench** Test facility enabling items such as avionics or auxiliary power systems to be connected as if they were in the aircraft.

**dynamic lift** Aerodynamic lift due to the movement of the air relative to a lighter-than-air aircraft.

**dynamic load** A load imposed by dynamic action, as distinct from a static load. Specifically, with respect to aircraft, rockets or spacecraft, a load due to acceleration as imposed by manoeuvring, landing, gusts, firing guns, etc.

**dynamic meteorology** The branch of meteorology that treats of the motions of the atmosphere and their relations to other meteorological phenomena.

**dynamic model** A model of an aircraft (or other object) in which linear dimensions, mass and inertia are so represented as to make the motion of the model correspond to that of the full-scale aircraft.

**dynamic particle filter** One which separates particulate solids from moving fluid by making them move relative to fluid; most common are centrifugal filter and momentum separation.

**dynamic pressure** 1 Pressure of a fluid resulting from its motion when brought to rest on a surface, given by  $q = \frac{1}{2}\rho V^2$ ; where  $\rho$  is density and  $V$  free-stream velocity; in incompressible flow, difference between total pressure and static pressure.

2 Pressure exerted on stagnation point(s) on a body by virtue of its motion through a fluid.

**dynamic RAM** Constructed of periodically refreshed capacitor elements.

**dynamics** Main rotating parts of helicopter airframe.

**dynamic sampling** Concentration by flight recorder on one particular aspect of aircraft behaviour, esp. a malfunctioning channel.

**dynamic scale** Scale of flow about a model relative to a flow about full-scale body; if two flows have same Reynolds number, both are at same \*\*.

**dynamic sidelobe level** That exceeded for 3 per cent of time on each main-beam scan.

**dynamic similarity** 1 Relationship between model and full-scale body when, by virtue of similarity between dimensions, mass distributions, or elastic characteristics, aeroelastic motions are similar.

2 Similarity between fluid flows about a model and full-scale body when both have same Reynolds number.

**dynamic-situation modelling** Program which seeks to create a framework for producing a real-time representation of the battlespace.

**dynamic soaring** Soaring by making use of kinetic energy of air movements.

**dynamic stability** Characteristic of a body that causes it, when disturbed from steady motion, to damp oscillations set up and gradually return to original state; used esp. of helicopters.

**dynamic stall** Transient or fluctuating separation of flow over an aerofoil, especially a helicopter rotor blade, subjected to rapidly varying angle of attack which periodically takes it beyond the normal stall angle.

**dynamic storage** In EDP (1), storage in which information is continuously changing position, as in delay line or magnetic drum.

**dynamic system** See *dynamics*.

**dynamic thrust** Work done by fan or propeller in imparting forward motion, equal to mass of air handled per second multiplied by  $(V_s - V)$ , where  $V_s$  is slipstream velocity and  $V$  aircraft speed.

**dynamic viscosity** Shear stress in a medium divided by shear velocity gradient, in each case between notional adjacent layers. Symbol  $\mu$ , =  $\eta v$  (kinematic viscosity multiplied by density), units  $ML^{-1}T^{-1}$ . The SI unit  $Nsm^{-2}$  or  $P_aS$ , has no name, but see *poise*, = SI unit  $\times 10$ .

**dynamometer** Device designed to measure shaft power; torque or transmission \* measures torque or torsional deflection of shaft; electric and hydraulic \* measure power by electrical or fluid resistance; fan brake \* uses air friction, and prony brake \* applies torque by mechanical friction.

**dynamotor** A d.c. generator and electric motor having common set of field poles and two or more armature windings; one armature is wound for low-voltage d.c. and serves as motor; other serves as generator for high-voltage d.c.

**Dynarohr** Sound-suppressing multicell lining of engine fan cases and ducts (Rohr).

**dyne** Abb. dyn, unit of force sufficient to accelerate 1 g at  $1\text{ cm s}^{-2}$ ; =  $10^{-5}\text{N}$  or  $\frac{1}{981}\text{g}$  or  $2.248 \times 10^{-6}\text{lb}$ .

**dynode** Electrode of electron multiplier which emits secondary electrons when bombarded by electrons.

**dysharism** Decompression sickness, usually caused by release of nitrogen bubbles into blood at very low pressure.

**DZ** 1 Drop (or dropping) zone.

2 light drizzle.

**DZAA** Drop-zone assembly aid.

**Dzus fastener** Countersunk screw with slotted shank anchored in removable or hinged panel, which hooks with half-turn into wire anchor on airframe.

**Dzus rail** Mounting rail for LRUs.

# E

- E**
- 1 Energy (but work often W).
  - 2 Electric field strength.
  - 3 Electromotive force; unit, volt.
  - 4 Prefix exa =  $10^{18}$ .
  - 5 Young's modulus of elasticity.
  - 6 US DoD role prefix, Special Electronic (from 1962).
  - 7 UK role prefix, ECM training.
  - 8 Illumination.
  - 9 Endurance (usually safe endurance).
  - 10 Estimated.
  - 11 Sleet.
  - 12 General controlled airspace (ICAO from 1990, US from September 1993).
  - 13 East, or eastern.
  - 14 Excellence (US defense contractors, WW2).
  - 15 Emergency.
  - 16 End (of reported weather).
  - 17 Execution [NW mission] (RAF).
  - 18 Effective (machine performance).
  - 19 Aircraft category: rotorcraft (FAI).
  - 20 Expected value of a function.
- e**
- 1 Strain rate.
  - 2 Induced drag.
  - 3 Base of natural logarithms, c2.71828.
  - 4 Emitter.
  - 5 Electron charge, [strictly, preceded by minus sign]  $= 1.6021 \times 10^{-19} \text{ C}$ .
  - 6 Eigen vector; suffix pm phugoid mode, sp short-period.
  - 7 Elevator or slab tailplane.
  - 8 Offset from hub of helicopter flapping hinge.
  - 9 Subscript, exit.
  - 10 Eccentricity of rotating item or shaft bearing, orbit or ellipse.
- e, E** Expansion ratio of rotating item r shaft bearing, rocket nozzle.
- (E)** 121.5 and 243.0 available, but may not be monitored.
- E** Electrostatic field,  $\text{Vm}^{-1}$ .
- E<sub>1</sub>** See *E-layer*.
- E<sup>2</sup>COTS** See *EECOTS*.
- E<sup>2</sup>I** Endoatmospheric/exoatmospheric interceptor.
- E<sup>2</sup>PROM** Electronically-erasable programmable read-only memory.
- E3** Rules governing import of used aircraft into the UK, and relevant design approvals (CAA).
- E<sup>3</sup>**
- 1 Energy-efficient engine (NASA).
  - 2 End-to-end encryption (networks).
  - 3 Electromagnetic environmental effects.
- E-6B** Analog dead-reckoning navigation computer (US, 1941).
- E36 LRD** Potassium acetate liquid runway dispenser.
- e-bomb** Renders electronic threat dumb, blind and incapable of retaliation.
- E-cats** See ECATS.
- e-check** Electronic passenger-recognition system, usually biometric facial scan or iris scan
- E-display** Radar display with az/el target on rectangular x/y axes.

- E-freight** Electronic replacement of paperwork (IATA).
- E-glass** Ultra-high-strength, used as reinforcement in advanced structures (not in commercial GRP).
- E-hitch** Standard connector between tug and baggage trolley, with vertical pin.
- E-hour** Precise time for launch of mission with NW [E from execution] (RAF, previously).
- E-layer** Ionised layer of ionosphere typically 100–120 km, most pronounced in daytime; also called Heaviside or Kennelly-Heaviside or E<sub>1</sub> layer; some evidence of higher layer called E<sub>2</sub>.
- E-Pireps** Electronic pilot report[s].
- E-plane** Plane of antenna containing electric field; principal \* is direction of maximum radiation.
- E-scan** Electronic scanning.
- e-tag** Electronic data tag.
- e-ticket** Book online, check-in with passport and hand luggage (IATA).
- EA**
- 1 Enemy aircraft.
  - 2 Electronic Attack, US aircraft category from 1962.
  - 3 Engine-attributable.
  - 4 Epoxy asphalt.
  - 5 Engineering authority.
  - 6 Environmentally acceptable.
  - 7 l'Espace Affaires business class (F).
  - 8 Evolutionary algorithm[s].
  - 9 The Institution of Engineers, Australia.
  - 10 Engine anti-ice, followed by number.
- EAA**
- 1 Experimental Aircraft Association (US, from 1953, office Oshkosh, Wisconsin).
  - 2 East Anglian Aircraft Preservation Society (UK).
  - 3 Export Administration Act (US).
  - 4 European Aluminium Association [office, Brussels B-1150] (Int.).
  - 5 Eastern Aerospace Alliance [trade association, Stevenage SG1 2PX].
- EA&AI** European Association of Aerospace Industries.
- EA&SD** Evolutionary acquisition and spiral development (EW).
- EAAP** European Association for Aviation Psychology (office in Zurich).
- EAAPS** European Association of Airline Pilots' Schools.
- EAAS** Empire Air Armament School (RAF Manby, November 1944 to June 1949).
- EAC**
- 1 Expected approach clearance time.
  - 2 Experimental-apparatus container.
  - 3 Equipment Approvals Committee (UK MoD).
  - 4 European Airlift Centre (Int.).
  - 5 Enlisted aircrew (USN).
  - 6 European Astronaut Center [Oberpfaffenhofen, near Cologne].
- EACC** European Airlift Control Cell (Eindhoven).
- EACS** Electronic automatic chart system.
- EACSO** East Africa Common Services Organization.
- EAD** European AIS database (Eurocontrol).
- EADB** Elevator-angle deviation bar.
- EADE** Extended air defense (US).
- EADI** Electronic attitude director, or display, indicator.

**EADRCC** Euro-Atlantic Disaster Response Co-ordination Centre.

**EADS** 1 Extended air-defense simulation.

2 Enterprise architecture and decision support (NSA1).

**EAEM** European Airlines Electronics Meetings[s].

**EAF** 1 Earned award fee.

2 Expeditionary Aerospace Force [= 10 AEFs] (USAF).

**EAFA** European Academy for Aviation Safety, non-profit organization providing permanent training (Int.).

**EAG** European Air Group, air forces which share facilities (Belgium, France, Germany, Italy, Netherlands, Spain, UK).

**EAGA** European Advisory Group on Aerospace (EU).

**EAGL** European Association for Grey Literature.

**Eagle** 1 Extended, or early, airborne global launch evaluation, or evaluator (Awacs).

2 Evolutionary aerospace global laser engagement (AFRL).

**Eagle Squadrons** Three RAF units whose pilots were American volunteers (1940–42).

**EAGS** Expeditionary arresting-gear system.

**EAI** 1 Engine anti-ice.

2 Enterprise application integration.

**EAIC** Enterprise Architecture Integration Council (USAF).

**EAISD** European AIS(1) database.

**EAL** 1 Elevated approach light.

2 Evaluation assurance level.

**EALS** 1 Ejector augmented lift system.

2 Electromagnetic aircraft launch system.

**EAM** 1 Emergency action message (NCA).

2 Extravehicular activity mobility.

**EAMDS** European Airlines Medical Directors Society.

**EAME** Europe/Africa/Middle East theatre (December 1941 to November 1945).

**EAMTRA** East Anglian military temporary reserved airspace.

**E&E** Escape and evasion.

**E&M** Engineering and maintenance.

**E&MD** Engineering and manufacturing development.

**E&S** Executive and support (ATC services).

**E&ST** Employment and Suitability Test Program (USAF).

**EANPG** European Air Navigation Planning Group.

**EANS** Empire Air Navigation School (UK).

**EAP** 1 Experimental aircraft programme.

2 Engine-alert processor.

3 Emergency audio panel.

4 Educator Astronaut program.

**EAPAS** Enhanced airworthiness program for airplane systems, concerned particularly with electric wiring (FAA).

**EAPS** Engine air particle separator.

**EAR** 1 Electronically agile radar.

2 Espace Aérien Réglementé (= danger, restricted or prohibited areas) (F).

3 Export after repair.

**EARB** European Airlines Research Bureau.

**EARC** 1 Extraordinary Administration Radio Conference (UIT).

2 Elimination of ambiguity in R/T callsigns.

**EARDA** European Armaments R&D Agency (EU objective, yet to be created).

**early operational capability** First inventory aircraft,

usually to lower standard than successors, to gain service experience.

**early turn** Turn made ahead of fix in airway to ensure that aircraft does not, because of speed, course change required, wind, etc, fly outside airway boundaries.

**early warning** Given by radar surveillance to LOS limit.

**earnings** Profit (US).

**EAROM, Earom** Electrical alterable read-only memory.

**EARS** 1 Electromagnetic aircraft recovery system.

2 Environment analysis and reporting system.

**EARSeL** European Association of Remote Sensing Laboratories [office, F-75340 Paris] (Int.).

**earth** Grounded side of electrical circuit or device.

**Earth funnel** Funnel-like shape of lines of force above magnetic poles.

**Earth inductor compass** Compass whose indication depends on current generated in coil revolving in Earth's magnetic field.

**earthing** Connecting to earth; also adjective, as in \* tyre (electrically conductive), \* wire.

**earthing point** In a long shaft system transmitting rotary power, a firm location where a trunnion, gearbox or shaft joint can be located to prevent whirl.

**Earth/Moon system** Regarded as two-planet system whose centre of rotation is on line joining the centres.

**Earth pendulum** See *Schuler pendulum*.

**Earth-rate correction** Command rate applied to gyro to compensate for apparent precession caused by Earth's rotation.

**earth return** Electrically bonded part of aircraft structure used in electrical circuit.

**earthshine** Illumination of dark part of Moon produced by sunlight reflected from Earth's surface and atmosphere. Also called earthlight.

**Earth station** Comsat, esp. Inmarsat, ground station, fixed or mobile.

**earth station** Point where a conductor can be connected to earth.

**earth system** All metallic parts of aircraft interconnected to form low-resistance network for safe distribution of electric currents and charges.

**EARTS** 1 Enhanced aircraft radar test station.

2 En-route automated radar tracking system.

**EAS** 1 Equivalent airspeed (see *airspeed*).

2 Espace Aérien Supérieur (upper airspace), (UIR).

3 Emergency avionics system.

4 Essential air service[s] (US).

**EASA** 1 European Aviation Safety Agency, replacing JAs (Int. except in non-EU states, 28 September 2003, office moved October 2004 to Cologne D-50452 G).

2 European Aviation Suppliers Association (Int., office Horsham, UK).

**Easie** Enhanced ATM and Mode-S implementation in Europe, see *EATMS(2)*.

**EASS** 1 European Aviation Safety Seminar.

2 Evaluation and source-selection.

**Eastern Test Range** Test range extending from Cape Canaveral across Atlantic into Indian Ocean and Antarctic.

**EASU** Engine analyser and synchrophase unit.

**Easy** Enhanced ADS(5) system.

**EAT** 1 Estimated (or expected) approach time.

2 Electronic angle tracking.

- 3** Engage and trim indicator.
- EATC** European Air Transport Command, proposed 2007 (Int.).
- Eatchip** European ATC harmonization and integration programme, from 1991, three phases, still active 2009 (ECAC/Eurocontrol).
- EATMP** European air-traffic management programme.
- eating irons** Knife, fork, spoon, issued to airmen (UK, colloq.).
- EATMS** 1 European Air-Traffic Management System (Int.).  
2 Enhanced air-traffic management and Mode-S Implementation in Europe (Int.).
- EAU** 1 European accounting unit; see *International Accounting Unit*.  
2 Engine analyser unit.
- EAW** Expeditionary Air Wing (RAF).
- EB** 1 Essential bus.  
2 Electron beam.  
3 End-bend.  
4 Executive Board (JAA).  
5 US DoD role prefix for standoff jamming platform.
- E<sub>b</sub>** Energy to be dissipated by wheel brakes.
- EBA** 1 Engine bleed air.  
2 Electric brake actuator.
- EBAA** European Business Aviation Association [office, Tervuren, B-3080 Belgium] (Int.).
- EBAC** Electric braking actuator controller.
- Ebace, EBACE** European Business Aviation Conference, or Convention, and Exhibition (Int.).
- EBA/H** EBA plus hydrazine.
- EBAPS, Ebaps** Electronically bombarded active-pixel sensor.
- EBDM** Extended Buhr design method.
- EBF** Externally blown flap.
- EBHA** Electrical back-up hydraulic actuator.
- EBIC** Electron-bombardment-induced conductivity.
- EBI** Eyeballs in.
- Ebidtar, EBIDTAR** Earnings before interest, depreciation, taxes and aircraft rent.
- EBIT** Earnings before interest and taxes; sometimes rendered [incorrectly] as earnings before income tax; DA adds depreciation and amortization; R adds [aircraft] rent.
- EBL** Electron-beam lithography.
- EBM** 1 Electron-beam machining (or micro-analysis).  
2 Electronic battle management.
- EBO** Effects-based operations.
- ebonite** Hard, brittle substance composed of sulphur and hard black rubber; possessing high inductive and insulating properties.
- EBP** Electron-beam perforated.
- EBPV** Electron-beam physical vapour deposition.
- EBR** 1 Electron-beam recording.  
2 Enhanced bit rate.
- EBRD** European Bank for Reconstruction and Development.
- EBRM** Electronic bearing and range marker.
- EBS** 1 Electronic beam squint tracking.  
2 Export baseline standard.
- EBSC** European Bird Strike Committee.
- Ebsicon** Standard NATO word for all SIT image tubes.
- EBSV** Engine-bleed shutoff valve.
- EBT** Effects-based targeting.
- EBU** 1 European Broadcasting Union.  
2 Engine build-up or build unit.
- ebullism** Formation of bubble, esp. in liquid rocket propellant or in biological or body fluids, caused by reduced ambient pressure.
- e-business** Electronic business, usually means Internet.
- EBW** 1 Electron-beam welding.  
2 Enhanced bandwidth.
- EC** 1 Eddy current.  
2 Environmental control (system).  
3 Escadre de Chasse (fighter wing) (F).  
4 Elliptic-cubic (wing profiles).  
5 Electronic combat.  
6 Engine-caused.  
7 European Community, or Commission.  
8 Event criterion.  
9 Electronic checklist.  
10 Electronic commerce.  
11 Earth coverage (Satcoms).
- E<sub>c</sub>** Compressive (bearing) strain.
- ec, e<sub>c</sub>** Perpendicular distance from wing aerodynamic axis to flexural axis.
- ECA** 1 Electronic control amplifier.  
2 European Cockpit Association [umbrella organization for pilot unions, [office, Brussels] (Int.).  
3 Emergency Controlling Authority (CAA).
- ECAA** European Common Aviation Area, comprising the 25 EU nations plus Albania, Bosnia/Herzegovina, Bulgaria, Croatia, Iceland, Macedonia, Montenegro, Norway, Romania, Serbia and the UN Interim Administration in Kosovo [2006–] (Int.).  
4 Export Control Act [2002–] (UK).
- ECAC** 1 Pronounced E-kak, European Civil Aviation Conference [since 1956, now 41 countries]; [office, Neuilly-sur-Seine] RL adds reference level (ATC) (Int.).  
2 European Civil Aviation Council [36 countries].  
3 Electromagnetic-compatibility analysis centre.
- ECAM** 1 Electronic centralized aircraft monitor (presents all information on two CRTs in FFCC).  
2 Electronic crew-alerting and monitoring.  
3 Also said to mean electronic checkout and maintenance.  
4 Electronic caution alert module.
- ECAP** 1 Electronic-combat adaptive processing.  
2 European capability action plan.
- ECAR** European Civil Aviation Regulation[s], [harmonized with FARs, replacing JARs 2004–] (Int.).
- Ecarda** European coherent approach to R&D in ATM(7). (Int.).
- E-Cars** Enhanced airline communications and reporting system.
- ECAS** Extended close air support.
- Ecass, ECASS** The European Committee for Aircrew Scheduling and Safety (Int.).
- Ecats, ECATS** Embedded combat-aircraft training system.
- ECB** 1 Electronic control box.  
2 Economical cruise boost.  
3 Electronic Components Board (UK).
- ECBA** Electronic-combat battle management.
- ECC** See *ECCM*.
- ECCA** Engine-condition classification analysis.
- ECCD** Electric cockpit-control device.

**eccentricity**

**eccentricity** 1 Deviation from common centre or central point of application of load.

2 Of any conic, ratio of length of radius vector through point on conic to distance of point from directrix.

3 Of ellipse, ratio of distance between centre and focus to semimajor axis. Also called numerical \*.

4 Also of ellipse, distance between centre and focus. Also called linear \*.

5 Distance measured chordwise between a wing's aerodynamic centre and its elastic [torsional] axis.

**ECCM** Electronic counter-countermeasures.

**Eccosorb** Important family of commercially available SFAs (RAM).

**ECCP** European Climate Change Programme (Int.).

**ECD** 1 Excusable contract delay (no penalty).

2 Equipment Capability Directorate[s] (MoD).

3 Engineering cognisance drawing.

**ECDES** Electronic combat digital evaluation system (USAF).

**ECDIS** Electronic charts and data-information system[s].

**ECDS** Enhanced container delivery system.

**ECDU** Enhanced control and display unit.

**ECE** Economic Commission for Europe (UN).

**ECEF** Earth-centred, Earth-fixed.

**ECF** Enhanced connective facility (SNA).

**ECFS** Empire Central Flying School.

**ECG** Electrochemically assisted grinding.

**ECGD** Export Credits Guarantee Department (UK).

**ECH** Electrochemically assisted honing.

**echelon** 1 Aircraft formation in which each member is above, behind, and to left or right of predecessor; such formation is said to be in \* to port or starboard.

2 Subdivision of headquarters, forward or rear.

3 Level of command.

4 Servicing unit detailed to provide ground support and maintenance facilities.

**Echo, ECHO** Enhanced C<sup>4</sup>ISR for homeland security operations, an attempted synthesis of GCCS, Adocs (2) and CATS(4) (US, 2003).

**echo** 1 Pulse of reflected RF energy, esp. that reaching the receiver.

2 Appearance on radar display of such energy returned from target; also called blip.

**ECHS** Electrochemical hydrogen separator [fuel cell].

**ECI** 1 Electronic commerce infrastructure.

2 Earth-centred inertial.

**ECIF** Electronic Components Industry Federation, [office, London] (UK).

**ECIM** Electronics computer-integrated manufacturing, ie, CIM of electronics.

**ECIPS, Ecips** Electronic-combat or countermeasures, integrated pylon system.

**ECIT** Enhanced communications interface transceiver.

**ECJ** European Court of Justice.

**ECL** 1 Emitter coupled logic.

2 Electro-generated chemiluminescence.

3 Engine, or equipment, condition lever (CAA).

4 Electronic checklist.

**ecliptic** Apparent path of Sun among stars because of Earth's annual revolution; intersection of plane of Earth's orbit with celestial sphere, inclined at about 23° 27' to celestial equator.

**ECLSS** Environmental control and life-support system [or subsystems].

**ECM** 1 Electronic countermeasures.

2 Electrochemical machining.

3 Engine-, or equipment-, condition monitoring.

4 Electronic control module.

**ECMJ** Escadrille de chasse multiplace de jour (multi-seat day fighter squadron) (F).

**ECMO** ECM officer (aircrew).

**ECMS** 1 Electronic component management system.

2 Engine condition monitoring system.

**ECMT** 1 European Conference of Ministers of Transport = CEMT [Paris F-75775] (Int.).

2 Emerging counter-Manpads technologies.

**ECN** Escadrille de chasse de nuit [night fighter squadron] (F).

**ECNI** Enhanced CNI.

**ECNP** Export control and non-proliferation (UK).

**ECO** 1 Electron-coupled oscillator.

2 Engineering change order.

3 Engine cut-off.

**ECA** Engine certificate of Airworthiness.

**ECOC** Enhanced Combat Operations Center.

**Ecofin** Council of Ministers for Economics and Financial Affairs (EU).

**Ecogas** European Council of GA Support (Int.).

**ECOM** 1 Earth centre of mass.

2 Electronic Command (USA).

**Econ** Economy.

**economical cruise mixture** Piston engine mixture with which AMPG is maximum.

**economiser** Reservoir in continuous-flow oxygen system in which oxygen exhaled by user is collected for recirculation.

**economiser valve** Assists in regulating fuel flow through piston engine carburettor, opened by increased airflow.

**economy** Originally a passenger fare cheaper than first class, with less luxurious standards of cabin service, meals, seat pitch etc. IATA airlines introduced \* class over North Atlantic in April 1958.

**economy-class syndrome** Normally means DVT (1).

**ECOP** Electronic copilot [colloq.].

**ECP** 1 Engineering change proposal, for introducing modification.

2 Etablissement Cinématographique et Photographique des Armées (F).

3 Effective candlepower (non-SI).

4 Eicas control panel.

5 Engine critical part[s].

**ECPNL** Equivalent Continuous Perceived Noise Level (*see noise*).

**ECPP** Effective critical parts plan.

**ECPS** Environmentally compatible propulsion system.

**ECR** 1 Electronic combat and reconnaissance.

2 Embedded computer resources.

**ECS** 1 Environmental control system.

2 Electronic Combat Squadron.

3 Engagement control station.

4 European company statute.

5 Engine-consumed spares.

6 Engineering compiler system.

7 Event-criterion sub-field.

8 Electronic chart system.

9 Engine control system, F adds failure.

- 10** Enhanced communications system[s].
- 11** Economical cruising speed.
- ECSL, ECSM, ECSR** Respectively ECS(1) plus left card, miscellaneous, right card.
- ECSR** East Coast Spacelift Range (USAF).
- ECST** Electronic-combat systems-tester (USAF).
- ECSVR** Engine-caused shop-visit rate.
- ECT** Enterprise caching technology.
- ECTM** Engine-condition trend-monitoring.
- ECU** **1** European Currency Unit (pronounced Ekyu, commonly called Euro).
- 2** Engine-change unit (complete bolt-on piston engine powerplant with cowl).
- 3** Environmental, or engine, or electronic, or Eicas, control unit.
- 4** Exercise Control Unit (a military formation).
- 5** External-compensation unit.
- EC<sup>UK</sup>** Engineering Council (UK).
- ECVS** Emergency communications voice system, or switch.
- ECW** **1** Electronic Combat Wing.
- 2** Enhanced compressed wavelet.
- ECWL** Effective combat wing loading.
- ED** **1** Emergency distance (or distress signal).
- 2** Engineering development (part of progress schedule).
- 3** End of descent (Lockheed uses 'EoD').
- 4** Explosive device.
- 5** Environmental damage.
- 6** Eicas display.
- 7** Followed by a two-digit number, design assurance levels for avionics systems, equivalent to DO-178B and DO-254. (Eurocae).
- E/D** End of descent.
- EDA** **1** Effective disc area (helicopter).
- 2** Electronic design automation.
- 3** Excess defense article, available for sale (US DoD).
- 4** European Defence Agency [20 June 2004–, office, Brussels] (Int.).
- EdA** Ejercito del Aire [Air Force, Spain].
- EDAC** See EDC(4).
- EDAU** Engine, or extended, data-acquisition unit.
- EDB** Extruded double-base.
- EDC** **1** European Defence Community.
- 2** Early display configuration.
- 3** Eros data centre.
- 4** Error detection and correction [often EDAC].
- Edcars** Engineering data computer-assisted retrieval system.
- Edcas** Equipment designers' cost analysis system.
- EDCT** Expected departure clearance time, issued to a flight as part of traffic-management program (FAA).
- EDD** Electronic data display (ATC flight data, tabular callsigns, heights, tracks and position information).
- EDDS** **1** Explosive-device detection system.
- 2** electronic document distribution service.
- eddy** **1** Local random fluid circulation drawing energy from flow on much larger scale and brought about by pressure irregularities, eg from passage of unstreamlined body.
- 2** In meteorology, developed vortex constituting local irregularity in wind producing gusts and lulls.
- eddy current** Generated in conductor by varying magnetic field; to reduce \*\* cores are built up of insulated laminations, iron dust or magnetic ferrite.
- eddy damping** Automatic damping by eddy currents generated by moving conductor.
- eddy Mach wave radiation** One of three major sources of jet-engine noise, associated with supersonically convecting disturbances.
- EDEM** European defence equipment market.
- EDG** **1** Electrical-discharge grinding.
- 2** Engine-driven generator.
- edge alignment** Distance, parallel to chord of propeller section, from centreline of blade to leading edge at any station.
- edge diffraction** Near-radial reflections caused by impedance mismatch around a radar antenna perimeter.
- edge effect** Distortion of eddy-current pattern when testing for cracks near edge of material.
- edge enhancement** Increasing the contrast at the periphery of an image, to render it easier to distinguish [important in recon. and baggage screening].
- edge flare** Rim of abnormal brightness around edge of video picture.
- edge keys** Buttons around electronic display.
- edge management** Strict discipline of maintaining optimum LE of wing, tail [and pylons, if present] for aerodynamics and radar signature.
- edge elevator** Deck-edge elevator (carrier).
- EDI** **1** Electronic-data interchange, or interface, between single computers or groups; F adds function.
- 2** Electronic design information; L adds library.
- 3** Electron-drift instrument.
- 4** Engine-data interface; F adds function, U unit.
- Edifact** Electronic-data interchange for administration, commerce and transport.
- EDIG** European Defence Industries Group [in April 2004 merged into ASD5, office same address at B-1200 Brussels] (Int.).
- E-Dircem** Escort directional IR countermeasures (USAF).
- EDIU** Engine-data interface unit.
- EDL** **1** Engage/disengage logic.
- 2** Electrical-discharge laser.
- 3** Entry, descent and landing.
- EdL** Erprobungsstelle der Luftwaffe (G).
- Edlar** European data-link for aerial reconnaissance (Int.).
- EDM** **1** Electrical-discharge machining.
- 2** Engineering development model.
- 3** Evasive defence manoeuvres.
- 4** Engine-data multiplexer.
- EDMS** Electronic data-management system[s].
- Edna** Enhanced diagnostic aid.
- EDO** Extended-duration orbiter.
- EDP** **1** Electronic data-processor, or processing.
- 2** Engine-driven pump.
- 3** Experimental data-processor (Eurocontrol).
- 4** Engineering-development pallet.
- 5** Engine development plan.
- EDR** Engineering design requirements.
- EDS** **1** Explosive[s], or electronic, detection system.
- 2** European Distribution System; A adds aircraft (USAF).
- EDSF** Electronic-data standard exchange.
- EDSS** Explosives-detection security system.
- EDT** **1** Eastern Daylight Time (US).
- 2** Expanded data-transfer; M adds module, S system.

- 3** Electronic drop tube.
- 4** Electrodynamic tether.
- 5** Engineering development test.
- EDU** *1* Enhanced, or engine, diagnostics unit.  
*2* Electronic display unit.
- eductor** Duct-fed ejector[s] for powered VTOL lift.
- Edwards** California [Mojave desert] AFB, site of AFFTC and NASA DFRC, previously called Muroc.
- EE** *1* Emergency equipment, or egress.  
*2* Electronic[s] equipment [bay or compartment].
- E/E** Electrical/electronic.
- E<sub>E</sub>** Elastic modulus in overall buckling of a panel.
- EEA** *1* Electronic Engineering Association (London, UK).  
*2* European Environment Agency (Int.).
- EEC** *1* European Economic Community.  
*2* Engine electronic, or electronic engine, control; U adds unit.  
*3* Extendable exit cone.
- EECM** Engine engineering and condition monitoring.
- EECots** Extended-environment commercial off the shelf.
- EECS** *1* Electrical/electronics cooling system.  
*2* Expeditionary Electronic Combat Squadron (USAF).
- EED** *1* Electromagnetic explosive deicing.  
*2* Electro-, or electrical explosive device.
- EEDS** Electro-expulsive deicing system.
- EEE** Energy-efficient engine, also E3 or E<sup>3</sup>.
- EEF** Engineering Employers Federation [UK, 800+ members, office London].
- EEFAE** Efficient and environmentally friendly aero engine; P adds program [completed end-2005].
- EEGS** Emergency electric-generating system.
- EEI** *1* EFIS/EICAS interface.  
*2* Essential elements of information (reconnaissance).  
*3* Electrical-engineering instruction.  
*4* Electronic engine instrument[s].
- EEL.3** Pioneer ester-based lubricant for gas-turbine engines (Esso).
- EELV** Evolved expendable launch vehicle.
- EEMAC, Eemac** Electrical & Electronic Manufacturers Association of Canada.
- EEMP** Enhanced electromagnetic pulse.
- EEMS** Electrostatic engine-monitoring system.
- EOC** En-route Expeditionary Operations Center (USAF).
- EEOS** European Earth-observing satellite.
- EEP** Experimental electronics package.
- EEP GS** Enhanced EPGS, typically ½-ATR boxes and ½-volume.
- EEPROM, EEPROM, E<sup>2</sup>Prom** Electronically-erasable programmable read-only memory.
- EER** Extended echo-ranging.
- EERM** Etablissement d'Etudes et de Recherches Météorologiques (F).
- EEPSG** European Equipment Producers Support Group (Int.).
- EES** *1* Electronically-enhanced sensing, or sensor.  
*2* Electrical Engineering Squadron (RAF).
- EET** *1* Estimated elapsed time.  
*2* Estimated entry time.
- 3** Escadron d'Expérimentation et de Transport (F).
- EETC** Enhanced equipment trust certificate (leasing).
- E-Etops** Initial E can mean early or EIS.
- EEU** Elms [electrical load-management system] electronic unit.
- EEVIP** Early extended-range twin operations validation and integration.
- EEW** Equipped empty weight.
- EEZ** Exclusive [coastal] economic zone; IG adds industry group.
- EF** Evaluator Flight (RAF).
- E/F** Engine failure.
- EFA** End-fire array (radar).
- EFAB** Extended forward avionics bay.
- Efams** External fuel, armament and management system.
- EFAS, Efas** *1* En-route flight advisory service.  
*2* Electronic-flash approach-light system.
- Efatō, EFATO** Engine failure at [or soon after] takeoff.
- EFB** Electronic flight bag.
- EFC** *1* Expected further clearance [time].  
*2* Elevator feel computer.  
*3* Engine-failure compensation mode.
- EFCC** Enhanced fire-control computer; C adds configuration.
- EFCS** Electrical [FBW], or electronic, flight-control system.
- efctv** Effective.
- EFCU** Electronic fuel-, or flight-, control unit.
- EFD** Electronic flight display.
- Efdars, EFDARS** Expandable flight-data acquisition and recording system (FAA).
- EFDC** Early-failure detection centre.
- EFDPMA** Educational Foundation of DPMA (US).
- EFDR** Expanded flight-data recorder.
- EFDS** Electronic flight-data system.
- FE** *1* Emitter feature extractor, an Elint tool.  
*2* Environmentally Friendly Engine (UK 2004-).
- FEFO** European Flight Engineers Organization (Int., merged into IFEO).
- EFF** *1* Explosively formed fragment.  
*2* Effective.  
*3* Enhanced forward funding.  
*4* Experimental Forecast Facility (AWC3).  
*5* Engine fuel flow; HS adds heat sink.
- EFFE** European Federation of Flight Engineers, later EFEFO.
- effective angle of attack** Angle at which aerofoil produces a given lift coefficient in two-dimensional flow, also called AOA for infinite aspect ratio.
- effective angle of incidence** See *effective angle of attack*.
- effective aspect ratio** That of aerofoil of elliptical planform that, for same lift coefficient, has same induced-drag coefficient as aerofoil, or combination of aerofoils, in question.
- effective atmosphere** That part of planetary atmosphere which measurably influences particular process of motion. For an Earth satellite limit is 120 miles, 193 km (see *mechanical border, sensible atmosphere*).
- effective coverage** Region within which a navaid provides accurate and reliable guidance.
- effective current** Difference between impressed current and counter-current.
- effective exhaust velocity** Velocity of rocket jet after effects of friction, heat transfer, non-axially directed flow, etc.

## effective helix angle

EGT

**effective helix angle** Angle of helix described by point on propeller blade in flight through still air measured relative to Earth.

**effective horsepower** Power delivered to propeller.

**effective pitch** Distance aircraft advances along flight-path for one revolution of propeller.

**effective pitch radio** Basic propeller characteristic  $V/nd$ , where V is airspeed, n propeller rpm and d diameter, units being compatible.

**effective profile drag** Difference between total wing drag and induced drag of wing with same aspect ratio but elliptically loaded.

**effective propeller thrust** Net propulsive force; propeller thrust minus increase in drag due to slipstream.

**effective range** Maximum distance at which weapon may be expected to strike target.

**effective sortie** One which crosses the enemy frontier [see *sortie*].

**effective span** Span minus correction for tip losses; usually defined as horizontal distance between tip chords.

**effective terrestrial radiation** Amount by which IR radiation from Earth exceeds counter-radiation from atmosphere. Also called effective radiation or nocturnal radiation.

**effective velocity ratio** Based on dynamic pressures

$$\sqrt{\frac{q}{q_j}} \text{ where } q_j \text{ is jet impingement stagnation pressure}$$

(jet-lift ground effect).

**effective wavelength** That corresponding to effective propagation velocity.

**effector** 1 In any system, an output device.

2 Any device used to manoeuvre a vehicle in flight, now becoming popular in US as alternative to inceptor.

**effects-based operations** Selection of a series of targets in a particular order, to achieve a specific final result.

**efficiency** Ratio of output to input, usually expressed in percentage form. See overall, propulsive, thermal\*.

**efficiency of catch** Proportion of total water droplets in path of aircraft which actually strike it.

**efflux** Total composition of gas or other fluid flowing out from a device, except that in an engine with a propulsive jet \* excludes flows from auxiliary devices such as turbogenerators, heat exchangers and breathers.

**effusion** Flow of gas through holes sufficiently large for velocity to be approximately proportional to square root of pressure difference.

**EFH** 1 Earth far horizon.

2 Engine flight hours.

3 Equivalent flight hours.

**EFI** Electronic flight instruments, or instrumentation; S adds system; 8×8 colour CRTs.

**EFIC** Electronic flight-instrument controller.

**EFIDS** European flight-information display system.

**EFIP** Electronic flight-instrument processor; CP adds control panel.

**EFIS** See *EFI*; CP adds control panel.

**EFIT** Engineer, furnish, instal and test.

**EFL** 1 Emitter function logic.

2 External-finance limits.

**EFM** 1 Enhanced fighter manoeuvrability, e.g. with TVC and RCFAM.

2 Engine fleet management.

**EFMCS** Enhanced flight-management computer system.

**EFMS** Experimental flight-management system (Phare).

**EFOGS** Enhanced fibre-optic-gyro missile.

**EFP** 1 Explosively formed penetrator, or projectile.

2 Engine fuel pump; MS adds and metering system.

**EFPS** Electronic flight-progress strip; D adds data.

**EFRS** Engine-failure recognition speed.

**EFS** External fuel system (battlefield helicopter).

**EFT** 1 Elementary flying, or flight, training; E adds exercise, P programme, S school.

2 Electronic funds transfer; S adds system.

**EFU** Emergency functions unit [air refuelling].

**EFVS** Enhanced flight vision system[s]. Allows aircraft below MDA and DH when not on Cat. II or III straight-in approach (FAA).

**EFW** Electric field and wave.

**EFX** Expeditionary forces experiment (USAF).

**EGA** 1 Exhaust-gas analyser.

2 Excess ground attenuation.

**EGAC** Enhanced general avionics computer.

**EGAD** Export Group for Aerospace and Defence (UK).

**EGads** Electronic ground automatic destruct sequencer button.

**EGAS** European guaranteed access to space (five-year 2003–07 plan requiring €1 billion).

**EGASF** European General Aviation Safety Foundation.

**EGATS** European Guild of Air Traffic Services.

**EGB** End-grain balsa.

**EGBU** Enhanced glide-bomb unit.

**EGCU** Electrical-generator control unit.

**EGDN** Ethylene-glycol dinitrate (a powerful explosive).

**eggbeater** Helicopter with intermeshing rotors.

**EGI** Embedded GPS/INS.

**EGIHO** Expedited ground-initiated handoff.

**EGIU** Electric[al] generator interface unit.

**Eglin** Florida, largest AFB, home of many facilities including former APGC (USAF).

**EGME** Ethylene-glycol monomethyl ether.

**EGNOS, Egnos** European geostationary new, or navigation, overlay service, or system. European equivalent of WAAS. (EC, ESA, Eurocontrol).

**EGP** Exterior-gateway protocol.

**EGPWS, EGPS** Ground-proximity warning system prefix E originally embedded, now enhanced; now called TAWS.

**EGR** 1 Engine ground run[ning].

2 Embedded GPS receiver.

**egress** 1 Procedure for getting out of spacecraft in orbit or after planetary or lunar landing, whether for working in space or any other reason. Begins with putting on spacesuits, and includes depressurizing and opening hatch.

2 Departure of combat aircraft from target area.

**egress handle** Handle which fires ejection seat.

**EGS** 1 Elementary gliding school.

2 Exfoliation galvanic stress.

**EGSE** Electrical ground support [or station] equipment.

**EGT** Exhaust-gas temperature, measured immediately downstream of turbine[s] or exhaust valve.

**EGTP** External ground test program.

**EGW** Ethylene glycol and water.

**EH** Edge enhancement.

**E<sub>h</sub>** Total energy at given speed and height.

**EHA** 1 European Helicopter Association [15 countries; office NL-1071 Amsterdam] (Int.).

2 Electro-hydrostatic, or -hydraulic, actuator, or actuation.

**EHAC** En-route high-altitude chart.

**Ehanods** Extended high-accuracy network orbital-determination system (USAF).

**EHAS** Electro-hydrostatic actuation system.

**EHBS** Enhanced high-band subsystem.

**EHD** Electro-hydrodynamic.

**EHDD** Electronic head-down display.

**e.h.f., EHF** Extra-, or extremely, high frequency, see Appendix 2.

**EHL** Environmental health laboratory (USAF).

**EHM** Engine health monitoring (or monitor).

**EHOC** European Helicopter Operators' Committee (Int.).

**ehp, e.h.p.** Equivalent horsepower. Usually total equivalent shaft horsepower.

**EHR** Engine history recorder.

**EHS** 1 Enhanced surveillance.

2 Electrochemical hydrogen separation.

**EHSI** Electronic horizontal-situation indicator.

**EHT** Electrothermal hydrazine thruster.

**ehT** Extra high tension (volts).

**EHUM** Engine health and usage monitor.

**EHV** Electro-hydraulic valve.

**EHVF** European Homebuilt and Vintage Federation [2005] (Int.).

**EI** 1 Earth (atmosphere) interface.

2 Entry interface.

3 Emissions index.

4 Electronic intelligence, prefix to SEAD.

**EIA** 1 Electronic Industries Alliance [originally Association; office Arlington, VA22201] (US).

2 Environmental impact assessment.

3 Element imaging array.

4 Enhanced imagery analysis [W adds workstation].

**EIAC** Electronic Industries Association of Canada.

**EIANS** Eurocontrol Institute of Air Navigation Services.

**EIB** European Investment Bank.

**EICAS, Eicas** Engine indication, or instrument, (and) crew-alert[ing]-system; C adds control.

**EICMS** Engine in-flight condition-monitoring system.

**EID** 1 Electro-impulse deicing.

2 Emitter identification.

**EIDS** Engine-instrument, or instrumentation, display system.

**Eiffel-type tunnel** Open-jet, non-return-flow wind tunnel in which whole working section is open.

**eigen values** Discrete values of undetermined parameter involved in coefficient of differential equation, such that solution, with associated boundary conditions, exists only for these values; also called characteristic values or principal values.

**eight** Flight manoeuvre in which aircraft flying horizontally follows track like large figure eight (see *Cuban\**, *lazy*\*).

**eight-ball** Artificial horizon or attitude indicator (colloq., US).

**18-m class** One of four Ostiv/FAI classes for competitive gliding, including span not greater than 18m.

**eight-point roll** Roll executed in eight stages, with aircraft held momentarily after each roll increment of 45°.

**eight pylon** Manoeuvre used in air racing in which aircraft is flown around pylons so that wingtip appears to pivot on pylon.

**802-M, -11B** Leading wireless cabin system [in 2002] for use by individual passengers.

**EIMG** Engine Industry Management Group [12 companies] (Europe).

**EIMS** European innovation monitoring system.

**EIOTEC** Engineering, integration, operational test and evaluation contract.

**EIP** 1 Enhanced industry participation.

2 Environmental-impact parameter.

3 École d'Initiation Pilote (F).

**EIPI** Extended initial protocol identifier.

**EIPS** Engine ice protection system.

**EIQ** Engine Integration Qualification (USA).

**EIRA** Ente Italiano Rilievi Aerofotogrammetrici.

**EIRP** 1 Effective [or equivalent] isotropically radiated power.

2 Earth incident radiated power.

**EIS** 1 Entry into service.

2 Environmental impact statement.

3 Ejection initiation subsystem.

4 Electronic instrument(ation) system.

5 Engine indication, or information, or instrument, system.

6 Engine in service (Pratt & Whitney).

**EISA** Extended industry-standard architecture.

**EISF** Engine initial spares factor.

**EISS** Enhanced information sensor system, or suite.

**EISW** Equivalent isolated single-wheel load (LCN).

**EIT** Exoatmospheric interceptor technology.

**EITB** Engineering-Industry Training Board.

**EIU** Interface unit prefixed by equipment, engine, electronic[s], Efis, Eicas or emergency.

**EJAA** European Joint Aviation Authorities [pre-2003 predecessor of EASA] (Int.).

**ejectable** Able to be ejected from aircraft, esp. capsule, crew seat, sonobuoy, drosonde or flight recorder.

**ejection** Escape from aircraft by ejection seat.

**ejection angle** Angle at which ejection seat leaves, measured relative to aircraft.

**ejection capsule** 1 Detachable compartment serving as cockpit or cabin, which may be ejected as unit and parachuted to ground.

2 Box containing recording instruments or data ejected and recovered by parachute or other device.

**ejection chute** Parachute(s) used to decelerate ejection seat or capsule; often ballute or drogue.

**ejection seat** Seat capable of being ejected in emergency to carry occupant clear of aircraft.

**ejector** Device comprising nozzle, mixing tube and diffuser, utilising kinetic energy of fluid stream to pump another fluid from low-pressure region.

**ejector augmented lift** *Ejector lift*.

**ejector exhaust** Piston engine pipe(s) disposed or shaped to produce forward thrust, not necessarily incorporating an ejector.

**ejector lift** Method of powered lift in which high-energy flow of hot gas (rarely, HP bleed air) from jet engine is expelled downwards through arrays of nozzles in large profiled vertical duct to entrain much greater flow of free air.

**ejector nozzle** Propulsive nozzle for engine of supersonic aircraft whose jet can entrain a large surrounding airflow.

**ejector ramjet** See *ram-rocket*.

**ejector seat** See *ejection seat*.

**EJS** Enhanced JTIDS.

**EK** Equatorial air mass.

**EKG** Electrocardiograph.

**Ekman layer** Transition between surface boundary layer and free atmosphere.

**EKP** Electronic knee-pad.

**EKV** Exatmospheric kill vehicle.

**ekW** Equivalent shaft power of turboprop, measured in kW. See *equivalent power*.

**EL** 1 Electroluminescent.

2 Ejector (augmented) lift.

3 Emitter locator (or location).

4 Elevation [or el].

5 Electronic logbook; also see *ELB*.

6 Expeditionary logistic [EAW] (RAF).

**E<sub>L</sub>** Reduced elastic modulus in local buckling.

**Elac, ELAC** 1 En-route low-altitude chart.

2 Elevator and aileron computer.

**Elass, E-LASS** Enhanced low-altitude surveillance system.

**elastance** Inability to hold electrostatic charge.

**elastic axis** Spanwise line along cantilever wing along which load will produce bending but not torsion.

**elastic centre** 1 Point within wing section at which application of concentrated load will cause wing to deflect without rotation.

2 Point within wing section about which rotation will occur when wing is subjected to twist.

**elastic collision** Collision between two particles in which no change occurs in their internal energy or in sum of their kinetic energies.

**elastic instability** Condition in which compression member will fail in bending before failing compressive strength of material is reached.

**elasticity** Property of material which enables a body deformed by stress to regain original dimensions when stress is removed.

**elasticiser** Elastic substance or fuel used in solid rocket propellant to prevent cracking of grain and bind it to case.

**elastic limit** Maximum stress withstood by material without causing permanent set or deformation. Hooke's Law asserts that within \*\* ratio of stress to strain is constant.

**elastic model** Linear dimensions, mass distribution and stiffness are so represented that aero-elastic behaviour of model can be correlated with that of full-scale aircraft.

**elastic modulus** Ratio of stress to strain [up to elastic limit].

**elastic stability** Able to bear compressive yield stress of materials without buckling.

**elastic stop nut** Nut in which self-locking is ensured by ring of fibre in which threads are formed as nut is screwed down.

**elasticity** See *specific elastance*.

**elastomeric bearing** Bearing in which angular (and some

linear) relative motion is permitted by distortion of flexible blocks bonded to the two parts. Needs no maintenance.

**elastomers** Rubber-like compounds used as pliable components in tyres, seals, gaskets etc.

**elasto-optical effect** Variation in length and refractive index of fibre optics when subjected to tensile stress.

**elastoplasticity** Theory of finite deformations.

**el-az** Elevation/azimuth.

**ELB** 1 Emergency locator beacon [A adds aircraft].

2 Extended [or extension of the] littoral battlespace.

3 Electronic logbook; FCG adds fault-correction guide, ISE in-service evaluation.

**ELBA** Emergency locator beacon, aircraft.

**elbow** 1 Angled section of piping used where change of direction is necessary.

2 Hollow fixture used for joining two lengths of electric conduit at an angle.

**ELC** Engine-life computer.

**ELCH** Elasticity laminate checker.

**ELCU** 1 Electrical control unit (CAA).

2 Electronic load-control unit.

**ELD** 1 Electroluminescent display.

2 Earth leakage detector.

**ELDO, Eldo** European Launcher Development Organization (1960, now defunct).

**elec** Usually electrical, not electronic.

**ElectRelease** Patented epoxy adhesive, rapidly disbanded by application of low voltage.

**electrical-discharge machining** Shaping hard metals by making the workpiece the anode in an electric circuit and eroding it by a shaped cathode tool, all submerged in ionised electrolyte.

**electrical engine** Rocket in which propellant is accelerated by electrical device; also called electric rocket (see *electric propulsion*).

**electrical interference** Undesirable and unintended effects on equipment due to electrical phenomena associated with other apparatus, cables, materials or meteorological conditions.

**electrical load management** Supervises links between generators/alternators on main engines and APU, batteries and ground power supplies and on-board loads.

**electric altimeter** Indicates height by variation of electrical capacitance. Also called electrostatic or capacity altimeter.

**electric bonding** Interconnection of metallic parts for safe distribution of electrical charges.

**electric braking** Use of powerful [rare-earth] electromagnets to squeeze the landing-gear brake rings.

**electric energy** Product of current and time, 1MJ = 0.277 kWh, 1J = 1Ws.

**electric field strength** Electric potential per unit distance across field, symbol E, units volts per metre.

**electric flux density** Also called dielectric flux density, D =  $4\pi \times$  displacement current, units coulombs/metre<sup>2</sup>.

**electric gyro** One whose rotor is driven electrically.

**electric propeller** One whose pitch-change mechanism is actuated by an electric motor and gearbox.

**electric propulsion** General term describing all types of propulsion in which propellant consists of charged electrical particles accelerated by electric or magnetic fields or both; eg electrostatic, electromagnetic or electrothermal.

## electric RAT

**electric RAT** Ram-air turbine driving electric alternator or d.c. generator.

**electronics** Generalised term for all electric power generation, control and services.

**electric starter** Electric motor used to crank engine for starting.

**electric steel** Steel made in electric furnace (induction or arc-type) which possesses uniform quality and higher strength than open-hearth steel of same carbon content.

**electric tachometer** See *tachogenerator*.

**electric trim** Trim tab[s] moved by electric motor [and usually irreversible screwjack].

**electric welding** Welding by electric arc or passing large current through material.

**electric wind** Emission of negative charge from sharp corner or point of conductor carrying high potential current. Also known as electric breeze.

**electrochemical machining** Range of processes in which large direct current is passed through workpiece via shaped electrode in conductive electrolyte.

**electrochemical treatment** Process involving application of electrical energy to produce chemical change in surface of material to be treated, such as anodization of aluminium alloys.

**electrochromatic** Optically dimmable [transparency] by applied voltage.

**electrode** 1 Terminal at which electricity passes from one medium into another; positive is called anode and negative cathode.

2 Semiconductor element that performs one or more of the functions of emitting or collecting electrons or ions, or of controlling their movements by electric field.

3 In electron tube, conducting element that performs one or more of the functions of emitting, collecting or controlling, by electro-magnetic field, movement of electrons or ions.

**electrodynamics** Science dealing with forces and energy transformation of electric currents, and associated magnetic fields.

**electrodynamic tether** EDT, long (<100-km, 62-mile) flexible filament[s] linking in tension two bodies in orbit round Earth or other primary, providing modest artificial gravity as well as ability to change orbit and efficiently generate electrical power. See *tether system*.

**electro-expulsive de-icing** Use of intermittent giant pulses of d.c. to detach ice from airframe.

**electroforming** Building up a metal part of complex but thin form as an electroplated layer on a substrate, eg nickel on expanded polystyrene.

**electro-hydraulic** Synonymous with electro-hydrostatic; both are abbreviated EHA.

**electro-hydrostatic** Using hydraulic power to provide output force in localised system with all command and power provided by multi-redundant electric channels, which are much lighter than hydraulic piping.

**electroimpulse deicing** Mechanical method involving repeated [small] surface deformations caused by electric shocks.

**electrojet** Current sheet or stream moving in ionised layer in upper atmosphere; \* move around Equator following sub-solar point and around polar regions, where they give rise to auroral phenomena.

**electrokinetics** Science dealing with electricity in

## electromechanical

motion, as distinguished from electrostatics. Electro-kinetic potential symbol is  $\zeta$ .

**electroluminescence** Emission of light caused by electric fields; gas light is emitted when kinetic energy of electrons or ions accelerated in field is transferred to atoms or molecules of gas.

**electrolysis** Chemical decomposition or change in chemical state produced by electric current.

**electrolyte** Liquid or paste conductor in electrolytic cell or battery; when acid, base or salt is dissolved in water dissolved material ionises, so that solution has electric potential and, when current is passed, will have different potential from metal immersed in it; solution used for anodizing aluminium and alloys, sulphuric or chromic acids being most common.

**electrolytic corrosion** Corrosion resulting from electro-chemical action of dissimilar metals in presence of electrolyte.

**electromagnet** Magnet whose flux is produced by current in coil which encircles ferromagnetic core; temporarily magnetised while current flows.

**electromagnetic** Pertaining to magnetic field created by current; combined magnetic and electric fields accompanying movements of electrons through conductor. Abb. EM.

**electromagnetic compatibility** All aircraft systems can work simultaneously with no mutual interference.

**electromagnetic expulsive deicing** Sends intermittent giant pulses of EM energy which impart skin shocks which, though small amplitude, throw ice off.

**electromagnetic focusing** Control and concentration of electrons in narrow beam by magnetic fields.

**electromagnetic frequency bands** For administrative purposes various EM bands allotted letters (see Appendix 2).

**electromagnetic induction** Establishment of current in conductor cutting flux of electromagnet; principle of rotary electrical machines and transformers.

**electromagnetic intrusion** Intentional insertion of EM energy into transmission paths with object of causing confusion.

**electromagnetic radiation** Radiation made up of oscillating electric and magnetic fields and propagated in a vacuum at 299,792,456 m [983,571,007 ft]/s; includes gamma radiation, X-rays, ultra-violet, visible light, infrared radiation, radio and radar waves.

**electromagnetic riveting** Closing rivets by violent EM pulse.

**electromagnetic rocket** See *electrical engine, plasma rocket*.

**electromagnetic spectrum** EM radiation extending from gamma rays down through broadcast band and long radio waves.

**electromagnetic units** Several related systems of units [e.g. featuring abampere, abcoulomb, maxwell] now superseded by SI.

**electromagnetic waves** Waves associated with EM field, with electric and magnetic fields perpendicular to each other. Also known as electric waves, radio waves, light, X-rays, and by other names.

**electromechanical** 1 Using electricity as sole source of power and of command/control functions. Such systems are expected to displace hydraulics and other secondary power services, partly because of rare-earth magnets.

## electrometallurgy

2 Control of engine fuel system by electrical signals.  
**electrometallurgy** Use of electricity for smelting, refining, welding, annealing and other processes, and for electrolytic separation of metals and deposition from solutions.

**electromotive force** External electrical pressure (measured at source) which tends to produce flow of electrons in conducting medium; volt is \*\* required to maintain current of one ampere through resistance of one ohm.

**electron** Subatomic particle that possesses smallest negative charge, and which is so-called "fundamental particle" assumed to be building block of the Universe; mass at rest  $m_c = 9.1093897 \times 10^{-28}$  g, negative charge  $1.60217733 \times 10^{-19}$  coulombs; charge/mass ratio  $e/m_c = 1.7588 \times 10^{11}$  C kg<sup>-1</sup>.

**electron beam** Stream of electrons focused by magnetic or electrostatic field and used for neutralisation of positively charged ion beam and to melt or weld materials with high melting points. Also called cathode ray.

**electron-beam lithography** 'Writing' parts of an integrated circuit (microchip) by means of beam of electrons.

**electron-beam welding** Use of powerful focused beam of electrons to make precision weld on workpiece in vacuum.

**electron charge** Unit, symbol e,  $-1.602 \times 10^{-19}$  C.

**electron gun** Electrode structure which produces and may control one or more electron beams to produce TV picture or weld material.

**electronic ADI** Attitude director indicator incorporating a CRT display forming part of an EFIS.

**electronic charge** Electron charge.

**electronic cloth** Rapidly growing range of micro-electronics based on low-cost flexible substrates.

**electronic combat** See *electronic warfare*.

**electronic counter-countermeasures** Subdivision of EW; actions to ensure effective use of electromagnetic radiation despite enemy use of countermeasures.

**electronic countermeasures** Subdivision of EW; actions to reduce or exploit effectiveness of enemy electromagnetic radiation.

**electronic data-processing** System using electronic computer(s) and other devices in gathering, transmission, processing and presentation of information.

**electronic deception** Deliberate radiation, reradiation, alteration, absorption or reflection of electromagnetic radiation, to mislead enemy in interpretation of data or present false indications; manipulative \*\* is alteration or simulation of friendly electromagnetic radiations to accomplish deception; imitative \*\* is introduction into enemy channels of radiation which imitates his own emissions.

**electronic defence evaluation** Mutual evaluation of radar(s) and aircraft by means of aircraft trying to penetrate radar through ECM.

**electronic drop tube** A multistation flight-strip manager.

**electronic flight bag** Software and data-services solution to digitize logbooks, charts and other flight documents to achieve paperless cockpit. Class 1, usually COTS, including laptops; Class 2, the same, but connected to aircraft systems when in use, so requires approval; Class 3, installed equipment [AC-120-76A] (FAA).

**electronic flight-control unit** Computer controlling surfaces used as spoilers and airbrakes, with or without roll-control function.

## electrostatics

**electronic flight instrumentation system** Replaces traditional flight instruments by full-colour CRT displays (typically three  $200 \times 200$  nm,  $8 \times 8$  in, for each pilot) each reprogrammable to operate in different modes and giving high redundancy.

**electronic interference** Disturbance that causes undesirable response in electronic equipment.

**electronic intelligence** Detection, recording, analysis and cataloguing (where possible, linking with particular emitters) of all unfriendly EM emissions.

**electronic jamming** Deliberate radiation, reradiation or reflection of electromagnetic signals with object of impairing use of electronic devices by enemy.

**electronic line of sight** Path traversed by electromagnetic waves not subject to reflection or refraction by atmosphere.

**electronic protective measures** Generally synonymous with electronic countermeasures.

**electronics** Branch of physics concerned with emission, transmission, behaviour and effects of electrons.

**electronic scanning** Scanning by cathode-ray tube, or sequenced emission from larger planar antenna array, instead of by mechanical means.

**electronic technical log** Manages civil airline fleet data including trip reports and maintenance requirements.

**electronic warfare** (also **electronic combat**) Use of electromagnetic emissions as a weapon or a source of intelligence.

**electron multiplier** Electron tube which delivers more electrons at output than it receives at input, because of secondary emission.

**electron tube** Gas-filled tube having anode, cathode and sometimes other electrodes for controlling flow of electrons.

**electron-volt** See *eV*.

**electro-optical guidance** EO guidance makes use of visible (optical) contrast patterns of target or surrounding area to effect seeker lock-on and terminal homing. Three such systems are contrast edge tracker (Mk 84 EOGB and Walleye); contrast centroid tracker (Maverick); and optical area correlator, which scans contrast patterns in large area surrounding target.

**electro-optic converter** Device which converts electricity into laser pulses for fibre-optic sensors.

**electro-optics** Electronics involving visible or near-visible light, eg TV.

**electroplating** Coating metal with deposit removed from electrode and carried by electrolyte in which object to be coated is immersed.

**Electropult** Patented assisted-takeoff device, in effect a d.c. motor "unrolled" (US c1940).

**electrostatic capacity** Measure of ability to hold electric charge, unit Farad, symbol F.

**electrostatic deflection** Bending of electron beam during passage through electric field between two parallel flat electrodes; beam is deflected towards positive electrode.

**electrostatic focusing** Use of electric field to focus stream of electrons to small beam.

**electrostatic precipitation** Use of high voltages (large potential gradients) to remove particulate matter from gas flow, smoke or other volumes.

**electrostatic rocket** See *ion rocket*, *ion engine*.

**electrostatics** Study of electricity (charges) at rest.

**electrostatic storage** Storage of information as electrostatic charges.

**electrostatic unit, ESU** Unit of electric charge, amount of charge which repels similar charge in vacuum with force of one dyne; a statcoulomb.

**Elektron** Magnesium alloys with 3–12% aluminium, 0.2–0.4% manganese and often 0.3–3.5% zinc.

**element** 1 In electron tube, constituent part that contributes to electrical operation.

2 In circuit, electrical device such as inductor, resistor, capacitor, generator, line, electrode or electron tube.

3 In semiconductor device, integral part that contributes to its operation.

4 Parameters defining orbit of body attracted by central, inverse-square force: longitude of ascending node, inclination of orbit plane, argument of perigee, eccentricity, semimajor axis, mean anomaly and epoch.

5 Flight of two or three aircraft (US) or basic fighting unit of two aircraft (UK).

6 Component parts of aircraft sufficiently distinctive and specific in type, shape or purpose as to be of major importance in design.

**elementary charge** Electron charge.

**elementary trainer** Ab initio, also known as primary trainer.

**element leader** Lead aircraft or pilot of element or flight.

**elephant ear** 1 Thick plate on rocket or missile used to reinforce hatch or aperture.

2 Air intake consisting of twin inlets, one on each side of fuselage.

3 Quasi-circular balancing area ahead of hinge axis of flight-control surface [rare after 1920].

**Elev, elev** Elevation.

**elevation** 1 Side or front view as drawn in orthographic projection.

2 Vertical distance of point or level, measured from mean sea level.

3 See *airfield\**.

4 Angle in vertical plane between local horizontal and line of sight to object.

**elevation rudder** Elevator (arch.).

**elevator** 1 Movable control surface for governing aircraft in pitch.

2 Effectiveness of pitch control, as in expression “to run out of \*\*”.

3 In air intercept, code meaning ‘take altitude indicated (in thousands of feet), calling off each 5,000 ft increment’ (DoD).

**elevator angle** Angle between chord of elevator and that of either the tailplane or aircraft longitudinal axis.

**elevator tab** Trim (or other) tab attached to elevator.

11-9 Date of 2001 terrorist attacks on US.

**elevons** Wing control surfaces combining functions of ailerons and elevators, esp. on delta-wing or ‘tailless’ aircraft.

**elex** Electronics (colloq.).

**e.l.f., ELF** 1 Extremely low frequency, see Appendix 2.

2 Electronic location-finder.

3 Aerospors federation (Estonia).

4 Early long flights [flight-test programme].

**Elfaa** European Low-Fares Airlines Association [January 2004–, 12 members] (Int.).

**Elfin** ATR racking and module for housing instrument, electronic unit or other equipment.

**ELG** 1 Emergency landing ground.

2 Electric Landing Gear (UK 2004–).

**ELGB** Emergency Loan Guarantee Board.

**Elint** Electronic intelligence.

**Elinvar** Trade name for an *invar* of steel character.

**Elios** Elint identification and operating system.

**Elips** Electronic integrated protection shield.

**Elite** Trade name for new [2005] range of lubricating oils, initially 20W-50.

**ELJ** External-load jettison.

**elliptical orbit** Orbit of space object about primary body having form of ellipse. Nearest/furthest points pericentre/apocentre.

**elliptical wing** Aerodynamic theory shows that for highest efficiency (lowest induced drag) the planform should be an ellipse with the quarter-chord line straight.

**elliptic loading** Ideal form of spanwise loading of wing, lift vectors forming semi-ellipse seen in front elevation.

**ELM** 1 Extended-length message.

2 Electrical load management [S adds system, U unit].

**elongation** 1 Increase in length of hardware under tension.

2 Angle at Earth between lines to Sun and another celestial body of the solar system.

**ELP** Electroluminescent panel.

**ELQA** Extended link quality analysis (TADIL).

**ELR** 1 Environmental lapse rate.

2 Extra-long-range.

3 Eyesafe laser ranger, or rangefinder.

**ELS** 1 Emitter location system.

2 Emergency landing strip.

3 (Electron) energy-loss spectroscopy.

4 Electronic library system.

5 Elementary surveillance.

**Elsa** Electronic lobe-switching antenna.

**Elsec** Electronic security.

**ELSS** Environmental life-support system.

**EL SSE** Electronic sky screen equipment; indicates departure of rocket from predetermined trajectory.

**ELT** 1 Emergency locator transponder, or transmitter.

2 Enforcement of laws and treaties.

3 Electronic light table, for EO reconnaissance.

4 Emergency landing technique.

**ELV** Expendable launch vehicle.

**Elvis** Enhanced linked virtual information systems.

**EL/VT, ELVT** Ejector lift, vectored thrust.

**EM** 1 Electromagnetic.

2 Energy manoeuvrability.

3 Electron microscope.

4 Element manager.

**Em** Emission.

**e.m.** Electromagnet.

**e/m** Electron charge/mass ratio.

**EMA** 1 Electromechanical actuator, or actuation.

2 Electron microprobe analysis.

3 External mounting assembly (helicopter).

4 Electronic missile acquisition.

**EMAA** Etat-Major de l’Armée de l’Air (Chief of Staff, F).

**EMAD** Engine-mounted accessory drive.

**EMADS** Euromux management and data sheets.

**EMAGR, E-MAGR** Enhanced miniaturized airborne GPS receiver.

## Emals, EMALS

## emissions control

- Emals, EMALS** Electromagnetic aircraft launch system (catapult).
- Emars** Electromagnetic aircraft recovery system (carrier).
- EMARSSH, E-marsh** Europe Middle East route [structure] south of the Himalayas.
- EMAS** 1 Electromechanical actuation system.  
2 Environmentally modified airfield surface.  
3 Engineered-material[s] arresting system (ESCO).
- EMAT** Electromagnetic acoustic transducer.
- E<sub>max</sub>** Peak voltage.
- EMB** Extended MAD boom.
- embedded** 1 Computer or other processor forming integral part of device or subsystem and thus unable to communicate directly with bus or highway or to be used for any other purpose.  
2 Mixed clouds, usually Cu embedded in other types.
- embedded optical databus** Plastic fibre-optic conductors printed on airframe structure, replacing looms of cables.
- embedded training** Simulated threat data are fed to the avionics of a real airborne aircraft; can include audio and ground control.
- embodiment loan** Loan of government property to private industry, research organization or individual, usually to enable recipient to fulfil government contract.
- Embratel** Empresa Brasileira de Telecommunicacoes SA.
- EMC** 1 Electromagnetic compatibility, or capability.  
2 Entertainment multiplexer controller.
- Emcat** Electromagnetic catapult.
- EMCD** Electromagnetic chip detector.
- EMCDB** Elastomer-modified cast double-base propellant.
- Emcon** Emissions, or emission-monitor, control.
- EMCS** Energy monitoring and control system.
- EMD** 1 Emergency distance.  
2 Eidgenossische Militärdepartement (Switz.).  
3 Energy-management display.  
4 Engine or engineering, model derivative.  
5 Engineering and manufacturing development, or engineering, manufacturing and development.
- EMDa** Emergency distance available.
- EMDM** Enhanced multiplex-demultiplex unit.
- EMDP** Engine model derivative program (US).
- EMDr** Emergency distance required.
- EMDU** Enhanced main display unit (AEW aircraft).
- EME** Electromagnetic effects.
- EMEA** Europe, Middle East, Africa [or, Qinetiq, Australasia].
- EMEC** Enhanced master events controller.
- EMED** Electromagnetic-expulsion, or explosive, deicing [sometimes Emedi].
- emer, Emerg** Emergency.
- Emerald** Emerging Research and Technology Department activities of relevance to ATM(7) concept definition (Euret).
- emergency air** Compressed air for energizing hydraulic or pneumatic circuit in event of failure of normal power supply.
- emergency cartridge** Provides combustion products to energize hydraulic or pneumatic circuit in event of failure of normal power supply.
- emergency ceiling** Highest altitude for multi-engined

- aircraft at which best rate of climb is 50 ft per minute with throttle of one engine closed; also known as usable ceiling.
- emergency combat capability** Condition exclusive of primary alert status whereby elements essential to combat-launch an ICBM are present and can effect launch under conditions of strategic warning (USAF).
- emergency controlling authority** Temporary air-traffic rules in vicinity of an incident if required to preserve life or property (CAA).
- emergency descent** Premature descent from operating altitude because of in-flight emergency.
- emergency distance** Distance sufficient for all takeoff or landing emergencies, such as critical-engine failure at V<sub>1</sub>, met by runway plus stopway and possibly clearway.
- emergency exit** Door or window designed to be opened after emergency landing or aborted takeoff for passenger and crew evacuation.
- emergency flotation gear** Inflatables fitted to aircraft in emergency to provide water buoyancy.
- emergency landing** Landing made as result of inflight emergency.
- emergency locator/transmitter** Radio beacon triggered by impact or water immersion giving position of crashed aircraft; fixed \*\*\*, portable \*\*\*, and survival \*\*\* (armoured and can float). Suggest synonymous with Adelt.
- emergency parachute** Second stand-by parachute.
- emergency power unit** On-board source of electrical and/or hydraulic power sufficient to continue controlled gliding flight following loss of main engines; commonly self-contained package using hydrazine monofuel (hence MEPU).
- emergency rating** 1 Special rating of remaining helicopter engine[s] following failure of one; time-limited, typically to 30s; also called super-contingency.  
2 Piston engine rating for emergency sprint periods, with aid of high boost, water/methanol injection, etc.
- emergency scramble** Aircraft carrier CAP launch of all available fighter aircraft; if smaller number required, numerals and/or type may be added (DoD).
- emergent properties** Features of a new design which were not, and could not reasonably be, predicted at the original project stage, for whatever reason.
- emery** Hard abrasives based on corundum Al<sub>2</sub>O<sub>3</sub>.
- EMF** Embarked military force.
- emf, e.m.f.** Electromotive force.
- EMG** Electromagnetic gun.
- EMGFA** Armed forces general staff (Portugal).
- EMH** Electromagnetic health.
- EMI** 1 Electromagnetic induction, or inductor, or interference, or impulse[s].  
2 Environmental message interchange.
- EMIH** EMI (1, 2) hardening, or hazard.
- EMI/HIRF** EMI (1) high intensity radio frequency.
- EMIO** Egyptian Military Industrialization Organization.
- EMIRS** Electromagnetic interference reduction system.
- emission** 1 Process by which body emits EM radiation as consequence of temperature only.  
2 Sending out of charged particles from surface for electrical propulsion.
- emissions control** Combat environment in which all detectable emissions are, as far as possible, prohibited.

## **emissivity**

Thus, shipboard aircraft must use autonomous landing aids. In the days of nuclear deterrence it was central to attack by manned bombers.

**emissivity** Ratio of radiation emitted by body (if necessary in specified band of EM wavelengths) to that of perfect black body under same conditions; only luminescent can exceed 1, value for black body.

**emittance wash repair** In-flight repair of spacecraft TPS tile[s], vulcanizing Si/SiC powder.

**emitter** Device releasing radiation, usually in usable optical, IR or RF wavelengths.

**EML** 1 Emergency medical link.

2 Electromagnetic launcher.

**EMLU** European mid-life update.

**Emma, EMMA** Engineering mock-up and manufacturing assembly.

**eMMP** Electronic maintenance-management planning.

**EMMU** Engine monitor multiplexer unit.

**EMP** 1 Electromagnetic pulse (nuclear).

2 Electric motor pump.

3 Engine monitor[ing] panel.

4 Engine motor pump [on ground, flight controls].

5 Extended maintenance plan.

**Empar, EMPAR** European multifunction phased-array radar.

**EMPASS** Electromagnetic performance of air and ship system (USN).

**empennage** Complete tail unit.

**empirical** Based on observation and experiment rather than on theory; used esp. of mathematical formulae.

**employment** Tactical usage of aircraft in desired area of operation; in airlift, movement of forces into a combat zone, usually in assault phase (USAF).

**empty tunnel** No model in test section.

**empty weight** Measured weight of individual aircraft less non-mandatory removable equipment and disposable load. OEW is preferred.

**EMR** 1 Electromagnetic radiation.

2 Electromagnetic resonance.

3 Electromagnetic riveting.

4 Extraordinary magnetoresistance.

**EMRP** Effective monopole radiated power.

**EMRS** Electromagnetic remote sensing.

**EMRU** Electromechanical (or electromagnetic) release unit.

**EMS** 1 Emergency medical service (usually helicopter).

2 Entry monitor system.

3 Equipment Maintenance Squadron (USAF).

4 Engine management, or monitoring, system; see EMS.

5 Environmental management system (AEW radar).

6 Electromagnetic-pulse shielding (hardening).

**EMSC** Engine-monitoring system computer.

**EMSG** European maintenance system guide.

**EMSP** Enhanced modular signal processor.

**EMT** 1 Equivalent megatons.

2 Error-management training.

3 Electronic maintenance trainer.

4 Enhanced moving target; I adds indicator.

5 Expert missile tracker.

6 Emergency maneuver training.

**EMTA** Engineering & Marine Training Authority (UK, office Watford).

**Emtas** Eco-management and audit scheme.

## **end thrust**

**EMTE** Electromagnetic test environment.

**EMU** 1 Extravehicular mobility unit; suit for exploring lunar surface.

2 Engine maintenance, or monitoring, unit.

3 Electronic mockup.

4 Environment monitoring unit.

**emu, e.m.u.** Electromagnetic unit[s].

**EMUT** Enhanced manpack UHF terminal.

**EMUX, Emux** Electrical multiplexing.

**EMWR** Eddy Mach-wave radiation.

**ENA** 1 Escuela Nacional de Aeronáutica (Arg.).

2 Extended network addressing.

3 Exhaust nozzle area.

4 Exercise notification area.

**ENAC** 1 École Nationale de l'Aviation Civile (F).

2 Ente Nazionale per l'Aviazione Civile [civil aviation] (Italy).

**ENAV** ATC authority (Italy).

**ENB** Enhanced neutron bomb.

**ENC** Electronic noise-cancelling.

**encasement** Formal laying up and dedication of a disestablished unit's flags and ensigns (US).

**encastré** Structural beam whose ends are not pinned but fixed.

**enclosed cockpit** Provided with an overhead structure, either integral with the fuselage or a separate hinged or sliding canopy.

**encoder** Analog-to-digital converter, eg converting linear or angular displacement, temperature or other variable to digital signals.

**encoding altimeter** Presents usual display but in addition incorporates digitized output to transponder for transmission of pressure height to ATC.

**encounter** Time-continuous action between airborne friendly and hostile aircraft.

**end-bend blading** Gas-turbine compressor blading whose ends (root and tip) are progressively given 3-D curvature to compensate for relatively sluggish flow over the inner and outer walls of the duct.

**end-burning grain** Solid-propellant charge which burns only on transverse surface at one end, usually facing nozzle.

**end effects** Aerodynamic effects due to fact wing span is finite.

**end-fire** Linear aerial array whose direction of maximum radiation is along axis.

**end game, endgame** In failed interception by AAM, time when missile runs out of V and energy.

**end instrument** Converts data into electrical output for telemetry. Also called end organ or pickup.

**end item** End-product ready for use.

**endo-atmospheric** Within an atmosphere.

**endothermic** Absorbing heat.

**Endox Q-576** Alkaline soak added to water to form ultrasonic-cleaning fluid (Enthonic).

**endplate[s]** 1 Small auxiliary fins at or near tips of tailplane.

2 \* effect, aerodynamic effect of T-tail on fin, or of tanks, pods, missiles or fairings on wingtips.

**end play** Unwanted axial movement of shaft.

**end speed** Speed of aircraft relative to carrier at release from catapult.

**end thrust** Thrust along axis of shaft.

## endurance

**endurance** Maximum time aircraft can continue flying under given conditions without refuelling.

**endurance limit** Highest structural stress that permits indefinite repetition or reversal of loading; always less than yield stress (see *fatigue limit*).

**endurance on station** Maximum time maritime aircraft can patrol in designated areas.

**ENEC** Extendable nozzle exit cone.

**Enema** Etablissement National pour l'Exploitation Météorologique et Aéronautique (Algeria).

**energy** Capacity to do work. SI unit = joule, or [more usefully]  $MJ = 0.3725 \text{ hp-h}, 0.277 \text{ kWh}; 1 \text{ kWh} = 3.6000 \text{ MJ}; 1 \text{ hp-h} = 2.68452 \text{ MJ}; 1 \text{ BTU} = 1.05506 \text{ kJ}$ . At any time \* of a flying vehicle is given by  $E_h = W(h + V^2/2g)$  where  $h$  is height above MSL and  $W$  is instantaneous mass.

**energy absorption test** See *drop test*.

**energy conversion efficiency** Ratio of kinetic energy of jet leaving nozzle to that of hypothetical ideal jet leaving ideal nozzle using same fluid under same conditions.

**energy density** Sound energy per unit volume (usual unit is non-SI: ergs/cc).

**energy footprint** Total area of damage caused by aircraft crashing, especially at airshow.

**energy height** A measure of kinetic and potential energy of an air vehicle;  $h_e = h + V^2/2g$  where  $h$  is altitude above MSL and  $V$  is TAS expressed as a velocity.

**energy level** Any specific value of energy which a particle may adopt; during transitions from one level to another, quanta or radiant energy are emitted or absorbed, frequencies depending on difference between levels.

**energy management** Monitoring to minimise fuel expenditure for trajectory control, navigation, environmental control, etc.

**energy manoeuvrability** Flight manoeuvres in which full use is made of kinetic energy of aircraft, normally in trading speed for altitude.

**energy state** Total kinetic plus potential energy possessed by aircraft, particularly a fighter; normally expressed as altitude from SL reached (without propulsion) if all such energy were converted to potential (height) energy.

**energy weapons** See *directed-energy*.

**ENG** Electronic news-gathering.

**Eng** Engine.

**Engage** Armed position of some arrester hooks, extended or hinged down prior to landing

**engage** 1 In air interception, order to attack designated contact (DoD usage).

2 To contact arrester wire or barrier.

**engage and trim indicator** Panel instrument showing proper engagement of ailerons/elevators/rudder to autopilot system.

**engagement** Encounter which involves hostile action by at least one participant.

**engagement control** Exercised over functions of air-defence unit related to detection, identification, engagement and destruction of hostile targets.

**engaging speed** Speed of aircraft relative to arrester wire at engagement.

**engin** Missile (F).

**engine altimeter** Indicates altitude corresponding to manifold pressure of supercharged engine.

**engine-attributable** Caused by fault in an engine.

## enhanced GPWS

**engine car** Airship car wholly or mainly devoted to propulsive machinery.

**engine change unit** Aircraft piston engine removable as single unit with all accessories, cooling and oil systems.

**engine cowling** Hinged or removable covering around aircraft engine shaped to keep drag to minimum and optimise flow of cooling air.

**engine critical part[s]** Part[s] whose failure is likely to cause a Hazardous Engine Effect.

**engineered material** Cellular concrete for overrun areas.

**engineering** 1 Department responsible for detail design and development.

2 Hardware design and development.

**engineering mock-up** Full-scale replica of new aircraft or major part thereof, made [usually in metal] with high precision, partly in hard tooling, to check three-dimensional geometry of structure, systems, and equipment.

**engineering time** Number of man-hours required to complete engineering task.

**engineering units** Pre-SI (suggested obsolete) system of units for expressing lift and drag of wing or component part in lb/sq ft at 1 mph at specified angle of attack.

**engine-failure recognition speed** Usually written  $V_{fr}$ .

**engine flight cycle** The flight profile upon which the Approved Life is based.

**engine icing** A problem with all engines, but especially with piston engine with a choke-tube carburettor, where temperature is sharply reduced.

**engine indication and crew alerting** Eicas monitors several [typically 12] measures of engine and system performance, and can indicate impending failure.

**engine mounting** Structure by which engine is attached to airframe.

**engine-out** Condition in which one engine of multi-engined aircraft gives no propulsive thrust.

**engine-plus-fuel weight** A criterion of propulsive efficiency, heavy engines generally burning less fuel.

**engine pod** See *pod*.

**engine positioner** Dolly or trailer designed to carry engine, especially large turbofan, on cradle provided with hydraulic, or electrohydraulic, lateral, vertical, fore/aft, roll and pitch movement.

**engine pressure ratio** Pressure ratio across complete compression system [possibly fan, booster and LP, IP and HP compressors]. In 1950 an axial spool of 15 stages achieved \* of about 6; today this number of stages can exceed 50.

**engine rating** Power permitted by regulations for specified use; maximum takeoff, combat, maximum continuous, weak mixture etc.

**engine-section stator** The ring of inlet guide vanes immediately downstream of a fan at the inlet to the core.

**engine speed** Revolutions per minute of main or other specified rotor assembly.

**engine swapping** Replacing engines due for overhaul with stored engines that have serviceable life remaining.

**English bias** Missile aiming error at launch, and temporary guidance commands to overcome it.

**EngO** Pronounced N-jo, Engineer Officer (RAF).

**ENH** Earth near horizon.

**enhanced GPWS** Uses aircraft flight data to calculate envelope along projected flight path and compare this with internal terrain data base. Potential conflict gives

$\leq 60$  s aural/visual warning [in addition to normal GPWS output] and also displays terrain map showing clearance ahead.

**enhanced vision system** 1 Uses dual-band IR camera to project conformal image of scene ahead on to HUD, allowing approach to continue from 200 to 100 ft (30 m) decision height.

2 Another provides HUD-system to input Flir and/or MWR(1).

**ENJJPT** Euro-NATO Joint Jet Pilot Training.

**ENK, ENNK** Endo-atmospheric non-nuclear kill.

**ENNA** Enterprise Nationale de la Navigation Aérienne (Algeria).

**ENOC** Engineering network operation center.

**enplanement** Boarding by one passenger (US).

**Enq** Enquire.

**ENR** En-route, also ENRT.

**ENRI** Electronic Navigation Research Institute (Sendai, Japan).

**enrichment** 1 Adjustment by piston engine mixture control to produce richer mixture.

2 Artificial increase in percentage of isotope; thus, enriched uranium contains more than natural 0.75% of fissile U235.

**en route** 1 Between point of departure and destination.

2 Portion of flight on airways or desired track, excluding initial departure and approach phases.

**en-route automated radar tracking system** A step beyond ARTS IIIA with improved digital-display radars and fail-safe features (FAA).

**en route base** Air base between origin and destination of air force mission which has capability of supporting aircraft operating route.

**en route clearance** Valid to destination, either to joining stack or coming under approach control.

**en route climb** Climb to designated FL or cruising altitude on desired track.

**en route height** See *cruise altitude*.

**en route support team** Selected personnel, skills, equipment and supplies necessary to service and perform limited specialised maintenance on tactical aircraft at en route base (USAF).

**en route time** Time en route (1), normally measured from initial cruise altitude to TOD.

**en route traffic control service** Provided generally by ATC centres, to aircraft on IFR flight plan operating between departure and destination terminal areas.

**ENRT** En route.

**ENS** Euler/Navier-Stokes.

**ENSA** École Nationale Supérieure de l'Aéronautique (F).

**ENSAE** New designation of ENSA, with addition of "et de l'Espace". Now more commonly called Supaéro.

**ENSCE, or Ensce** Enemy situation correlation element (US, intelligence).

**Ensieta** École Nationale Supérieure des Ingénieurs des Etudes et Techniques d'Armement [F-29806 Brest] (F).

**ENSIP, Ensip** Engine structural integrity program (USAF).

**ENSMa** Ecole Nationale Supérieure de Mécanique et d'Aéronautique (F).

**ENSO** El Niño southern oscillation.

**Ensolute** Very wide range of closed-cell foams made

chiefly from VN (vinyl/nitrile PVC NBR rubber) or Neoprene; many applications (Uniroyal).

**Entel** Empresa Nacional de Telecomunicaciones (Argentina, Chile, etc).

**Enterprise caching technology** Combines VDA, APC(10) and selective caching in order to prevent superfluous data from being sent over electronic communications.

**ENTG** Euro/NATO Training Group.

**enthalpy** Total energy (heat content) of system or substance undergoing change from one stage to another under constant pressure, expressed as  $H = E + PV$ , where  $E$  is internal energy,  $P$  pressure and  $V$  volume; another expression is  $Q = V + pV$ . See specific \*.

**entity** Radar-detected aircraft seen on screen.

**entomopter** Flying machine based on insect aerodynamics.

**ENTR** Entire.

**entrainment** Sucking-in of induced fluid flow by high-velocity jet through duct.

**entrance cone** Portion of Eiffel-type tunnel upstream of working section.

**entrant** Start-up airline, new to the market [opposite of incumbent].

**entropy** 1 In physics and thermodynamics, measure of unavailability of energy; symbol  $\phi$ , or  $S$ , a measure of energy per unit temperature J/K. Specific \*, symbol  $s$ , is \* per unit mass  $\text{kJ/kgK} = 0.238846 \text{ Btu/lb}^\circ\text{R}$ ; the reciprocal is 4.186798. Thus, in irreversible process, such as occurs in any real engine, \* always increases. Any system or process having constant \* is said to be isentropic.

2 In communications theory, measure of information disorder.

**entry** 1 Penetration of planetary atmosphere by spacecraft or other body travelling from outer space.

2 Fore part of body or aerofoil, esp. wing.

**entry corridor** Limits of route through atmosphere which returning spacecraft must follow. With too steep a trajectory spacecraft would burn up; with too shallow, spacecraft would bounce off atmosphere and be unable to return.

**entry fix** Precise reporting point at entry to FIR or control area, see next.

**entry gate** Point(s) of entry for incoming airways traffic to TMA.

**entry interface** Point during re-entry at which returning spacecraft encounters sensible atmosphere. Traditionally (non-SI) = 400,000 ft.

**entry level** Not precisely defined, but most common meaning is to describe small business jet, first to be bought by customer, who may later change to more costly replacement.

**entry point** 1 Ground position at which aircraft entering control zone crosses boundary.

2 Where supersonic track crosses coast inbound.

**ENU** East/north/up co-ordinate system.

**envelope** 1 Of variable, curve which bounds values but does not consider possible simultaneous occurrences or correlations between different values.

2 Curve drawn through peaks of family of curves or through all limiting valves.

3 Glass or metal casing of electronic tube.

4 Hot air or gas container of non-rigid aerostat.

5 Outer cover of airship.

**envelope diameter**

**6** Volume of airspace bounded by limits of effective use of weapon.

**envelope diameter** **1** Diameter of circle encompassing engine or other irregular object.

**2** Diameter of airship envelope.

**envelope jigging** Precision assembly of stressed-skin structure in reverse order, starting with skin in female jig and then adding internals (Fairey).

**ENVG** Enhanced night-vision goggle[s] combining thermal imager with image intensifier.

**environmental chamber** Chamber in which humidity, temperature, pressure, solar radiation, noise and other variables may be controlled to simulate different environments.

**environmental control system, ECS** Produces environment in which human beings and equipment can work satisfactorily.

**environmental lapse rate** Measured rate of decrease of temperature with height; determined by vertical distribution of temperature at given time and place, and distinguished from process lapse rate of individual parcel of air.

**environmental mock-up** Mock-up cabin intended to assist design of ECS.

**environmental stress screening** Test procedure similar to burn-through for promoting reliability with growth.

**environmental system** Environmental control system.

**EO** **1** Electro-optical, or optics; used thus in subsequent definitions.

**2** Engineering [or Executive] order.

**3** Earth observation.

**EOA** **1** Early Operational Assessment.

**2** Engine-out allowance.

**E/O** Engine out.

**EOAR** European Office of Aerospace Research (USAF).

**EOB** Electronic order of battle.

**EOBT** Estimated off-block[s] time.

**EOC** **1** Electro-optic convertor.

**2** Enhanced, or early, operational capability.

**EOCCM, EOC<sup>2</sup>M** EO counter-countermeasures.

**EOCM** EO countermeasures.

**EOD** **1** Explosive-ordnance disposal, or demolition; S adds system, T reaining.

**2** Electro-optical device [S adds system, T training].

**3** End of day.

**4** Enhanced operating database.

**5** Embedded optical databus.

**6** Erasable optical disc.

**EoD** Effects of defects.

**EODAS, Eodas** Electro-optical distributed-aperture system.

**EODAP, Eodap** Earth and ocean dynamic applications program.

**EODC** Earth-Observation Data Centre (UK).

**EOE** Elasto-optical effect.

**EOEM** Electronic original equipment manufacturer.

**EOF** EO fire control.

**EOFT** Enhanced operational flight trainer.

**EOGB** Electro-optical[ly] guided bomb.

**EO guidance** Electro-optical guidance.

**EOI** Expression of interest, requested by potential customer from supplier; if answered, could lead to ITT (2).

**EOIS** EO imaging system.

**EOIVS** EO IR viewing system.

**EOL** **1** Engine-off landing.

**2** Edge of light, use of reflected light at grazing angle to highlight surface imperfections.

**3** End of life; D adds disposal.

**Eolia** European pre-operational data-link applications (ATC/Euret).

**EOL power** End-of-life power.

**EOM** **1** Earth observation mission.

**2** End of message.

**Eonnex** Aircraft fabrics; name registered by Eonair Inc.

**EOP** **1** Engine oil pressure.

**2** Engine operating point.

**3** Enhanced operational capability.

**4** End of production; R adds review.

**EOQ** Economic order quantity.

**EOQC** European Organization for Quality Control (Int.).

**EOR** Extend/off/retract.

**EoR** Effects of repairs.

**EOS** **1** Electrophoresis operations in space.

**2** EO sensor/system/subsystem/surveillance. Thus EOSDS is surveillance and detection system, EOSS is sensor system.

**3** Earth observation satellite, or observing system; DIS adds data and information system.

**Eorsat** Elint ocean-reconnaissance satellite.

**EOSP** EO signal processor.

**EOT** **1** EO target/tracking/threat: S adds system, EOTADS target acquisition and detection system and EOTWD threat-warning development.

**2** End of test.

**3** End of text.

**4** Early orbit test[ing].

**EOTS** EO targeting system.

**EOVL** Engine-out vertical landing.

**EOVS** EO viewing system.

**EOW** EO warfare.

**EP** **1** External [or electric] power.

**2** Environmental protection, [or plot], or processor [see EPX].

**3** Engineering project, or plan.

**4** Extended performance (target).

**5** Electronic protection.

**6** l'Espace Première = 1<sup>st</sup> class (F).

**7** Enhancement phase.

**8** Equipment Programme [MoD] (UK).

**9** Evolutions programme.

**EPA** **1** Environmental Protection Agency (US).

**2** Epoxy polyamide.

**3** Extended planning annex.

**4** Economic price adjustment (US contracting).

**5** Experimental (or European) prototype aircraft.

**EPAD** Electrically powered actuation design.

**EPAF** European participating [rarely, partner] air force[s].

**EPAM, Epam** Electronic pilot activity and alertness monitor.

**EPAS** Expert process advisory set.

**epaulettes** In aviation, shoulder-mounted bages of rank or seniority, in civil aviation the most senior having four bars denoting captain of aircraft.

**EPC** **1** External power contactor, or connector.

- 2** Equipment Policy Committee (UK MoD).
- 3** Elementary Pilot Certificate.
- 4** Electronic power conditioner.
- EPCA** Energy Policy and Conservation Act (US).
- EPCO** EANPG Co-ordination meeting[s] (ICAO).
- EPD** *1* Exhaust-plume dilution.
- 2** Electronic product definition.
- 3** Electric-power distribution; A adds assembly, S system.
- EPDS** See above.
- Epera** Extractor-parachute emergency-release assembly.
- EPFA** The European Property Flying Association [registered Monmouth, Wales, promotes aircraft in the construction industry].
- EPG** European participating governments (or groups).
- EPGS** Electric[al] power generation, or generating, system.
- ephemeris** Periodical publication tabulating future positions of satellites or daily positions of celestial bodies and other astronomical data (plural = *ephemerides*).
- ephemeris time** Uniform time defined by laws of dynamics, determined in principle by observed orbital motions of Earth and other planets (see *universal time*).
- EPI** *1* Engine performance indicator.
- 2** Engineering process improvement.
- 3** Electronic-protection initiatives (AFRL).
- 4** Elevator position indicator.
- EPIA** European Photovoltaic Industry Association (Int.).
- EPIC, Epic** *1* Epitaxial passivated integrated circuit.
- 2** Engineering and product information control (management team).
- 3** Emergency procedures information centre (BAA).
- 4** Electronic Privacy Information Center (DC-based watchdog).
- 5** Electronic and photonic integrated circuit (Darpa).
- epicos** Global e-business platform for aerospace and defence industries (Int.).
- EPIRB, Epirb** Emergency position-indicating radio beacon, operating on 121.5 and 406 MHz in link with Sarsat.
- EPL** Engine power lever, ie throttle.
- EPLD** Electrically programmable logic device.
- EPLRS** Enhanced position-location reporting system.
- EPM** Electronic protection, or protective, measures.
- EPMaRV** Earth-penetrating manoeuvring re-entry vehicle; does not penetrate planet, only its atmosphere (USAF).
- EPMS** *1* Engine performance monitoring system.
- 2** Electrical power management system.
- EPN** European participating nations.
- EPNdB** Equivalent Perceived Noise Decibel; unit of EPNL (see *noise*).
- Epmér** Ecole du Personnel Navigant Centre d'Essais et de Réception (F).
- EPNL** Equivalent perceived noise level; measure of effect of noise on average human beings which takes into account sound pressure level (intensity), frequency, tonal value and duration.
- EPNR** Electrically powered noise reduction.
- EPO** Earth parking orbit.
- epoch** Time when a satellite is established in orbit.
- epoxy resin** Complex organic adhesive and electrical

insulating material; addition of hardeners, plasticiers and fillers tailors its properties.

- EPP** *1* Emergency power package.
- 2** Enhanced parallel port.
- EPPIC, Epic** Enhanced precise positioning integrated capability (satellite).
- Eppler** Family of wing sections for competition sailplanes; tailored to small R, high IAS for penetration.
- EPR** *1* Engine pressure ratio.
- 2** External power receptacle.
- 3** Ethylene/propylene/rubber.
- EPRL** Engine pressure ratio limit.
- Eeprom** Erasable, or electrically, programmable read-only message, or memory.
- EPRT** Engine pressure-ratio transmitter.
- EPS** *1* Emergency, or [confusing] electrical, power system, or supply or source.
- 2** Enhanced propulsion, or polar, system.
- 3** Earning[s] per share.
- EPSA** Emirates Parachute Sport Association [office, Dubai] (UAE).
- EPSG** Equipment product supply group.
- Epsilam** Copper-coated flexible substrate of ceramic-filled Teflon.
- EPSRC** Engineering and Physical Sciences Research Council [1994-; office, Swindon SN2 1ET] (UK).
- EPSU** European Public Service Union (Int.).
- EPT** Egress procedures trainer, initially for the F-22 but with wide future possibilities.
- EPTA** European Pultrusion Trade Association.
- EPU** *1* Emergency power unit.
- 2** Electronic processing unit.
- EPUU** EPLRS user unit [MLS can be suffix].
- EPV** *1* Estimated programme value.
- 2** École du Personnel Volant (F).
- EPW** Earth-penetrating warhead.
- EPX** Environmental processor, military extension.
- EQAR** Extended-storage [or expanded] quick-access recorder.
- EQD** Electrical Quality-assurance Directorate (UK MoD).
- EQPT** Equipment.
- equal deflections** Principle used in analysis of statically indeterminate structure: two members rigidly attached must deflect an equal amount at point(s) of attachment under load.
- equaliser** *1* Filter network which compensates over-specified frequency band for distortion introduced by variation of attenuation with frequency.
- 2** Connection between generators in parallel to equalise current and voltage.
- equalising pulses** Signals sent before and after vertical synchronizing pulses to obtain correct start of lines in iconoscope, vidicon and display tubes.
- equal taper** The same on LE and TE.
- equation of time** Before 1965, difference between mean time and apparent time, usually labelled + or - to obtain apparent time. After 1965, correction applied to 12 hours + local mean time (LMT) to obtain local hour angle (LHA) of Sun.
- equations of motion** Give information regarding motion of a body or point as a function of time when initial position and velocity are known.

## equator

**equator** Primary great circle of sphere or spheroid, such as Earth, perpendicular to polar axis.

**equatorial bulge** Excess of Earth's equatorial diameter over polar diameter.

**equatorial satellite** One whose orbit plane coincides, or almost coincides, with Earth's equatorial plane.

**equi-axed** Descriptive of traditional crystalline cast metal items.

**equiax blade** Turbine rotor blade cast in traditional way with random arrangement of crystal axes [often capital E].

**equilibrium flow** Fluid flow in which energy is constant along streamlines, and composition at any point is not time-dependent.

**equilibrium glide** Hypersonic gliding flight in which sum of vertical components of aerodynamic lift and centrifugal force is equal to weight at that height.

**equilibrium height** At which, under given conditions, equilibrium is established between lift and weight of free aerostat without power.

**equilibrium vapour** Vapour pressure of system in which two or more phases coexist in equilibrium; in meteorology reference is to water unless otherwise specified.

**equinox** 1 Instant that Sun occupies one equinoctial point.

2 One of two points of intersection of elliptic and celestial equator, occupied by Sun when declination is 0°; also called equinoctial point.

**equi-period transfer orbit** Orbit differing from first but having same period, eg that of lunar module following separation from command module.

**equipment** Type or class of aircraft used or to be used on particular air-transport route(s).

**equipment configuration report** Real-time all CMC, P/N S/N and DB/N.

**equipment interchange** Agreement allowing aircraft to fly long routes over sectors of two or more carriers, crew being changed so that each carrier flies its own sectors.

**equipment operationally ready** Weapon system is capable of safe use and all subsystems necessary for primary mission are ready (USAF).

**equipped empty weight** Measured weight of individual aircraft including removable and other equipment but less disposable load.

**equi-signal zone** Zone within which aircraft receives equal signals from left and right intersecting lobes, giving continuous on-track signal.

**equivalence ratio** Ratio of stoichiometric to experimental air-fuel ratios.

**equivalent airspeed** See *airspeed*.

**equivalent brake horsepower** See *equivalent horsepower*.

**equivalent circuit** Theoretical circuit diagram electrically equivalent to practical circuit or device.

**equivalent drag area** See *equivalent flat-plate area*.

**equivalent flat-plate area** Area of square flat plate, normal to free-stream relative airflow, which experiences same drag as the body or bodies under consideration; usually written  $f = D/\frac{1}{2}\rho V^2\alpha$ .

**equivalent flight hours** 1 The equivalent actual flight time simulated in an accelerated fatigue test.

2 A yardstick [C-130 EFH] established by the European Airlift Centre to enable members to trade flight time without the need to exchange funds (Int., 2004-).

**equivalent full-throttle power** The theoretical brake horsepower which a supercharged piston engine would

## equivalent wing

develop at sea level if it were run at full throttle and maximum r.p.m.

**equivalent horsepower** In turboprop, sum of horsepower, usually measured as brake hp, available at propeller shaft plus equivalent power derived from jet thrust by applying numerical factor to measure of thrust (abb. ehp). See *equivalent power*.

**equivalent isotropically radiated power** Product of power to antenna multiplied by antenna gain in a particular direction relative to that from isotropic antenna.

**equivalent kilowatt[s]** SI measure of power of turboprop, abb. ekW, see *equivalent power*.

**equivalent monoplane** Monoplane wing having same lift and drag properties as combination of two or more wings under consideration.

**equivalent monoplane aspect ratio** Wings and tip vortices of biplane mutually interfere; Prandtl showed increase in induced drag of each wing is:  $\Delta Di = \frac{\sigma L_1 L_2}{\frac{1}{2} \rho V^2 \pi b_1 b_2}$  where

$\sigma$  is Prandtl interference factor, L wing lifts, b spans, and  $\frac{1}{2} \rho V^2$  dynamic head. Total added induced drag is twice that of single wing, so \*\*\*\* =  $\frac{b_1^2}{S} \left[ \frac{\mu^2 (1+r)^2}{\mu + 2\sigma\mu r + r^2} \right]$  where

$b_1$  is longer span, S total area,  $\mu$  ratio  $\frac{\text{shorter span}}{\text{longer span}}$ , and r ratio  $\frac{\text{shorter-span lift}}{\text{longer-span lift}}$

**equivalent pendulum** Freely gimballed platform usually incorporating gyros and accelerometers, which has same period of oscillation as simple pendulum of particular length.

**equivalent perceived noise level**  $L_{PN_{eq}} = L_E - 10 \log T/t_0$  where  $L_E$  is aircraft exposure level, T is total period of noise and  $t_0$  is (usually) 1s (see *noise*).

**equivalent potential temperature** Temperature given sample of air would have if brought adiabatically to top of atmosphere (ie to zero pressure) so that all water vapour is condensed and precipitated, remaining dry air then being compressed adiabatically to 1,000 millibars. \*\*\* is therefore determined by absolute temperature, pressure and humidity.

**equivalent power** See *equivalent horsepower*; in SI units power is measured in W or multiples thereof; to a first-order approximation  $ekW = kW + 68F_n$  where  $F_n$  is residual jet thrust in kN. In Imperial units jet thrust (lb force) is typically multiplied by 0.3846 [reciprocal 2.6] before being added to shaft power.

**equivalent shaft horsepower** See *equivalent horsepower*.

**equivalent single-wheel load** Mass which, supported by single wheel of size just large enough not to sink significantly into surface, causes same peak bending moment in airfield pavement as particular truck, bogie or other multi-wheel gear of actual aircraft.

**equivalent still-air distance** The distance over the ground the aircraft would have covered in the absence of wind.

**equivalent temperature** Temperature particle of air would have if brought adiabatically to top of atmosphere (ie to zero pressure) so that all water vapour is condensed and precipitated, remaining dry air then being compressed adiabatically to original pressure.

**equivalent wing** In stress analysis, same span as actual wing, but with chord at each section reduced in propor-

tion to ratio of average beam load at that section to average beam load at section taken as standard.

**ER** 1 Extended-range.

2 Enhanced radiation.

3 Echo reply.

4 Essential requirements.

5 Expanded Response [SLAM].

**E/R** Extend/retract.

**Er** *Erbium*.

**ERA** 1 European Regional Airlines Association [offices at Geneva and Fairoaks Airport GU24 8HX, UK] (Int.).

2 Elastic recoil analysis, for hydrogen content.

3 En-route [radar] array.

4 Explosive reactive armour.

5 Employment relations act (UK 1999).

6 European Research Area (Int.).

7 European Robotic Arm [ISS].

8 Electrical Research Association (UK).

**ER-AAM** Extended-range air-to-air missile.

**ERAAS** Extended-range autonomous attack system (UAV).

**eradiation** See *Earth radiation*.

**ERAM** 1 Extended-range anti-tank mine (or anti-armour munition).

2 En-route automation modernization (FAA).

**ERAQ** European Regional Airline Organization (Int.).

**ERAP** 1 Earth-resources aircraft program (US).

2 Enhanced range applications program (USAF).

**ERAPDS** Enhanced recognised air picture dissemination system.

**ERAPS, Eraps** Expendable reliable-acoustic-path sonobuoy.

**erase** In EDP (1) to expunge stored information, usually without affecting storage medium.

**ERASL** Enhanced recognition and sensing lidar.

**Erasmus** En route air-traffic management ultimate system (Honeywell, EU).

**Erast** Environmental research aircraft and sensor technology (NASA).

**E-Rast** Expendable Rast.

**Erat** En-route absorption of (expected) terminal delay.

**ERATS, Erats** En route advanced, or automated, tracking system.

**ERAU** Embry-Riddle Aeronautical University [Daytona Beach, FL32114-3900; Prescott, AZ 86301-3720] (US).

**ERB** 1 Executive, and also Engineering, Review Board.

2 Executive responsibility budget.

3. Earth radiation budget.

**erbium** Bright silver metal, Er, density 9.1, MPt 1,529°C, important in optics [especially optical fibres] and in eye-safe Er-glass lasers on 2.9 μ.

**erbium silicide** One of the favoured materials currently used for fabricating nanowires.

**ERBM** Electronic range/bearing marker.

**ERBS** Earth radiation budget system, later satellite.

**ERC** 1 Electronics Research Center, NASA, Cambridge, Massachusetts.

2 Extended runway centreline.

3 Engine-related causes.

4 En route chart.

**ERCA** Etablissments Régional du Commissariat de l'Air (F).

**ERCC** 1 En-route control centre.

2 Engine Requirements Co-ordinating Committee (CAA).

**ERCS** 1 Emergency rocket communications system.

2 Enhanced radar cross-section (UAV decoy).

**ERCE** Escadrille de Réception et de Convoyage Equipe [crew ferry flight unit] (F).

**ERD** End-routing domain.

**ERDA** 1 Energy Research and Development Administration (US).

2 European Regional Development Agency.

3 En Route Descent Adviser (NASA).

**ERDE** Explosives Research and Development Establishment (formerly at Waltham Abbey, UK).

**ERDI** ERD infrastructure.

**ER/DL** Extended-range, data link.

**ERE** External roll extrusion.

**ERA** European research establishments in aeronautics, or for aerospace, launched 2001 with seven members.

**erect** 1 Not inverted, vertical acceleration +1g.

2 To restore a horizon or standby horizon to give correct indication after upset.

**erection** 1 Assembly and rigging of aircraft from component parts or from dismantled state; eg after crated shipment.

2 Of gyro, acceleration from rest to operating speed with axis in desired alignment. (Thus re-\*, to restore proper axis alignment after being toppled.)

**erector transporter** Vehicle used to convey ballistic rocket, elevate it for firing and act as launcher; also known as transporter erector.

**E-region** Region of ionosphere in which E-layers and Sporadic E-layer tend to form.

**EREL** Elevated runway-edge light.

**ERFA** Conference on Economics of Route Air Navigation Facilities and Airports.

**ERFCs** Extended-range fuel containment system [= tank].

**ErG** Erbium-glass.

**erg** Unit of energy in CGS (not SI) system; work done by force of one dyne acting through distance of 1 cm =  $10^{-7}$  J.

**ERGM** Extended-range guided munition (USA, USN).

**ergometer exerciser** Device for exercising astronauts on long missions and measuring muscular work.

**ERGP** Extended-range guided projectile.

**ERHA** En-route high-altitude; C adds chart.

**Erint** Extended range-interceptor.

**ERIS, Eris** Exoatmospheric re-entry vehicle interceptor system.

**ERJ** External-combustion ramjet; one in which airflow and combustion are outside vehicle with profiled exterior surface.

**erk** RAF slang (WW2) for airman ground crew possessing minimal skills and lowest rank (AC2 or ACH).

**ERL** 1 Environmental Research Laboratories (NOAA).

2 Electronics Research Laboratory (Australia).

**ERLA** En-route low-altitude; C adds chart.

**ERMA, Erma** Extended-red multi-alkali (Gen II image intensifiers).

**ER/MP** Extended-range, multipurpose.

**ERMR** Economic Regulation and Multilateral Relations (European Commission).

**E<sub>rms</sub>** Root mean square voltage.

**ERO** Engine repair and overhaul.

- EROC** En-route obstacle clearance study group.
- Erom** Erasable ROM.
- Erops, EROPS** Extended-range operations, same as Etops.
- EROS, Eros** 1 Earth Resources Observation Systems (US Geological Survey).
- 2 Earth-resources orbiting satellite.
  - 3 Earth remote observing system.
- erosion gauge** Instrument for measuring erosion by dust and micrometeorites on materials exposed to space environment.
- ERP** 1 Effective radiated power.
- 2 Eye reference point.
  - 3 Excitation [or exciter] receiver processor.
  - 4 Enterprise resource planning, or process.
- ER-PDU** Echo reply protocol data unit.
- ER-PGB** Extended-range precision guided bomb.
- ERPM** Engine rpm [normally of helicopter].
- Erprobungstelle** Proving (test) centre (G).
- ERQ-PDU** Echo request protocol data unit.
- ERR** Early risk-reduction
- ERRB** Enhanced radiation, reduced blast.
- error** 1 In mathematics, difference between true value and calculated or observed value.
- 2 In EDP (1), incorrect step, process or result, whether due to machine malfunction or human intervention.
  - 3 In air/ground bombing or photography, various definitions mainly concerned with linear miss-distance.
- error band** Error value, usually expressed in per cent of full-scale, which defines maximum allowable error permitted for specified combination of transducer parameters.
- error signal** Voltage proportional to difference between actual and desired condition. Thus, in radar, \*\* obtained from selsyns and AGC circuits and used to control servo to correct error.
- ERS** 1 Earth-resources satellite.
- 2 Error-recovery service message (networks).
  - 3 En-route supplement.
  - 4 Emergency radio switching [system].
  - 5 Electronic resource system.
  - 6 Earth remote surveillance.
- ERs** Essential requirements (EASA).
- ersatz** Substitute material (G).
- ERSDS** En-route software development and support (FAA).
- ERSU** Environmental remote-sensing unit.
- ERT** 1 Elevator rigging tool.
- 2 Extended-range tank.
  - 3 Earth-receive time [signal from planet].
- ERTS** Earth-resources technology satellite.
- ERU** 1 Ejector release unit for external stores.
- 2 Emergency reaction unit (USAFSS).
  - 3 Engine relay unit.
- ERV** Expendable rocket vehicle.
- Ervis** Exoatmospheric re-entry vehicle interception (or interceptor) system (SDI).
- ERW** Enhanced-radiation (neutron) weapon.
- ER-WCMD** Extended-range wind-corrected munitions dispenser.
- ERWE** Enhanced radar-warning equipment.
- ES** 1 Escape slide.
- 2 Expert systems (artificial intelligence).
  - 3 Electronically scanned.
- 4 Electrostatic.
  - 5 Electronic support.
  - 6 End system.
  - 7 Extended squitter.
  - 8 Evolution strategy [algorithm].
- Es** 1 Specific energy,  $h + v^2/2g$ .
- 2 Secant modulus.
- ES1, ES2** Radar antenna with electronic scanning about 1 or 2 axes, respectively.
- ESA** 1 European Space Agency [17 members; office, F-75738 Paris Cedex 15] (Int.).
- 2 Enhanced signal average.
  - 3 Electronic signature authentication.
  - 4 Engineering source approval.
  - 5 Electronically scanned, or steered, array.
  - 6 Enhanced [or electronic] situation[al] awareness [S adds system].
  - 7 Embedded/special application, also E/SA.
- ESAD** 1 Equivalent still-air distance.
- 2 Electronic safe/arm device.
- ESAA** Electronic-scanning array antenna.
- ESAF** Electronic safety arming and fuzing.
- ES&DF** Electronic support and direction finding.
- ESAR** Enhanced synthetic-aperture radar.
- ESARR** Eurocontrol safety regulatory requirements.
- ESAS** 1 Electronically steerable antenna system.
- 2 See *ESA* (6).
  - 3 Exploration systems architecture study (NASA).
- ESASC** EEA/SBAC Avionics Systems Committee.
- ESB** Elevating sliding bridge, simpler than apron-drive type of airbridge.
- ESC** 1 European Space Conference.
- 2 Executive steering committee.
  - 3 Engine supervisory control.
  - 4 Energy storage [and] control.
- Escadre** Wing (military unit, F).
- Escadrille** Flight (military unit, F).
- Escadron** Squadron (F).
- escalation** 1 Increase in scope, violence or weapons of conflict.
- 2 Increase in cost due to incorrect cost estimation, inflation, advances in technology, changes in specification or other factors.
- E-scan** Electronically scanned array.
- escape** To achieve velocity and flightpath outward from primary body sufficient neither to fall back nor orbit.
- escape capsule** See *ejection capsule*.
- escape chute** Near-vertical chute forming part of structure, entered by opening pressure door in floor of crew compartment. Not to be confused with escape slide.
- escape hatch** Hatch in aircraft, usually jettisonable, intended for use in abandoning aircraft; ventral for use in flight, dorsal after belly landing or ditching.
- escape manoeuvre** 1 Several predetermined manoeuvres to evade hostile triple-A.
- 2 Maximum-rate manoeuvres to avoid CFIT.
  - 3 Trajectory of spacecraft departing from Earth or evading planet [not normal usage].
- escape orbit** Any of several paths body escaping from central force field must follow in order to escape.
- escape rocket** Small rocket used to accelerate and separate payload near pad following launch-vehicle malfunction.
- escape slide** Rapid-inflation pneumatic channel

## **escape spoiler**

extended (usually from doors) from transport aircraft to enable passengers and crew to evacuate quickly in emergency. (Possible confusion with escape chute.)

**escape spoiler** Aerodynamic baffle extended upstream of crew escape door or chute.

**escape tower** Connects escape rocket(s) to vehicle; separated if ascent is normal.

**escape velocity** Speed body must attain to escape from gravitational field. Earth 25,022 mph, 11.186 kms<sup>-1</sup>, 36,700 ft/s, Moon 7,800 ft/s, Mars 16,700 ft/s and Jupiter 197,000 ft/s.

**ESCC** European space components co-ordination (Estec).

**Eces** Experimental Satellite-Communication Earth Station (India).

**ESCS** 1 Emergency satcom system.

2 Electrical-system controller subsystem.

**ESD** 1 Electronic Systems Division (USAF Systems Command).

2 European Security [or Strategy] and Defence [A adds Agency, I adds identity, P policy]; proposed EU task force.

3 Electrostatic discharge.

4 See *ESSD*.

**Esdac** European Space Data Centre (now DIH).

**ESDP** European Security and Defence Policy.

**ESE** Earth-science enterprise (NASA).

**ESF** 1 European Science Foundation (Int., office Strasbourg 67080).

2 Expanded support, or supporting, foam.

3 Explosion suppressant foam.

**ESFC** Emergency surgery flying centre (helicopter).

**ESG** 1 Electrostatically suspended gyro.

2 Extended-service goal.

3 Electronic Security Group (USAF).

**ESGM** ESG monitor.

**ESH** End system hello.

**ESHE** École de Spécialisation sur Hélicoptères Embarqués (F).

**eshp** Equivalent shaft horsepower, ehp.

**ESI** 1 Engineering staff instruction.

2 Engine and system indication [D adds display, S system].

3 Earth-surface imager.

**ESIC** Environmental Science Information Center (NOAA).

**ESID** 1 Electrical-storm identification device.

2 Engine and system indication display.

**ESIID** Embedded-system ionosphere interoperability demonstration.

**ESIL** Eye-safe IR laser.

**ESIP** Engine structural integrity program (US).

**ESIS** 1 Electronic standby instrument system.

2 See *ESI(2)*.

**ESJ** Equivalent single jet.

**ESKE** Enhanced station-keeping equipment.

**ESL** 1 Earth-Sciences Laboratories (NOAA).

2 Eye-safe laser [R adds ranger].

**Eslab** European Space Laboratory; now DSS of Estec.

**ESLE** Electronic survivor-location equipment.

**ESLR** Electronically scanned laser radar.

**ESM** 1 Electronic support measures (UK).

2 Electronic surveillance measures, or measurement (US).

## **essential bus**

3 Electronic surveillance, or signal, monitoring.

4 Enhanced space multiprocessor.

**ESMB** Electrically-steered multi-beam.

**ESMC** Eastern Space and Missile Center (USAF Patrick AFB).

**ESMD** Exploration Systems Mission Directorate (NASA).

**ESMO, Esmo** ESM operator.

**ESMR** Electronically scanned microwave radiometer.

**ESO** 1 Engineering standards order (FAA).

2 Evolutionary structural optimization.

**Esoc, ESOC** European Space Operations Centre, Darmstadt (Int.).

**ESP** 1 External starting power.

2 Extended-service programme.

3 Elastically suspended pendulum.

4 Electrical standard practice[s].

5 En-route spacing program.

6 Expandable signal [or system] processor.

7 Expendable system programmes.

8 Engine surge protection.

9 European Safety Programme for ATM7 [2006-].

10 External stowage platform [Shuttle].

**ESPA** Electronically scanned phased-array.

**ESPI** European Space Policy Institute.

**Esprit** 1 European strategic programme for research into information technology.

2 Eye-slaved projected raster inset (Singer Link-Miles).

**ESQAR** Extended-storage quick-access recorder.

**ESR** 1 Electro-slag refined (or remelt).

2 European staff requirement (NATO).

3 Energy storage.

4 Emergency Sun reacquisition.

**Esrangle** Former European (now Swedish) space launch range, Kiruna.

**ESRO** European Space Research Organization, now part of ESA.

**ESRC** Engineering and Sciences Research Council (UK).

**ESRDA** European Safety, Reliability and Data Association.

**ESRL** Electronic and Surveillance Research Laboratory [Salisbury, SA5108] (Australia).

**ESRP** European supersonic research programme [also called **PERS** (F)].

**ESRRD** E-scope radar repeater display.

**ESS** 1 Environmental stress screening.

2 Experiment support system (spacecraft).

3 ESM subsystem.

4 Electronic switching system.

5 Exercise support system.

6 Electronic Security Squadron (USAF).

7 Engineering Support System (RAF), or services.

8 Engine section stator.

9 Engine support structure.

10 Essential.

**ESSA** Environmental Science Services Administration (now NOAA).

**ESSAP** European Strategic Safety Action Plan, programme to raise air safety standards in 41 European countries, (2004).

**ESSD** Electrostatic sensitive device[s].

**essential bus** Electrical bus (bus-bar) on which are grouped nothing but essential electrical loads.

**essential items** Shaft-driven accessories whose failure would bring about termination of the flight, examples being fuel and oil pumps. Drive-shafts to these items do not incorporate deliberate weak lines.

**ESSI** Enhanced special structural inspection.

**ESSL** Emergency speed select lever.

**ESSP** 1 European Satellite Services Provider [F, DSNA; G, DFS; I, ENAV; Portugal, NAV; Spain, AENA; Switzerland, Skyguide; UK, NATS]. (Int. 2005-).  
2 Efficient small-scale propulsion.

**ESSS, ES<sup>3</sup>** 1 External stores support system.

2 Electronic sensors and systems sector.

**Eswacs** Electronic solid-state wide-angle camera system.

**EST** 1 Eastern Standard Time (US).

2 En-route support team (USAF).

3 See *E&ST*.

4 Elevation, slope, temperature.

5 Estimate[d].

**ESTA** Electronically scanned tacan antenna.

**establish** To achieve a steady state. In particular see next.

**established** Aircraft confirmed as being stable at a prescribed flight condition, notably at a given FL or on a particular glidepath.

**ESTAe** Ecole Spéciale de Travaux Aéronautiques (F).

**ESTC** European Space Tribology Centre.

**Estec** European Space Research and Technology Centre.

**Esteem** Elaboration of a strategy for the transition from Eatchip Phase III to EATMS (Euret).

**Ester** EO sensor technology and evaluation research.

**ester** Compound which reacts with water, acid or alkali to give an alcohol plus acid; important in many aerospace lubricants and other materials.

**ESTL** European Space Tribology Laboratory (ESRO).

**ESTOL, Estol** Extremely STOL.

**ESU** 1 Electronic storage unit.

2 Emergency supply unit.

**e.s.u.** Electrostatic unit  $2.998 \times 10^{-6}$  wb/m<sup>2</sup>.

**ESV** Enhanced synthetic vision [S adds system, but Kollsman has registered ESViS].

**ESVN** Executive secure-voice network (US civil govt.).

**ESWL** Equivalent single-wheel load[ing] (of multi-wheel landing gear).

**ET** 1 Emergency technology.

2 Extraterrestrial.

3 External tank.

**Et** Elastic tangent [longitudinal] modulus; in US often  $E_t$ .

**e<sub>t</sub>** 1 Tensile strain.

2 Thermal efficiency.

3 Environmental sensor unit.

**ETA** 1 Estimated time of arrival.

2 Estimated time of acquisition.

3 Ejector thrust augmentation.

4 Effective turn angle.

**ETAC** 1 Enlisted tactical air controller[s].

2 Engin tactique anti-chars (F).

**ETACCS** European theatre air command and control study.

**ETADS** Enhanced transportation automated data system.

**Etalon** Small interferometer which reflects/refracts laser

light to form interference pattern giving unique signature, rejecting all other sources.

**ET&E** European test and evaluation (USAF).

**ETAP** European technology acquisition plan, or programme.

**eta patch** Fan-shaped patch of fabric and webbing secured to aerostat envelope to provide attachment for a cable eyelet.

**e-Taws** Early, or embedded, terrain-awareness warning system.

**ETB** 1 Engineering [and] Technology Board (UK Engineering Council).

2 End of block (ASCII).

3 Engineering test band.

**ETBE** Ethyl-tertiary butyl ether.

**ETBS** Etablissement Technique de Bourges (F).

**ETC** 1 Environmental Test Centre (Foulness, UK).

2 Electro-thermal chemical.

3 Erroneous track change (FDR).

4 European Travel Commission [office, B-1000] (Int.).

5 Equipment trust certificate, for financing new equipment.

**ETCAS, E-TCas** Enhanced traffic-alert and collision-avoidance system.

**ETCS** Expeditionary tactical communications system (MCWL).

**ETD** 1 Estimated time of departure.

2 Explosive[s] trace detection, or detector.

3 Expendable towed decay.

**ETE** 1 Estimated time en route.

2 Environmental test and evaluation.

**ETEB** Engineering Test and Evaluation Board (US).

**ETEC** Expendable turbine engine concept.

**ETES** Exotic threat-emitter system.

**eTES** Enhanced total entertainment system.

**ETF** 1 Electronic time fuze.

2 Enhanced tactical fighter.

3 Engine test facility.

4 Engineering task force.

**ETG** 1 European Tripartite Group.

2 Electronic target generator.

**Ethernet** Ether-net, yet uses coaxial cable or twisted pair of wires to link IEEE-802 radar images or data at <10 Mbps.

**ethyl alcohol** Alcohol prepared from organic compound such as grain, starch or sugar; withstands high compression ratios but compared with conventional fuel costs more, has lower heat value and vapour pressure, and affinity for water, basically  $C_2H_5OH$ .

**ethylene glycol** Principal additive in cooling systems of liquid-cooled engines, composed of saturated solution of ethylene oxide and water ( $C_2H_6O_2$ ), BPt 197C.

**ethylene oxide** Petroleum-derived gas used in FAE devices.

**ETI** 1 Elapsed-time indicator.

2 Engine-technology improvement (US).

3 Extraterritorial income.

**ETICS, Etics** Embedded tactical internet control system.

**ETIESS** Enhanced technical-intelligence exploitation of SBIRS sensor data.

**Etips** Electrothermal ice-protection system.

**ETL** 1 Elevated threshold light.

2 Electronic technical log.

- ETM** 1 Elapsed-time measure[ment].  
 2 Environmental technical manual.  
 3 Electronic training manual [i.e., paperless].
- ETMP** Enhanced terrain-masked penetration.
- ETMS** Enhanced traffic-management system (FAA).
- ETNAS** Electro-level theodolite naval alignment system.
- ETO** 1 Estimated time over, or overhead.  
 2 European theatre of operations (WW2).
- ETOA** European Tour Operators' Association [2005–] (Int.).
- Etops** Extended-range twin (engine) operations. Said to translate as: engines turning or passengers swimming.
- ETOS** Effective time on station.
- ETOT** Estimated takeoff time.
- ETOW** Engine time on wing.
- ETP** 1 Equal time point.  
 2 Estimated time of penetration.
- ETPS** Empire Test Pilots' School (originally Farnborough, now Boscombe Down, UK).
- ETPU** Engine transient-pressure unit.
- ETR** Eastern Test Range (US).
- Etrac** Enhanced tactical radar correlator.
- ETRAS** Electrical thrust-reverser actuation system [see next].
- E-Tras** Electromechanical thrust-reverser actuation system.
- ETRC** Expected taxi ramp clearance.
- ETS** 1 Experimental test site.  
 2 External tank system.  
 3 Electronic systems test [S adds site].  
 4 Engineering test station.  
 5 Emitter targeting system.  
 6 Emissions Trading Scheme [January 2005–] (European nations).  
 7 Embedded training simulator.
- ETSC** European Transport Safety Council (Int.).
- ETSI** European Telecommunications Standards Institute.
- ETSS** Enterprise targeting and strike system.
- ETU** 1 External transmitter unit (IRCM).  
 2 Engineering Test Unit.
- ETV** 1 Elevating [cargo] transfer vehicle.  
 2 [missile] Eject test vehicle.
- ETVS** Enhanced terminal voice switch.
- ETW** European transonic windtunnel [D-51127 Köln] (Int.).
- E<sup>2</sup> PROM** See *EEPROM*.
- ETX** End of transmission.
- EU** 1 European Union.  
 2 Ejector unit (stores carrier).  
 3 Electronic[s] unit [many applications].
- Eu** Europeum.
- EUA** European Union emissions allowance.
- EUACA** European Union Airport Co-ordinators Association (Int.).
- EUAFS** enhanced upper-air forecast system.
- Eucare** European confidential aviation reporting network (Int.).
- Euclid** European co-operation for the long term in defence (Int.).
- EUEA** European Union emissions allowance.
- EulG** K iron garnet.
- Euler formula** Maximum load W of strut or long column,

$W = \frac{kEI}{l^2}$ , where E is modulus of elasticity, I moment of inertia of strut section, k constant, and l<sup>2</sup> square of length between supports.

**Eulerian angles** Systems of three angles which uniquely define with reference to one co-ordinate system (Earth axes) orientation of a second (body axes); orientation of second system is obtainable from first by rotation through each angle of turn, sequence being important. A singularity at 90° became significant with the latest [Russian] fighters.

**Eulerian co-ordinators** System in which properties of fluid are assigned to points in space at each time, without attempting to identify individual parcels from one time to next.

**EUM, Eumed** European–Mediterranean Air Navigation Region (ICAO).

**Eumetsat** European meteorological satellite organization [office, D-64295 Darmstadt] (Int.).

**EUMS** Engine-usage monitoring system; EULMS adds 'life'.

**EUPS** External uninterruptible power supply.

**EUR** European (ICAO).

**Eur** Eureka.

**Eurac** 1 European aircraft-cost formula (includes landing, navigation and interest charges).  
 2 European Air Chiefs conference.

**Euraca** European Air Carrier Assembly [charter air carriers, office, Zaventem B-1930] (Int.).

**Euram** European research on advanced materials (EC7).

**EURANP** European air-navigation plan (ICAO).

**EURATN** European ATN(1).

**Eureca** European retrievable carrier.

**Eureka** Ground beacon responding to Rebecca radar homing and distance-measuring system.

**Eureka piece** Fragment of wreckage showing cause of catastrophe.

**Euresco** European research conference[s].

**Euret** European Research Programme in Transport.

**EURFCB** European frequency-coordinating body (ICAO).

**Euricas** European Research Institute for Civil Aviation Safety.

**EuroAVIA** The European Association of Aerospace Students (Int.).

**EuroCAE** European Organisation [spelt thus] for Civil-Aviation Electronics [office, Paris F-75783] (Int.).

**Eurocard** Standard single-sided PCB, 160 × 100 mm.

**Eurocontrol** The European Organization for the Safety of Air Navigation, comprising 37 states [office, B-1130 Brussels] (Int.).

**Eurocores** ESF collaborative research programmes.

**Eurogrid, Euro Grid** Digital map with terrain overlain by pilot-selected graphics (initially for military helicopters).

**Eurogroup** Informal group of European defence ministers (NATO).

**Eurohorcs** European Heads of Research Councils (1992–, Int.).

**Euromep** European mission equipment package (helicopter night vision etc, F/G).

**Europa** European undertakings for research organization, programmes and activities, an umbrella MoU (Int.).

**European Air Chiefs** Free-ranging conference held twice per year since 1993 to promote air-power co-operation.

**Europilote** European organization of airline pilots' associations.

**euroium** Symbol Eu, soft silvery metal, a lanthanide; density 5.243, MPt 822°C, many uses in phosphors, screen coatings, semiconducting alloys and lasers.

**Europol** Intra-European air-transport policy (ECAC).

**Eurospace** Popular name for AESI (merged 27 April 2004 into ASD5).

**EUR-TFG** European Traffic-Forecast Group (Eurocontrol).

**eutectic point** Lowest temperature at which mixture can be maintained in liquid phase; lowest melting or freezing point of alloy.

**Eutelsat** European Telecommunications Satellite Organization (Int.).

**EUV** Extreme ultra-violet, just beyond FUV (ie shorter wavelength); E adds Explorer.

**EUVSA** European Unmanned Vehicle Systems Association (Int.).

**EV** 1 Enhanced vision.

2 EAS (F).

3 Earned value.

**Ev** Every.

**eV** Electron-volt, gain in energy acquired by electron gaining one volt in potential,  $1.60219 \times 10^{-19}$ J.

**EVA** 1 Extravehicular activity; carried on outside spacecraft or on lunar surface.

2 Equipement vocal pour l'aéronef, (cockpit human voice control) (F).

3 Equipe de Voltige Aérien (F, = team).

4 Economic value added.

**evaluation** 1 Appraisal of information in terms of credibility, reliability, pertinency and accuracy; for US and NATO letters A-F indicate reliability and numbers 1-6 accuracy; thus B-2 indicates probably true from usually reliable source, while E-means improbable from unreliable source.

2 Process of assessing proposal, design or hardware, usually on comparative basis in course of commercial or military procurement.

**Evaluation Assurance Level** Any of seven rankings of multiple independent levels of security of the Common Criteria; DO-178B is ranked by different authorities at EAL4+ or EAL5, while no commercial operating system has achieved a level above 4.

**evaporative cooling** Cooling system which uses latent heat of evaporation by allowing coolant to boil, then condensing and recycling it.

**evaporative ice** Ice formed in engine induction system on surface cooled by evaporation; can form from water or vapour at air temperatures up to 25°C.

**EVAS** Emergency vision assurance system = smoke goggles.

**Evasion** Ensemble de Visualisation et d'Affichage au Service de l'Instructeur à Organisation Numérique.

**evasive action** Flight manoeuvre performed by aircraft to evade defending forces, esp. AAA fire.

**EVC** Embedded visual computer, or computing.

**EVCS** Extravehicular communications system.

**EVD** 1 Elementary vortex distribution.

2 Explosive-vapour detector.

**EVED** Eidg. Verkehrs und Energiewirtschafts Departement (Switz.).

**event** At an airport, either a takeoff or a landing.

**event marker** Time-dependent indicator in HUD.

**Everel propeller** One of the few single-bladed propellers to have achieved any commercial success, the blade being counterbalanced by a lead cylinder (US c1930-40).

$$\text{Everling number} \quad No = \frac{n}{C_D} = \frac{V_C^3}{96,000\sqrt{\sigma}} \cdot \frac{W_o/p}{W_o/S}$$

where n is propulsion efficiency,  $C_D$  total drag coefficient,  $V_C$  max level KEAS,  $\sigma$  relative density,  $W_o/p$  power loading and  $W_o/S$  wing loading.

**Evett's Field** Airfield serving WRE (Australia).

**EVF** Enter visual fix.

**EVG** Electrostatically supported vacuum gyro.

**EVIR** Enhanced-vision IR.

**EVM** 1 Engine-vibration monitor.

2 Error-vector magnitude.

3 Earth-viewing module.

**EVO** Hellenic arms industry.

**EVP** Executive vice-president.

**EVR** Electronic video recording.

**EVS** 1 Electro-optical viewing system.

2 Enhanced vision sensor, or system.

3 Electronic voice-switching [S adds system].

**EVT** 1 Extravehicular transfer.

2 Educational and vocational training (for return to civilian life).

**EW** 1 Electronic[s] warfare.

2 Early warning.

3 Equatorial [warmer] air.

4 Elliptical waveguide.

5 Examining Wing.

6 Expeditionary warfare.

**EWA** European Wind-tunnel Association (Int.).

**EWAAS** End-state wide-area augmentation system.

**EWAC** 1 Electronic-Warfare Aircraft Commander (USN).

2 Electronic-warfare analysis centre.

**EW/Aco** Electronic warfare and/or acoustic (RAF aircrew trade).

**EWACS, Ewacs** 1 Electronic wide-angle camera system.

2 Early warning and control system.

**EWADS** Expeditionary warfare air-defense systems.

**EWAISF** Electronic warfare avionics integrated support facility.

**EWAM** Extended-window addressable memory.

**EW&C** Early warning and control.

**EWAP** Electronic-warfare AGE [access on ground equipment] panel.

**EWAS** Electronic-warfare analysis system.

**EWAT** Electronic-warfare advanced technology.

**EWAU** Electronic-warfare avionics unit (RAF).

**EWBM** Electronic-warfare battle management.

**EWCC** 1 Electronic-Warfare Combat Co-ordinator.

2 Electronic-warfare co-ordination cell (NATO).

**EWCS** Electronic-warfare coordination system, or command station.

**EWCU** Electronic-warfare computer unit.

**EWEDS** Electronic-warfare evaluation display system.

**EWEP** Electronic-warfare evaluation program (USAF).

**EWES** Electronic-warfare evaluation system.

**EWG** Executive working group.

**EW/GCI** Early warning and ground-controlled intercept.

**EWIRDB** Electronic-warfare integrated reprogramming database (USALF).

**EW line** The early-warning line 240 n.m. in advance of the frontier of the supposed hostile state [USSR] at which an NW attacking force would have descended to low level (RAF, 1957–90).

**EWM** Electronic-warfare management [S adds system, U unit].

**EWMC** Electronic-Warfare Mission Commander.

**EWMS** Electronic warfare management system.

**EWO** 1 Electronic-Warfare Officer.

2 Emergency war order.

**EWOP** Electronic-Warfare Operator (USN).

**EWOSE** Electronic Warfare Operational Support Establishment (UK).

**EWPA** European Women Pilots' Association.

**EWPI** Electronic-warfare prime indicator.

**EWR** 1 Early-warning radar.

2 Emissite wash repair.

**EWS** External weapon station.

**EWSM** Electronic-warfare (or early-warning) support measures (or surveillance measures).

**EWSP** Electronic-warfare self-protection.

**EWTA** Electronic-warfare sensor technology modeling simulator and analysis research (USAF).

**EWTS** Electronic-warfare training system.

**Ex** Expected[ed].

**Ex, ex** Except.

**e<sub>x</sub>** Longitudinal distance between lift-jet centrelines.

**E-x** Time until encounter with heavenly body.

**exa** Prefix, multiply by  $10^{18}$  [million million million], symbol E.

**Exactor** Mechanical remote-control system giving precise position.

**exact orbit** That Earth satellite must follow if exact sought-after data are to be obtained.

**exact-point symbology** That showing a point rather than a locus; eg, in HUD, point where one projectile would have hit, rather than tracer line.

**Excap** Expanded capability (= better).

**exceedence** Single event, recordable on all HUM systems, in which engine or other device suffers an excursion in operating regime beyond allowable limits.

**excess power** 1 Difference between horsepower available and horsepower required; determines rate of climb. When horsepower available and required are equal, rate of climb falls to zero and absolute ceiling has been reached (see *SEP*).

2 A totally different meaning is extra power required for level turn at same airspeed.

**exchange rates** Conversion factors used in calculating influence of variables in aircraft performance, most being guesses or assumptions; thus there are \*\* linking engine s.f.c., engine weight, parts cost, engine price and similar factors; \*\* will vary with stage length, operating conditions, costing formulae etc.

**exciter** 1 Source of small current, such as battery or d.c. rotary generator, which supplies current for field windings of large electrical machine.

2 Oscillator which supplies carrier voltage to drive

subsequent frequency-multiplying and amplifying circuits of transmitter.

**3** Source of light used to stimulate photo-emissive cell.

**exciton** Bound state of electron and hole in nanoscale material.

**exclusion zone** Airspace prohibited to aircraft, e.g. over National Monuments (US).

**EXCM** Expendable [or external] countermeasures.

**Excom** Extended communications search [SAR].

**EXCP** Except[ed].

**excursion** Undesired short-term variation of variable, such as instrument reading or flight path, away from correct value.

**excursion fare** Promotional fare offered by airlines to stimulate traffic; usually applicable only to round trips, with limits on season, days available and/or trip duration.

**excursion level** 1 In glidepath, maximum vertical or angular variation of centreline voltage/signal.

2 In glidepath, lowest safe angle of centreline voltage/signal.

**EXD** Expand display [in cockpit].

**exducer** Outlet from diffuser of centrifugal compressor.

**Exec** Executive.

**execute missed approach** A mandatory ATC instruction.

**exercise** There are no specific aerospace meanings.

**exercise option** To convert option(s) into firm order(s).

**exfoliation corrosion** Surface sheds thin flakes or layers.

**exhaust branch** Short pipe from cylinder to exhaust manifold.

**exhaust collector ring** Circular duct into which exhaust from radial engine is discharged.

**exhaust cone** Assembly of outer pipe and inner cone which leads gas from turbine to jetpipe.

**exhaust-disk supercharger** Turbocharger.

**exhaust duct** 1 Tunnel through which gas is expelled from underground missile launcher.

2 Fan duct of aft-fan engine.

**exhaust flame-damper** Expanding and shrouded pipes designed to prevent exhaust gas or stacks being seen at night.

**exhaust gas analyser** Electrical instrument for indicating proportion of carbon monoxide and so indicating efficiency of combustion and correctness of fuel/air mixture.

**exhaust manifold** Duct into which gas is led from number of cylinders. In a radial engine called collector ring.

**exhaust plug** Streamlined body in exhaust nozzle for adjusting backpressure and giving propulsive thrust.

**exhaust reheater** See *afterburner*.

**exhaust stack** Exhaust pipe.

**exhaust stator blades** Whole or partial ring of blades behind turbine to remove residual whirl from gas.

**exhaust stroke** Fourth stroke in four-stroke cylinder, in which piston moves up to expel burnt gases.

**exhaust stub** Short pipe linking cylinder direct with atmosphere.

**exhaust tailpipe** Final pipe leading exhaust away from a collector ring or manifold.

**exhaust turbocharger** See *turbocharger*.

**exhaust velocity** Mean velocity of jet from rocket measured in plane of nozzle exit,  $v_e$ .

**Eximbank** Export-Import Bank (US).

**exit** Departure from battlefield [helicopter or fixed-wing].

## exit cone

Thus \***criteria**, required capabilities in flight performance and avionics to achieve this.

**exit cone** Portion of wind tunnel into which air flows from working section.

**exit fix** Reporting point at which aircraft leaves control area or FIR.

**exit ramp** Safe path through mountainous region following pressurization failure.

**exo-atmospheric** Beyond the atmosphere.

**exogenous inputs** Disturbing inputs to dynamic [especially flight control] systems which, though neither actual controls nor reference signals, are crucial; Stevens/Lewis have noted that, without such an input, a glideslope coupler would command a horizontal trajectory.

**exosphere** Outermost layer of atmosphere where collisions between molecular particles are so rare that only gravity will return escaping molecules; lower boundary is critical level of escape (region of escape) at 500–1,000 km.

**exotic fuel** Any unusual fuel for air-breathing engine intended to produce greater thrust.

**exotic material** Structural material seldom used in conventional applications; esp. one with melting point above 1,800°C.

**expandable structure** One packaged in space vehicle and erected to full size and shape outside atmosphere.

**expanded foam** Low-density material, usually rigid but of low mechanical strength, produced by chemical reaction in liquid state; often formed inside hollow metal airframe part.

**expanding balloon** Kite balloon encircled by rubber cords or other devices to control shape when not full of gas; also known as dilatatable balloon.

**expanding brake** One whose segments are forced radially against drum by flexible sac.

**expanding square search** Standard method for searching for item on Earth's surface, made up of increasingly long straight legs with 90° corners.

**expanding reamer** One with slotted flutes expanded by tapered pin.

**expansion-deflection nozzle** Rocket nozzle in which jet enters top of bell-type nozzle moving radially outwards through an annular throat.

**expansion joint** Pipe joint so constructed as to allow limited axial movement between sections held together.

**expansion ratio** Ratio of cross-sectional area of rocket nozzle exit to area of nozzle throat.

**expansion stroke** See *power stroke*.

**expansion wave** Simple wave or progressive disturbance in compressible fluid, such that pressure and density decrease on crossing wave in direction of its motion; also known as rarefaction wave.

**expansive corner** On supersonic body, convex corner [makes flow expand and accelerate].

**expected approach clearance, EAC** Time at which arriving aircraft should be cleared to begin approach for landing; also known as expected approach time (EAT).

**expected further clearance, EFC** Time at which it is expected additional clearance will be issued to aircraft.

**expedite** ATC request: hurry up.

**expendable construction** Rocket propellant tanks divided into sections jettisoned in sequence.

**expendables** Missiles, RPVs, drones, and stores and materials consumed in action or in flight, esp. in space.

## extended-rootblade

**experimental aircraft** Aircraft whose objectives are fundamental research, or development of hardware having general application to many types of aircraft.

**experimental mean pitch** Distance through which propeller advances along its axis during one revolution when slip is zero, i.e., when giving no thrust.

**exploding bridgewire** Metal wire which melts at high temperature, produced by large electrical impulse.

**explosion turbine** Turbine rotated by gas from intermittent combustion process taking place in constant-volume chamber.

**explosive bolt** One incorporating explosive charge so that, when detonated, whatever it secures in position is released.

**explosive cladding** Use of explosive welding to clad one material with another.

**explosive decompression** Rapid reduction of pressure caused by catastrophic leak in pressure cabin (eg loss of window).

**explosive forming** High-energy-rate forming of sheet metal by using controlled explosive energy to blow work-piece against die.

**explosive rivet** Blind rivet with partially hollow shank charged with black gunpowder which, when detonated, causes shank to bulge.

**explosive welding** Effecting near-perfect bond between dissimilar metals by using explosion to drive them together under such pressure that joint melts and sweeps away previous surface impurities.

**exposed wing area** Net area minus projected area of nacelles and similar bodies, often written  $S_{\text{exp}}$ .

**exposure level**  $L_E = k \log \sum 10L_{EPN} + 10$ ; can be amplified using  $L_{EPNi}/k$  where  $L_{EPNi}$  is  $i^{\text{th}}$  event and  $k$  is usually 10, with additions of  $10T_o/t_o$  where  $t_o$  usually 1s and  $T_o$  may be 10s (see *noise*)

**express** Property transported under air express tariffs filed with CAB; conducted on basis of agreement between Railways Express Agency and airlines.

**Ext** Extension of runway.

**ext** External.

**EXTD, Extd** Extended.

**extendable nozzle** Rocket exit cone retracted or extended to alter area ratio; also called extendable exit cone.

**extended air defence** Defence against aircraft, UAVs and TBMs.

**extended centreline** Centreline of runway extended in either direction indefinitely.

**extended overwater operation** As defined by US FAR (Pt 1), an operation over water at horizontal distance more than 50 nm from nearest shore.

**extended-range Dovap, Extradop** Baseline extension of Dovap to provide coherent reference to ground transmitter and all Dovap receivers located beyond line of sight.

**extended-range operations** Modern engines are so reliable that twin-engined aircraft [large jets] can be certified for Etops routes taking them 60, 90, 180, or 240 minutes away from nearest suitable airport at engine-out cruise speed. In 2006 the FAA was considering an extension to 5½ hours.

**extended-root blade** 1 Gas-turbine rotor blade in which aerofoil is carried on long platform in disc of reduced diameter.

## extension contract

2 Propeller blade with root extended in chord.

**extension contract** Industrial contract formed as extension of previous contract in either scope or timing.

**extension flap** See *area-increasing flap*.

**extensometer** Instrument for measuring small amounts of deformation.

**external aileron** Aileron mounted clear of wing surfaces but deflected conventionally.

**external augmentor** Generalised description for arrangements which use high-energy primary flow to entrain ambient airflow remote from source of power, as in ejector lift.

**external check** See *externals 1*.

**external energiser** Portable motor used to supply motive power to engine inertia starters.

**external gearbox** That attached outside the casing of a gas-turbine engine, providing drives for accessories, usually from HP shaft, and connector for hand-turning. More often called the accessory gearbox.

**external input** System input from source outside system.

**external lighting** Some aircraft have none. Usually \* serves two functions: to render the aircraft visible from other aircraft at the same level from the greatest possible distance [see *navigation* \*] and to illuminate the ground ahead when taxiing or under tow. Other species include ice-warning, airline-logo and air-refuelling guidance.

**externally blown flap** Flap in wake of main engine[s] when deflected, thus having greatly enhanced effect esp. in increasing lift.

**externals** 1 External inspection of aircraft carried out by pilot [if necessary with other crew members] before boarding.

2 Complete gas-turbine engine apart from the core, i.e. fuel and lubrication systems, accessories, starting system, etc.

**external storage** EDP (1) storage media separate from machine but capable of retaining information in form acceptable to it.

**external supercharger** Impeller (manifold-pressure booster) located upstream of carburettor.

**extinction** 1 Attenuation of light through absorption and scattering.

2 Cessation of combustion (see *flameout*).

**extinction coefficient** In meteorology, space rate of diminution of transmitted light; attenuation coefficient applied to visible radiation.

**extraction** 1 To recover friendly troops from hostile location.

2 To take shaft power from engine for performance-measuring purposes.

**extraction parachute** Extracts cargo from aircraft and deploys main parachutes.

**extraction zone** Specified ground area upon which

supplies are delivered by extraction technique from low-flying aircraft.

**extractor** 1 Part of firearm which engages rim or base of cartridge to pull it from chamber.

2 Computer-controlled device for automatic initiation and maintenance of all desirable radar contacts in ATC or air-defence system.

**extraordinary magnetoresistance** Fantastic increase in resistance of superplastics in extremely powerful magnetic fields.

**extra section** Extra flight by airline to take overflow of fully booked flight.

**extravehicular activity** See *EVA*.

**extremely high frequency** 30–300 GHz.

**EXTRM** Extreme.

**extrusion** Hot or cold forming of metals, rubbers and plastics by forcing through die of appropriate cross-sectional shape.

**Extv** Extensive,

**ExW** Explosive welding.

**E<sub>zo</sub>, E<sub>x zero</sub>** Elastic modulus of composite panel in direction of fibres.

**e<sub>y</sub>** Lateral distance between jet centrelines.

**EYE** European Young Engineers (Int.).

**eye** In centrifugal compressor, that portion through which fluid enters.

**eyeball** 1 Passenger-controlled spherical valve outlet for fresh air, usually overhead.

2 To search visually, or keep eyes on a target (colloq.).

**eyeball design** Design by eye, without calculation.

**eyeballs down** Jargon for severe positive acceleration.

**eyeball/shooter** Manoeuvre in which lead fighter flies across to identify target visually, while wingman (shooter) remains able to fire BVR.

**eyeballs in** Acceleration from behind when subject is seated upright, or below when prone [best].

**eyeballs out** Deceleration when subject is seated upright [worst].

**eyeballs up** Negative-g, downward acceleration.

**eyebrow panel** Panel of instruments or controls in flight deck roof, above and behind windscreens.

**eyebrow window** In roof of flight deck, also called VIT window.

**eyelids** Jet-engine reverser or afterburner nozzle halves similar to eyelid in appearance and action.

**eye patch** Worn over one eye by all members of crew of aircraft about to drop live NW or launch missile with NW warhead.

**eye reference point** Actual or notional position in three dimensions of an eye, or mean of both eyes, of pilot looking ahead, especially during landing.

**eye relief** Distance from eyeball to NVG eyepiece or image of HMD.

**Eytie** Italian [noun and adjective, collaq.] (WW2).

# F

**F** 1 Fahrenheit (contrary to SI).

2 Fighter aircraft category (USN since 1922, USAF since June 1948), UK prefix since 1942.

3 Flap angle.

4 Force, especially net propulsive force, thrust.

5 Farad.

6 Sonobuoy size, 0.3 m (1 ft) long.

7 Photographic category (USAS, USAAC, USAAF, 1924–47).

8 First class (seating).

9 Fuel mass.

10 Fuel, with suffix 12 to 44, thus F18 =100LL and F22 = 115 Grade (NATO).

11 Flashing [sequenced] light.

12 Fog.

13 Area forecast.

14 Magnetomotive force [also M].

15 Luminous flux [usually  $\Phi$ ].

16 General term for a factor.

17 General term for a flight-control forcing function, suffix  $\xi$  for lateral,  $\eta$  for longitudinal.

18 New top airport taxiway category, able to handle A380.

19 Aircraft category: model, aeromodelling (FAI).

20 Prandtl's tip-loss function [helicopter rotor blade].

**F** Faraday constant.

**f** 1 Frequency.

2 Frictional force.

3 Acceleration, esp. linear.

4 Equivalent parasitic area of aircraft or flat-plate equivalent of helicopter fuselage.

5 Symbol meaning a function of [rarely, F].

6 Subscript, usually fuel, flap or fountain.

7 Normal stress.

8 Prefix femto,  $= \times 10^{-15}$ .

**FT<sup>2</sup>EA** Find, fix, track, target, engage and assess (AFRL).

**F<sup>3</sup>** 1 Form/fit/function, called F-cubed.

2 Full flight-envelope flight, control law and display system.

3 Free-form fabrication.

**F4** Airfield subgrade, standard asphalt.

**F-class** Restricted or advisory airspace (ICAO).

**F-code** In flight plan, aircraft has 4096-code transponder and approved R-nav.

**F-display** Target centred in rectangle, blip gives az/el aiming errors.

**F-factor** Dimensionless number interpreting vertical/horizontal strengths of windshear in terms of quantified reduction in climb performance.

**F-layer** One layer of ionosphere, at 150–300 km divided into F<sub>1</sub> and F<sub>2</sub> layers, F<sub>2</sub> being always present and having higher electron density.

**f-pole** Firing point of AAM which maximises aircraft/target separation at missile impact.

**f-pole line** Avionics limit which keeps fighter nose pointing within limits of radar gimbal boundary.

**FA** 1 Frequency agility, or frequency-agile.

2 Frontal (tactical) aviation (USSR, R)

3 Flight attendant, or assistant.

4 Free-air (tunnel).

5 Final approach.

6 Fix to an altitude.

7 Flying accident (RAF).

**F/A** Fix/attack (display).

**F<sub>A</sub>** 1 Flaperon [rarely, flap] angle.

2 Any resultant aerodynamic force.

**FAA** 1 Federal Aviation Administration (US, since 1967 part of Department of Commerce, said to mean 'federal acronym association').

2 Federal Aviation Agency (US, 1958–67, independent body, previously CAA).

3 Fleet Air Arm (formed 1924 as part of RAF, from 1939 part of Royal Navy, until 1953 officially called Naval Aviation).

4 Fuerza Aerea Argentina.

5 Foreign Airlines Association (UK, office Bourne End, Bucks; also [unrelated] in Japan, office Tokyo).

6 Functional analysis and allocation.

7 Flasher and audio (alarm).

**FAAA** Flight Attendants Association of Australia (office, Sydney).

**FAAD** Forward-area air defense; C<sub>2</sub>I can be added, S adds system.

**FAAM** 1 Family of AAMs.

2 Fleet Air Arm Museum [Yeovilton, BA22 8HT] (UK).

3 Facility for Airborne Atmospheric Measurements (Met. Office and NERC, UK).

**FAAN** Fight Against Aircraft Nuisance (UK).

**FAAOA** Fleet Air Arm Officers' Association [1957-; London SW1Y 4JU] (UK).

**FAAR** Forward-area alerting radar, against low-flying aircraft.

**FAAS** Focal-area aerial surveillance.

**FAATC** 1 FAA Technical Center, Atlantic City, NJ, until 1981 called Nafec.

**FAAWC** Force Anti-Air-Warfare Commander.

**FAB** 1 General-purpose HE bomb (USSR, R).

2 Flight-authorization book.

3 Força Aerea Brasileira.

4 Functional Airspace Block.

**Fab** Family of beyond LOS.

**fabric** Cloth or linen material of two main types: biased, multi-ply with one or more plies cut so that threads are transverse or diagonal; and parallel, with warp threads of all plies parallel.

**fabricated** Usually means welded.

**fabrication** 1 Generally, manufacture of hardware.

2 Specific, assembly by welding.

**fabric strip** A particular meaning is the piece of fabric repeatedly doped over the leading edge of many 1940-*era* fighters to protect guns from contamination by rain, snow and ice.

**Fab-T, FAB-T** Family of advanced beyond-LOS terminals (USAF).

**FAC** 1 Name of several air forces, usually Spanish- or Portuguese-speaking [see 8 below].

- 2 Forward Air Control[ler], now called JTAC.  
 3 Flight-augmentation computer.  
 4 Federal Airports Corporation (Australia).  
 5 Federal Aviation Commission (US, 1934–36).  
 6 Farnborough Aerospace Consortium [550+ companies, office GU14 0LX] (UK).  
 7 Fast attack craft (marine).  
 8 Federación Aérea de Chile [general aviation, office Santiago] (Chile).  
**Fac** Facility, facilities.  
**FAC (A), FAC-A** = FAC (2) airborne, the airborne controller in a tactical situation  
**FACCE** See FAC<sup>2</sup>E.  
**FACE** Future airline core environment [IT system] (Int.).  
**face** 1 Any exposed quasi-flat surface, such as main area of turbine disk.  
 2 Any surface for mating with another.  
 3 Open end of duct to be joined to another, including front of gas-turbine-engine inlet.  
 4 Either surface of propeller or helicopter-rotor.  
**face alignment** Distance perpendicular to chord from propeller or rotor blade chord centreline to flat face of blade at any station.  
**faceblind firing** Method of firing ejection seat in which occupant pulls roller blind at top of seat down over his face, thus shielding latter from airstream on leaving aircraft.  
**faceplate** 1 Disc mounted on nose of lathe spindle for rotating work between centres or for gripping asymmetric item of short length.  
 2 Accessory mounting pad.  
 3 Transparent front of pressurized helmet.  
**FaCET** Falcon combined-cycle engine technology (Darpa).  
**Facet** Fault-assisted circuits for electronic training.  
**facet** Panel forming part of external visuals of simulator. The F-22 FMT has nine.  
**faceted aircraft** One whose external surface is made up of flat 2-D panels. Such an aircraft is theoretically invisible to hostile radars except for brief instants when one face is precisely normal to the incident signal. Such aircraft have severe flight-control limitations, and increased computer power now enables LO aircraft to have better aerodynamics.  
**Facets** Future anti-air concepts experimental technology (also terminal) seeker.  
**facilitation** Portmanteau word meaning making air travel easier for passengers.  
**facility** 1 Physical plant, buildings and equipment (previously US usage).  
 2 Any part of adjunct of a physical plant or installation which is an operating entity.  
 3 An activity or installation which provides specific operating assistance to military or civil air operations.  
**facility availability** Actual/specified operating times, usually as percentage.  
**facility performance category** See *categories* (3).  
**Faco, FACO** Final assembly and check-out.  
**FACP** Forward air control post.  
**FACRI** Flight Automatic Control Research Institute (China).  
**FACS** Fully automatic compensation system.  
**facsimile** Telecommunications process in which picture

- of image is scanned and signals used locally or remotely, sent by telephone or TV, to reproduce \* or likeness of subject image.  
**Fact, FACT** French air force ATM co-ordination tool.  
**Factar** Follow-up action on accident reports.  
**Factor** Development of functional concepts from EATMS operational requirements (Euret).  
**factored field lengths** Any distance relative to CTOL operations (TOR, EMD, TOD etc) multiplied by factor to take account of engine failure at V<sub>1</sub>, slippery surface or any other hazard.  
**factoring** Process of selecting and applying appropriate factors (of safety) in such areas as design and stress calculations, performance estimates etc.  
**factor of safety** 1 Factor by which limit load is multiplied to produce load used in design of aircraft or part; intended to provide margin of strength against loads greater than limit load, and against uncertainties in materials, construction, load estimation and stress analysis.  
 2 Ratio of ultimate strength to actual working stress or maximum permissible stress in use of material component.  
**factory loaded** Propellant charge or explosive filling added in plant before delivery.  
**factory remanufactured** Product, usually an engine, indistinguishable from new.  
**Facts** 1 FLIR-augmented Cobra Tow sight.  
 2 Fighter-aircraft-control training system.  
**FAC<sup>2</sup>E** Fighter air command and control enhancement.  
**FAD** 1 Fleet air defense (US).  
 2 Fast-action device.  
 3 Fighter aerodynamics development.  
 4 Feature analysis data.  
 5 Flexible-aircraft dynamics.  
 6 Funding authorization document.  
 7 Fuel advisory departure.  
 8 Forsvarets & Aerospaceindustrien i Danmark.  
**FADA** Federación Argentina de Aeroclubes.  
**FADD** Fatigue and damage data.  
**fade** Decrease in received signal strength without change of receiver controls.  
**Fadec** Full-authority, or fully authoritative, digital engine (or electronic) control.  
**faded** Radio word meaning ‘air-intercept contact has disappeared from reporting station’s scope, and further information is estimated’ (DoD).  
**fade-out** Fading in which received signal strength is reduced below noise level of receiver. Also known as radio fade-out, Dellinger effect, Mogel-Dellinger effect (see *blackout*).  
**fading** Variation of radio field strength caused by change in transmission medium.  
**FADOLC** Full-authority direct organic lift control.  
**FADR** Fixed [-site] air-defence radar.  
**FADS, Fads** Flush, or flexible air-data system.  
**FAE** 1 Fuel/air explosive; large class of ordnance devices.  
 2 Federación de Aeronáutica Española (Spain).  
**Faeshed** FAE store, helicopter delivery.  
**FAEI** Federation of Aerospace Enterprises in Ireland.  
**FAF** 1 Final-approach fix.  
 2 Full and free [flight controls].  
 3 Confusingly, French Air Force.

**FAFC** Full-authority fuel controller.

**FAFL** Forces Aériennes Françaises Libres (1940–45).

**FAFT** Fore/aft fuselage tankage ( $\text{LH}_2$ ).

**FAGC** Fast automatic gain control.

**FAGr** Fernaufklärungsgruppe, long-range reconnaissance wing (G).

**Fagsa, FAGSA** Federation of Airline General Sales Agents (UK, office, Birmingham).

**Fahrenheit** Temperature scale, contrary to SI, in which ice point is  $32^\circ$  and boiling point of water  $212^\circ$ ; thus to convert to  $^\circ\text{C}$  subtract 32 and multiply by  $\frac{5}{9}$ ; to convert to  $^\circ\text{K}$  add 459.67 and multiply by  $\frac{5}{9}$ .

**FAI** 1 Fédération Aéronautique Internationale, the supreme body ratifying aeronautical records, (office Lausanne, Switzerland, established 14 October 1905).

2 Fatal-accident inquiry.

3 First-article inspection.

4 Final approach initiation [rendezvous].

**fail** 1 To cease normal operation.

2 Deliberately to close throttle of an engine in order to provide asymmetric practice.

**fail-active** Quality of a dynamic functional system of remaining correctly operational after any single failure.

**failed item** For whatever reason, one that has ceased to function. A failed engine may be in perfect running order [see fail 2].

**fail frozen** Should a failure occur, the system instantly locks into its current operating condition.

**fail-hard** 1 Describes part or component, notable primary structure or other unduplicated load path, fracture of which would be catastrophic.

2 Describes system component whose failure renders system immediately misleading, incorrect or dangerous.

**failing load** That which, when applied, will just cause structural member to fail.

**fail link** Deliberate weak link to prevent overload damage to costly structure.

**fail-operational** Any single system failure has no (or limited) effect on operation, though warning is given.

**fail-passive** Failure inactivates system, thus preventing dangerous spurious signal or hardover output.

**fail-safe** Normally structural design, rather than system, technique in which no crack can cause catastrophic failure of whole structure but is allowed to occur and be detected.

**fail-soft** System failure does not inhibit operation but authority or limits of travel are reduced.

**failure** Separation of a part into two or more pieces such that the part is no longer complete (FAA).

**FAIP** First-assignment instructor pilot.

**fairing** Secondary structure whose function is to reduce drag; eg streamlined cover, or junction between two parts.

**fairing wire** Wire provided as point of attachment for outer cover to maintain contour of airship envelope.

**fairlead** Streamlined tube through which trailing aerial or other cable exits aircraft.

**fair over** To reduce drag of excrescence by fitting fairing over or around it.

**faker** Strike aircraft engaged in air-defence exercise (DoD).

**FAL** 1 Facilitation of air transport (ICAO, section of AIP).

2 Fuselage, or final, assembly line.

3 Fédération Aéronautique Luxembourgeoise.

**Falac** Forward-area liaison and control.

**Falcon** 1 Frequency-agile low coverage netted.

2 Force application and launch from the Continental US (USAF/Darpa).

**fallaway section** Part of rocket vehicle that separates; one that falls back to Earth.

**fallback** 1 Immediate return of malfunctioning ballistic vehicle after vertical launch.

2 Material carried into air by nuclear explosion that ultimately drops back to Earth.

**fallback area** Area to which personnel retire once missile (large, surface-launched) is ready for firing.

**fallback programme** Second project undertaken as insurance against failure of first.

**falling leaf** Aerobatic manoeuvre in which aircraft is stalled and then forced into spin; as soon as spin develops, controls are reversed; process is repeated, resulting in oscillations from side to side with little apparent change in heading.

**fall off on a wing** See *stall turn*.

**fallout** 1 Rain of radioactive particulate matter from nuclear explosion. Local \* settles on surface within 24 hr; tropospheric \* is deposited in narrow bands around Earth at about latitude of injection; stratospheric \* falls slowly over much of Earth's surface.

2 See *spin-off*.

**fallout contours** Lines joining points of equal radiation intensity.

**fallout mission** Alternative or secondary combat mission, primary being impossible of accomplishment.

**fallout pattern** Distribution as portrayed by fallout contours.

**fallout prediction** Estimate before and immediately after nuclear detonation of location and intensity of militarily significant fallout.

**fallout safe height** Altitude of detonation above which no militarily significant fallout will be produced.

**fallout wind plot** Wind vector diagram from surface to highest altitude affecting fallout pattern.

**false alarm** Appearance on a radar display of what appears to be a valid target but is caused by something else.

**false cirrus** Cirrus-like clouds in advance of and at summit of thunder cloud, lacking feathery texture. Also known as thunderstorm cirrus.

**false-colour film** 1 Has at least one emulsion layer sensitive to radiation outside visible spectrum (eg infra-red), in which representation of colours is deliberately altered.

2 Modified film whose dye layers produce assigned colours rather than natural ones.

**false cone of silence** Radio-range phenomenon similar to cone of silence above transmitting station and likely to occur over mountains, ore deposits or other factor that causes dead spot in reception; lacks four characteristics of true counterpart; build-up, deadspot, surge and fade.

**false glidepath** Loci of points in vertical plane containing runway centreline at which DDM is zero, other than those forming ILS glidepath.

**false heat** Emitted by flares and other IR decoys.

**false lift** Additional aerostat lift caused by positive superheat, temperature difference between gas and surrounding air.

**false nosing** Built up of nose-rib formers and D-skin, attached to front spar to form leading edge.

**false ogive** Rounded fairing added to nose of vehicle to improve streamlining. Also known as ballistic cap.

**false ribs** Auxiliary nose ribs between main ribs forward of front spar to support fabric covering and improve contour.

**false spar** Secondary spar not attached to fuselage, used as mounting for movable surfaces.

**false start** Gas-turbine starting cycle which fails to achieve stable light-up; ability to survive is certification requirement.

**FALW** Family of air-launched weapons.

**FAM** 1 Fighter attack manoeuvring.

2 Federal Air Marshal [P adds program].

3 Final-approach mode.

**Fame** Full-sky astrometric mapping explorer.

**Famet** Fuerzas Aeromóviles del Ejército de Tierra [army aviation] (Spain).

**FAMG** Field artillery missile group (USA).

**familiarisation** Training to acquaint technical personnel with specific system.

**Famis** Full-aircraft management and inertial system.

**famished** Air-intercept code: 'Have you any instructions for me?' (DoD).

**Famos** Floating-gate avalanche-injection MOS.

**FAMS** 1 Family of air missile systems.

2 Federal Air Marshal Service (US 2002–).

**FAN** 1 Forward air navigator.

2 False-alarm normalization [normally holds CFAR to  $10^{-6}$ ].

**fan** 1 Vaned rotary device for producing airflow.

2 Multi-bladed rotor, usually with single stage, serving as first stage of blading in turbofan [last stage in aft-\* engine] and handling much greater airflow than core.

3 Propeller, when function is moving air rather than providing thrust.

4 Assembly of three or more reconnaissance or mapping cameras at such angles to each other as to provide wide lateral coverage with overlapping images.

**fan blade off** Most severe turbofan certification requirement, ability to contain and survive severance of one entire fan rotor blade at redline speed without danger to aircraft.

**F&E** Facilities and equipment.

**F&F** Fire and forget.

**F&R** Function and reliability.

**F&U** Fire and update.

**fan duct** Annular duct [in B-52H twin C-ducts] through which air compressed by fan of turbofan engine is delivered. Can be short, ending in annular propulsive nozzle surrounding core case, or extend to rear where there may be a mixer. Almost always incorporates a reverser.

**fan engine** 1 See *turbofan*.

2 Three-cylinder engine with one cylinder vertical and others at about 45° to it.

**fan exit case** Casing surrounding fan (2) carrying reverser and often accessory gearbox.

**fan-failure clutch** When necessary, disconnects engine fan from transmission of tilt-rotor.

**Fang** Federation of Anti-Noise Groups (charity, UK, 1973–, office East Molesey).

**fanjet, fan jet** Turbofan, or aircraft powered thereby (colloq.).

**fan lift** Jet V/STOL system using large axial fans inside

wings and fuselage covered by shutters above and below which are opened only in hovering mode.

**fan mapping** Aerial survey using fan of cameras.

**fan marker** Radio position-fix beacon radiating in vertical, fan-shaped [ellipse or dumbbell] pattern, keyed for identification (see *radio beacon*, *Z-marker*, *FM-marker*).

**fanned-beam antenna** Unidirectional antenna so designed that transverse cross-sections of major lobe are approximately elliptical.

**fanning beam** Radiant-energy beam (eg radar) which sweeps back and forth over a limited arc (see *scan*).

**Fanpac** Fan-noise prediction and control.

**fan ramjet** See *augmented turbofan*.

**FANS, Fans** Future air navigation system[s]; several variants with suffix letter or number (ICAO).

**fan straightener** Radial vanes in front of and/or behind fan in wind tunnel to introduce or remove flow rotation usually counteracting that of fan.

**fan stream burning** Thrust boosting by burning fuel in airflow downstream of fan; in some vectored engines same as PCB, in ejector lift and RALS after travel along large pipe.

**FanWing** Patented VTOL lift/propulsion system based on powered 'paddlewheels' rotating on transverse axes.

**FAO** Fabrication assistée par ordinateur (F).

**FAOR** Fighter area of responsibility.

**FAP** 1 Fleet average performance.

2 Force Aérienne de Projection (F).

3 Fuel-adjusted profit.

4 Frangible armour-piercing; DS adds discarding-sabot.

5 Forward, or flight, attendant panel.

6 Final approach, or final-approach point.

7 Federation of Australian Pilots.

8 Fluorinated aluminium powder.

9 Federación Argentina de Paracaidismo [sport parachuting] (Argentina).

**FAPA** 1 Future Aviation Professionals of America.

2 First Air Pilots Association.

**FAQ** Frequently-asked question[s].

**FAR** 1 Federal Aviation Regulation[s]; eg FAR-23 [also called Part 23] defines flight performance of private and taxi a/c  $\leq 12,500$  lb [5670 kg] MTOW, FAR-25 covers a/c above this limit, Pt 36 is concerned with noise and FAR-103 with single-seat ultralights, for example.

2 False-alarm rate.

3 Fighter/attack/recon. (pilot grading, USAF).

4 Field assessment (or functional area) review (US).

5 Force d'Action Rapide (F).

6 Forward-area rearm [or rearm/refuel, P adds point].

7 Federal Acquisition Regulations.

8 Federatia Aeronautica Romana [office, R-70139 Bucharest] (Romania).

9 Fatal-accident rate.

**FARA** Formula Air Racing Association [office, London W1X] (UK).

**farad** SI unit of electrical capacity, Symbol F; capacity of condenser (capacitor), which has potential difference of 1V when charged with 1C. More commonly used: microfarad and picofarad.

**faraday** Symbol F; non-SI unit of electric charge carried by 1 mole of singly-charged carbon-12 ions =  $9.6487 \times 10^4$  C.

## Faraday waves

**Faraday waves** Specific family of waves set up by fluid sloshing in confined space.

**Faradex** Functional architecture reference for ATM (7) systems and data exchange (Euret).

**Faraway** Fusion of radar and ADS (5) data through two-way data-link (Euret).

**fare dilution** Dilution of airline revenue yield by excursion, affinity, group, seasonal or off-peak and other types of promotional fares, and by discounted or free travel to employees, or passengers on particular sectors.

**fare structure** Complete range of airline fares, either approved by licensing authority such as CAB for domestic use or agreed at IATA traffic conferences for international use.

**far-field boom** Supersonic N-wave boom after long travel has changed form, esp. by reducing rate of change of pressure at front and rear.

**far-field noise** Noise, especially from jet engine, at considerable distance (typically 100+ metres) where higher frequencies are attenuated.

**far IR, far infra-red** Wavelengths longer than  $6\ \mu$ .

**farm** Compact group of large number of aerials (antennas), especially protruding from aircraft.

**farm-gate operations** Operational assistance and specialised tactical training provided to friendly foreign air force by United States armed forces; includes, under specified conditions, flying of operational missions by combined US and foreign aircrew as part of training when such missions are beyond recipient's capability.

**farm strip** Private airfield, usually with no facilities except hangar.

**Farnborough** Location of Qinetic/Royal Aerospace Establishment (RAE), originally Royal Aircraft Factory (UK).

**Farnborough indicator** Pioneer indicator for continuously recording pressure cycles in cylinder of piston engine.

**Farnham roll** Large powered machine for two-dimensional bending of sheet metal.

**FARRP** Forward-area rearming and refuelling point (or FARP, forward arming and refuelling point).

**farval** Aerobatic manoeuvre in which two aircraft perform routine with one inverted above the other (thus a half-roll results in the pair changing places). See *double* \*, (USN 1929, relaunched by Blue Angels 1962).

**FAS** 1 Frequency-agile subsystem.

2 Flight-attendant station.

3 Forward acquisition sensor.

4 Federatsiya Aviationsionogo Sporta (USSR).

5 Flare-augmentation system.

6 Fuel-advisory system.

7 Fore-and-aft scanner; S adds system.

8 Forces Aériennes Stratégiques (F, note plural, unlike FAT).

9 Future antenna suite.

10 Federal air surgeon (US).

11 Final-approach segment.

**FASA** 1 Friendly aircraft simulating aggressors.

2 Fédération Algérienne des Sports Aériens.

**Fasat** Future anti-satellite (weapon).

**FASGW** Future air/surface guided weapon (UK).

**FASH** Future amphibious support helicopter.

**FASI** 1 Federation of air sports [Jakarta airport] (Indonesia).

## FASU

2 Fused all-sources intelligence.

**Fasid, FASID** Facilities and services implementation document.

**FASM** 1 Forward air-support munition.

2 Farnborough Air Sciences Museum (2003–).

**Fasoc, FASOC** Future air & space operations concept, or capability (MoD, UK).

**Fasotragru** Officially written in capitals, Fleet Aviation Specialized Operational Training Group; DET adds Detachment (USN).

**FASS** 1 Fore and-aft scanner system.

2 Fixed aircrew seat standardization.

**FASST** Federation of Americans Supporting Science and Technology [office, Washington, DC].

**FAST, Fast** 1 Fan and supersonic turbine.

2 Fuel and sensor, tactical (clip-on pack).

3 Future aviation safety team (EC, JAA).

4 Flying-ambulance surgical trauma.

5 Fuselage automated, or automatic, splicing tool.

6 Fast-acting stabilizing [reefed drogue].

7 Final-approach spacing tool.

8 Fleet-aircrew simulation training.

9 Forecasting and assessment of science and technology.

10 Fly-away satellite terminal.

11 Forward-area support team.

12 Flight-advisory service test [of civil/military ground radar].

13 Fully automatic scoring target.

14 Flexible acquisition [and] sustainment tool (USAF).

15 Fuze air-to-surface technology (USAF).

16 Future air systems tanker.

**FASTA** Farnborough Air Sciences Trust Association [Mytchett GU16 6DH] (UK).

**Fasta** Flugzeugabwehrstartanlage (air-defence launcher, G).

**Fast-action device** Thyristor switch which brings battery on line upon failure of generator or TRU.

**Fastar** Forward-area surveillance and target-acquisition radar.

**FASTC** Foreign Aerospace Science & Technology Directorate Center (USAF).

**Fast CAP, Fastcap** Combat air patrol by fast jet.

**Fastec, FASTec** Foundation for Advancing Science & Technology Education (US).

**fast erection** Provision for super-rapid [usually electrical] acceleration of gyro[s].

**Fast FAC** Forward air controller in fast jet.

**Fasti** First air traffic control support tools implementation (Eurocontrol).

**Fastjam** Flow analysis for selective, or selected, target jamming (Darpa).

**fast jet** Generic title for ATC purposes of any aircraft with typical jet speed.

**fast mover** Jet combat aircraft, especially in FAC role.

**fast prototyping** Techniques for getting first flight article airborne at earliest possible date, ignoring deficiencies and making maximum use of simulation.

**fast-reaction weapons demonstration** Ongoing research into optimum methods of dispensing multiple miniature smart submunitions (USAF).

**Fastt** Flight-strip automation system for towers and Tracons.

**FASU** Federation of Aeronautical Sports of Ukraine.

**FAT** 1 Flechette anti-tank.  
2 Factory acceptance test.  
3 Final-approach track.

**fat** 1 Overweight.

2 Material that can be removed to meet less-severe requirement, as in civil derivative of military engine.

**Fatac** Force Aérienne Tactique (F).

**fatal accident** One in which at least one occupant is killed; casualties on ground do not qualify.

**Fatca** Federal ATC authority (Yugoslavia).

**Fate** 1 Fuzing, arming, test and evaluation.

2 Factory acceptance test equipment.

**FATG** Fixed air-to-ground, ie against non-moving target.

**fathom** Nautical unit of sea depth, 6 ft, 1.8288 m.

**fatigue** 1 Weakening or deterioration of metal or other material under load, esp. repeated cyclic load; causes cracks and ultimately failure.

2 Progressive decline in human ability to carry out appointed task apparent through lack of enthusiasm, inaccuracy, lassitude or other symptoms. In any form of briefing, limits usually quantified in terms of hours or sorties.

**fatigue index** Arbitrary scale of airframe structure life terminating at 100, but capable of being extended to higher values by modification.

**fatigue life** Minimum time, expressed in thousands of hours or specified number of load cycles, that structure is designed to operate without fatigue failure.

**fatigue strength** Maximum stress that can be sustained for specified number of cycles without failure. Also known as fatigue limit.

**fatigue test** Test in which specimen is subjected to known reversals of stress, such as alternate tension and compression, or cycle of known loads repeatedly applied and released.

**Fatmi** Finnish air-traffic management integration.

**FATO, Fato** Final approach and takeoff [determines size of heliport].

**Fature** Federation of Air Transport User Representatives in Europe [office, London WC2B 6TE] (Int.).

**FAU** Forward antenna unit.

**fault-tree analysis** Use of a family-tree structure in order to establish the probability of failure of any level or component; the analysis is based on the established MTBF of each element, some parts being in parallel [four engines or hydraulic pumps]. This is a fundamental procedure in the PSSA and SSA.

**FAUSST** Franco-Anglo-US SST Committee (1964–66).

**FAV** First-article verification.

**fav** Fuel available.

**favourable unbalanced field** A T-O with excess power available, so that surplus acc/stop distance can give screen height greater than 35 ft.

**FAW** Fighter, all-weather (role prefix, UK).

**FAWS** Future airborne weapon system.

**faying surface** Overlapping of adjoining skin surfaces with edges exposed to airstream or to water.

**FB** 1 Fighter-bomber (role prefix, UK). Also major subdivision of undergraduate pilots, as alternative to TTT (USAF).

2 Fingerprint biometrics.

3 Flare block [of cartridges].

**F<sub>B</sub>** 1 Aerodynamic loading due to buffeting pressure field.  
2 Structural buckling factor [highly variable, depending on construction].

**F<sub>b</sub>** 1 Burn time at average thrust (rocket).  
2 Body-fixed reference frame.

**FBC** 1 Fighter-bomber clear-weather day/night.  
2 Fan/booster/compressor [module].  
3 Fly by cable = mechanically signalled manual FCS.

**FBE** Fleet battle experiment (USN).

**FBG** Fighter/Bomber Group (USAAF).

**FBH** Front-bearing housing.

**FBI** Frequency and bias injection.

**FBL** 1 Fly-by-light.

2 FIATA combined transport bill of lading.

**FBM** 1 Fleet ballistic missile (S adds ‘submarine’ or ‘system’).

**FBO** 1 Fixed-base operator.

2 Flights between overhauls.

3 Federal budget outlays.

4 Fan-blade off; hence, an \* event, \* test.

**FBPAR** Fixed-base precision approach radar.

**FBR** Fuji bearingless [main] rotor.

**FBS** 1 *Fly-by-speech*.

2 *Fixed-base simulator*.

3 Forward-based system.

4 Flash/bang/smoke.

**FBSM** Feature-based solid modelling.

**FBT** Fixed-base tower.

**FBVL** Fédération Belge de Vol Libre.

**FBW** 1 *Fly-by-wire*.

2 Fly-by waypoint.

**FBWG** Franco-British Working Group [Concorde].

**FC** 1 First class.

2 Fuel cell.

3 Funnel cloud, tornado or waterspout.

4 Foot-candle[s].

5 Flight crew.

6 Flight cycle.

7 Fibre channel [bus].

**F<sub>c</sub>** Fracto-cumulus.

**f<sub>c</sub>** Carrier frequency.

**F/C** Forecast.

**FCA** 1 Future cycle accumulation (engine).

2 Functional configuration audit (software).

3 Flight-control, or -critical, avionics.

4 Fully controllable array.

5 Frequency control and analysis.

6 Frequency clearance agreement.

7 Flying Chiropractors Association [office, Johnstown, PA] (US).

**FCAC** Future combat air capability (RAF).

**FC-AE** Fibre channel avionics environment.

**FCAS** 1 Flight-control actuation system [Bell].

2 Future combat air system.

**FCB** Frequency co-ordinating body.

**FCBA** 1 Fédération des Clubs Belges d’Aviation.

2 Future carrier-based, or -borne, aircraft (UK, replaced by FJCA).

**FCC** 1 Federal Communications Commission (US, from 1934).

2 Flight-control computer.

3 Flight-connection centre (DAIS.2).

4 Flat conductor cable.

<b>5</b>	Flying Control Committee.	<b>4</b>	Friction coefficient.
<b>FCCC, FC3</b>	Framework Convention on Climate Change.	<b>FCTP</b>	Flight-control technology program (VTOL, at WPAFB).
<b>FC cost</b>	Flight-crew cost.	<b>FCTR</b>	Fan/core thrust ratio.
<b>FC (CSA)</b>	Fleet Command [Carrier Strike and Aviation] (UK).	<b>FCTS</b>	Flight-controller training simulator.
<b>FCD</b>	Full concept definition.	<b>FCU</b>	Feathering, fighter, flight or fuel control unit.
<b>FCDA</b>	1 Federal Civil-Defense Administration (US).	<b>F<sub>cy</sub></b>	Yield strength in compression.
<b>2</b>	Federación Colombiana de Deportes [sport] Aereos [Santa Fe de Bogotá] (Colombia).	<b>FD</b>	1 Flight director.
<b>FCDC</b>	1 Flight-control digital computer.	<b>2</b>	Frequency duplex.
<b>2</b>	Flight-control data concentrator.	<b>3</b>	Frequency domain.
<b>3</b>	Flight-critical direct current.	<b>4</b>	Flight, or final, data.
<b>4</b>	Flexible confidant detonating cord.	<b>5</b>	Flight deck [D adds documentation].
<b>FCDM</b>	Flow-control decision message.	<b>6</b>	Full development.
<b>FCDS</b>	Flight-control display system.	<b>7</b>	Flight dynamics.
<b>FCE</b>	1 Flight-control electronics.	<b>8</b>	Finite difference.
<b>2</b>	Flight-crew environment.	<b>F<sub>d</sub></b>	Takeoff-distance correction factor for slush, = TOD ÷ TOD for dry runway.
<b>3</b>	Full cockpit emulator.	<b>f<sub>d</sub></b>	Doppler frequency.
<b>FCEM</b>	Flow-control execution message.	<b>FDA</b>	Flight-data acquisition; F adds function, S system and U unit.
<b>FC-ECY, FC/ECY</b>	First-class and economy.	<b>FDAC</b>	Flight demonstration of ASTA (2) concepts.
<b>FCES</b>	Flight-control electronics system.	<b>FDAD</b>	Full digital Arts (1) display.
<b>FCF</b>	1 Functional check, or checkout, flight.	<b>FDAF</b>	See <i>FDA</i> .
<b>2</b>	Forward centre fuselage.	<b>FDAI</b>	1 Flight-director attitude indicator.
<b>FCG</b>	Fatigue-crack growth.	<b>2</b>	Føreningen for Dansk Aerospace Industri [office, DK-1787 Copenhagen] (Denmark).
<b>FCGMS</b>	Fuel and c.g. management system.	<b>FDAMB</b>	Field ambulance.
<b>FCI</b>	1 Fuel-consumed indicator.	<b>FD&amp;E</b>	Forces development and evaluation (USAF).
<b>2</b>	Flight-command indicator.	<b>FDAS</b>	See <i>FDA</i> .
<b>FCL</b>	Flight-crew licensing (CAA).	<b>FDAU</b>	See <i>FDA</i> .
<b>FCLP</b>	Field carrier-landing practice.	<b>FDB</b>	Flight[plan] data bank.
<b>FCLT</b>	Freeze calculated landing time (FAA).	<b>FDC</b>	1 Frequency-to-digital converter.
<b>FCM</b>	Fuel control and monitoring; C adds computer, S system.	<b>2</b>	Flight-director computer, or coupler.
<b>FCNP</b>	Fire-control navigation panel.	<b>3</b>	Flight-data concentrator, or centre.
<b>FCNS</b>	Fiber-channel network switch (USN).	<b>4</b>	Fire direction centre; OPC adds operations planning cell.
<b>FCNU</b>	Flight-control navigation unit (UAV).	<b>5</b>	Fuel-data concentrator.
<b>FCO</b>	1 Formal change order (contract).	<b>FDCC</b>	Forward-deployed communication[s] center (USAF).
<b>2</b>	Fire-control operator.	<b>FDD</b>	1 Flight-data display.
<b>3</b>	Foreign and Commonwealth Office [London SW1A 2AH] (UK).	<b>2</b>	Flying Display Director
<b>FCOC</b>	Fuel-cooled oil cooler.	<b>FDDI</b>	Fibre-optics distributed, or fibre distribution, data interface.
<b>FCOM</b>	Flight crew operating, or operations, manual.	<b>FDDP</b>	Full-digital design process.
<b>FCP</b>	1 Fuel cell powerplant.	<b>FDDS</b>	Flight-deck display system.
<b>2</b>	Flight-control panel, or processor.	<b>FDE</b>	1 Fire detection and extinguishing., or fire-detector element.
<b>3</b>	Future capability plan, or programme.	<b>2</b>	Fault detection and exclusion.
<b>4</b>	Fuel control panel.	<b>3</b>	Force development evaluation.
<b>5</b>	Fatigue countermeasures program [NASA Ames] (US).	<b>FDECU</b>	Field-deployable environmental-control unit.
<b>FCPC</b>	Flight-control primary computer.	<b>FDEP</b>	Flight-data entry and print-out (or FDE panel).
<b>FCR</b>	Fire-control radar.	<b>FDF</b>	1 Føreningen Danske Flyvere (Danish pilots' association) [office Copenhagen]
<b>FCRC</b>	Federal Contract Research Center (US).	<b>2</b>	Fachverband Deutsche Flugdatenbearbeiter.
<b>FCRS</b>	Flight-crew record system.	<b>FDFF</b>	Føreningen af Danske Fabrikanter af Flymaterial (Danish industry assoc.).
<b>FCS</b>	1 Flight control system.	<b>FDFM</b>	Flight-data and flow management (ICAO group).
<b>2</b>	Fire control system, for management of weapons.	<b>FDH</b>	Flight-deck handset.
<b>3</b>	Failure combat system.	<b>FDI</b>	1 Flight director indicator.
<b>4</b>	Future combat system[s] (USA).	<b>2</b>	Flight-data interface [MU adds management units, U unit].
<b>5</b>	Frame check sequence.	<b>3</b>	Fault detection and isolation.
<b>FCSC</b>	Flight-control secondary computer.	<b>FDIO</b>	Flight-data input/output.
<b>FCSS</b>	Fire-control sight system.		
<b>FCST</b>	Federal Council for Science & Technology (US).		
<b>Fest, FCST</b>	Forecast.		
<b>FCT</b>	1 First configuration test.		
<b>2</b>	Foreign comparative test[ing] (USAF).		
<b>3</b>	Flight-crew training [RM adds reference manual].		

## FDL

## feeder

<b>FDL</b>	1 Full-drawn line (symbology right across display).
2 Flight Dynamics Laboratory.	
3 Fast deployment logistic (ship).	
4 Fighter data link.	
<b>FDM</b>	1 Frequency-division multiple, or multiplex.
2 Fused deposition modelling.	
<b>FDMA</b>	Frequency-division multiple access.
<b>FDMS</b>	Flight deflection measurement system.
<b>FDMT</b>	Flight-data monitoring tool.
<b>FDMU</b>	Flight-data management unit.
<b>FDO</b>	Flight-deck officer.
<b>FDOA</b>	Frequency difference of arrival.
<b>FDP</b>	1 Flight [-plan] data processing, or processor; R adds replacement, S adds system, or service.
2 Flight-duty period.	
3 Floating-deck pulser.	
4 Funded delivery period.	
<b>FDR</b>	1 Flight-data recorder [A adds analysis, S system].
2 Flat-deck runway.	
3 Flight-deck reporting.	
4 Fiduciary deposit receipt[s].	
<b>FDS</b>	1 Flight director, or data, or display, system.
2 Fence disturbance sensor.	
3 Flight-deck [of aircraft] simulator.	
4 Field-deployable simulator.	
<b>FDSC</b>	Future defence supply chain.
<b>FDSO</b>	Full dispersed-site operations.
<b>FDSS</b>	Flight display subsystem.
<b>FDSU</b>	Flight-data storage unit.
<b>FDT</b>	Flight-deck, or -data, terminal[s].
<b>FDTE</b>	Force development test and experimentation.
<b>FDU</b>	1 Flight-data unit.
2 Flux, or fire, detector unit.	
<b>FDVLO</b>	First-day vertical liftoff.
<b>FDX</b>	Fast-switched Ethernet.
<b>FE</b>	1 Flight engineer [or examiner].
2 Ferroelectric.	
3 Fan exit.	
<b>Fe</b>	Iron.
<b>F<sub>e</sub></b>	Static thrust per engine at sea level.
<b>f<sub>E</sub></b>	Factor of stress increase at corner of a cut-out in stressed skin.
<b>FEA</b>	1 Federal Energy Administration (US).
2 Finite-element analysis.	
<b>FE(A)</b>	Flight Examiner (Aeroplanes).
<b>FEAF</b>	Far East Air Force[s] (WW2 and Korea).
<b>FEAR</b>	Failure-effect[s] analysis report.
<b>feasibility study</b>	Determines whether plan is within capacity of, or makes best use of, resources available.
<b>feathering</b>	1 Turning propeller blades to feathering angle, following engine failure or apparent malfunction, to minimise drag and prevent further damage.
2 Of helicopter, cyclic pitch.	
3 SpaceShipOne, pivoting tails up 65° to give shuttlecock re-entry stability.	
<b>feathering angle</b>	See <i>feathering pitch</i> .
<b>feathering button</b>	Used to feather propeller; protected by hinged cover.
<b>feathering hinge</b>	Helicopter rotor-blade pivot which allows blade angle to be varied.
<b>feathering pitch</b>	Angular setting giving zero windmilling torque for stopped propeller (opposite ends of each blade cancelling out torque), thus minimum drag.

<b>feathering pump</b>	After stoppage or failure of engine, provides hydraulic pressure to feather propeller.
<b>feathers</b>	Wing moveables: slats, Krügers, droops, flaps, ailerons, spoilers (colloq.).
<b>FEATMS</b>	[sometimes <b>Feats</b> ] Future European air-traffic management system.
<b>FE@R</b>	Force elements at readiness [2005–, MoD RAF] (UK).
<b>feature console</b>	In passenger cabin, clock, TAS readout, phone, fax etc.
<b>feature-line overlap</b>	Series of overlapping air photographs which follow ground feature such as river or road.
<b>FEBA</b>	Forward edge of battle area (replaced by FLOT).
<b>FEC</b>	Forward error correction.
<b>fecal canister</b>	Sealable container for human solid wastes in spaceflight.
<b>FECU</b>	Flap electronic control unit.
<b>FED</b>	1 Field-effect display.
2 Field emission display.	
<b>fed</b>	Of radio, supplied with RF oscillations.
<b>Federal Air Marshal</b>	Armed guard carried [as ordinary passenger] on US commercial flights to deter terrorism (FAA).
<b>Federal Flight-Deck Officer</b>	Captain or copilot trained to carry a gun (TSA).
<b>federated</b>	Traditional arrangement of avionics in which each suite provides its own processor and a separate unit [usually called mission computer] distributes workload and output.
<b>Fedix</b>	Federal information exchange, online.
<b>FEDN</b>	Fondation pour les Etudes de Défense Nationale (F).
<b>FEDP</b>	Fuel-element differential pressure.
<b>Feds</b>	The FAA (1) [colloq.].
<b>feed</b>	1 To provide signal.
2 Point at which signal enters circuit or device.	
3 Signal entering circuit or device; input.	
4 Means of supplying ammunition to gun, or chaff through dispenser.	
<b>feedback</b>	1 Return of portion of output to input; positive * adds to input, negative * subtracts from it.
2 Information on progress, results, field performance, returned to originating source.	
3 Transmission of aerodynamic forces on control surfaces or rotor blades to cockpit controls; also forces so transmitted.	
<b>feedback control loop</b>	Closed transmission path containing active transducer, forward path, feedback path, and one or more mixing points arranged to maintain prescribed relationship between input and output signals.
<b>feedback control system</b>	One or more feedback control loops to combine functions of controlled signals with functions of commands to tend to maintain prescribed relationships between them.
<b>feedback path</b>	1 Transmission path from loop output signal to loop feedback signal.
2 The path from output to demand.	
<b>feeder</b>	1 Transmission line which connects aerial to transmitter or receiver.
2 Air route or service that feeds traffic to major domestic or international routes (see <i>commuter, third-level</i> ).	

## feederliner

## FFA

**feederliner** Transport aircraft used to operate feeder, commuter or third-level services.

**feeder route** Links en-route to initial approach fix.

**feed pipe** Pipe supplying any liquid.

**feed tank** Small tank drawing fuel from main tankage and transferring it under pressure to an engine.

**feel** Subjective pilot assessment of aircraft response to flight-control commands, stability, attitudes and other factors influencing his opinion.

**feeler aileron** Small manual aileron whose primary purpose is to impart feel.

**feel system** Mechanism in which control feel is augmented, improved or simulated artificially rather than provided only by aerodynamic forces on control surfaces (see *artificial feel*).

**feet dry** Code: "I am, or contact designated is, over land" (DoD).

**feet per second** Ft/s, =  $0.3048 \text{ ms}^{-1}$ , 1.09728 km/h.

**feet wet** Code: "I am, or contact designated is, over water" (DoD).

**FEFA** Future European Fighter Aircraft (project).

**FEFI** Flight engineers fault isolation (technique and handbook).

**FEGV** Fan-exit guide vane.

**FE(H)** Flight Examiner [Helicopter].

**FEI** 1 Federation of the Electronics Industry [office London WC1B 5EE] (UK) 300+ members.

2 Field engineering instructions (NATS).

**FEIA** Flight Engineers' International Association (US, merged into IFEO).

**FEL, Fel 1** 1 Free-electron laser.

2 Fibre-elastomer or elastomeric.

**FELC** Field-effect liquid crystal.

**FELD** Forward electrical load center (EP-3).

**FELT, Felt** Free-electron laser technology; IE adds integration experiment (SDI).

**felt** Non-woven materials used when properties of unidirectional fibre-reinforced plastics are not required; built up from fibres or whiskers of carbon, glass, formerly asbestos, etc.

**felt strip** See *moleskin*.

**FEM** 1 Force effectiveness measure.

2 Finite-element model/mesh/method.

**FEMA** Federal Emergency Management Agency (US).

**femto** Prefix: multiplied by  $10^{-15}$ , one thousandth of a millionth of a millionth; see *fermi*.

**fence** 1 Line of readout or tracking stations for communication with satellite.

2 Line or network of radar stations, on land or round periphery of surface fleet, for detecting enemy aircraft or missiles.

3 Wall-like plate mounted on upper surface of wing, often continuing around leading edge, substantially parallel to airstream and used to prevent spanwise flow, esp. over swept wing at transonic speeds.

**Fenda** Federación Nacional de los Desportes Aéros (Spain).

**FENE** Fixed exit nozzle engine.

**Fenestron** Helicopter tail rotor with numerous blades rotating in short duct inset into fin.

**FEO** Federal Energy Office (US).

**FEP** Front-end processor.

**fermi** Unit of length, =  $10^{-15}\text{m}$ .

**Ferpic** Ferroelectric photoconductive image ceramic.

**FEPS** Flight-envelope protection system.

**ferret** Aircraft, ship or other platform equipped for detection, location, recording and analysis of hostile EM radiation (Elint mission).

**Ferris scheme** Carefully designed paint scheme using two shades of colours to make it difficult to ascertain aircraft attitude (secondarily, aircraft type and direction of travel).

**ferrite** Magnetic ceramics composed of salts of iron and another divalent metal; because of low eddy-current losses, cores constructed of sintered powders of these materials are widely used for rod aerials and cores of inductors for RF and video.

**ferrite paint** See *iron paint*.

**ferritic** Of ferrite.

**ferrous** Derived from iron.

**Ferroxcube** Proprietary non-metallic insulating magnetic materials which have extremely high resistivity and low eddy-current losses but do not become permanently magnetised.

**ferrule** Small metal fitting or wire wrapping used to prevent loosening of wire terminal.

**ferry flight** Flight whose purpose is to reposition aircraft at a different place.

**ferry pilot** One responsible for delivering aircraft from one place to another; eg from manufacturer to customer.

**ferry range** Distance unladen aircraft can be ferried; specified with or without ferry tanks.

**ferry tank** Extra fuel tank for ferry flight over range greater than normal limit.

**fertile material** Not itself fissile by thermal neutrons, can be converted into fissile material by irradiation; two are U-238 and Th-232, partially converted into Pu-239 and U-233.

**FES** Flexible elastomer skin.

**FESC** Forward electrical/electronic service centre.

**Fescolizing** Patented electroplating of Cd, Cr or Ni.

**FESG** Forecasting and Economic-Support Group.

**FEST** Foreign emergency support team (USAF).

**FET** 1 Field-effect transistor.

2 First engine to test (date).

3 Fighter engine[s] team.

**FETAP** Fédération Européenne des Transports Aériens Privés.

**FETT** First engine to test, date of first run of first complete engine of new type; confusingly sometimes said to mean first engine Type-Test, which might be years later.

**FEW** 1 Fighter Escort Wing.

2 Few clouds, usual = 1 to 2 oktas.

**The Few** Collectively, the fighter pilots defending the UK between 10 July and 31 October 1940.

**few** Up to 7 hostile aircraft (DoD).

**FEWP** Federation of European Women Pilots.

**FEWSG** Fleet EW Support Group.

**FF** Final fix.

**FF, f.f.** Fuel flow.

**f<sub>f</sub>** Frequency to which digital filter is tuned.

**FFA** 1 Flying Farmers Association [office, Shobdon airfield, HR6 9LT] (UK).

2 Foam-filled aluminium.

3 Flygtekniska Föröksanstalten; aeronautical research institute, merged 2001 into FOI (Sweden).

<b>FFAM</b>	4 Fédération Française d'Aérostation [ballooning; office, F-75116 Paris] (F).	4 First Flight Society [Kitty Hawk, NC 27949] (US).
<b>FFAM</b>	Fédération Française d'Aéro-Modélisme.	<b>FFSP</b> Full-function signal processor.
<b>FFAR</b>	1 Folding-fin aircraft rocket (2.75-in calibre).	<b>FFSS</b> Fire Fighting and Safety School (RAF).
2	Rarely, free-flight, or forward-firing, aircraft rocket.	<b>FFT</b> 1 Fast Fourier transform.
3	Feel forces/stick angle relationship.	2 Full-scale fatigue test [S adds specimen].
<b>FFAS</b>	French-language rendition of ADSL.	<b>FFTTEA</b> See $F^2T^2EA$ .
<b>FFATC</b>	Free-flight [phase] air-traffic control.	<b>FFTx</b> Fuel-flowmeter transmitter.
<b>FFBW</b>	Fully fly-by-wire.	<b>FFVC</b> Forward-facing video camera.
<b>FFC</b>	1 Fan-failure clutch.	<b>FFVV</b> Fédération Française de Vol à Voile [gliding; F-75006 Paris] (F).
2	For further clearance.	<b>FG</b> 1 Fighter Group (USAAF, USAF).
<b>FFCC</b>	Forward-facing crew cockpit.	2 Fog, defined as visibility $\leq \frac{1}{8}$ mile.
<b>FFCS</b>	1 Formation-flight control system.	3 Fuel-carrying glider (USAAF, 1944–47).
2	Fly-by-wire [primary] flight-control system.	4 Formation-flying system [a TCAS].
3	Free-fall control system (air-dropped ICBM).	<b>Fg</b> Gross thrust.
<b>FFD</b>	1 FMS (1) flight data.	<b>FGA</b> Fighter, ground attack (role prefix, UK).
2	Free-form deformation.	<b>FGAS</b> Flight guidance and autopilot system.
<b>FFDO</b>	Federal Flight-Deck Officer.	<b>FGB</b> Functional payload [or cargo] block (R).
<b>FFF</b>	1 Film-forming foam (extinguishants).	<b>FGC</b> Flight-guidance computer.
2	Free-form fabrication.	<b>FGCP</b> Flight-guidance control panel.
<b>FF/FU</b>	Fuel flow/fuel used (panel instrument).	<b>FGCS</b> Flight guidance and control system[s].
<b>FFG</b>	Code: guided-missile frigate (USN).	<b>FGIH</b> Federal government in-house.
<b>FFH</b>	For further headings.	<b>FGM</b> Flux-gate magnetometer.
<b>FFI</b>	1 Freedom from infection.	<b>FGMDSS</b> Future global maritime distress and safety system, integrated with aviation satellites.
2	Forsvarets Forskningsinstitut [defence research, Kjeller N-2007] (Norway).	<b>FGPA</b> Field-gate programmable array.
<b>FFIS</b>	Formation-flight instrumentation system.	<b>FGR</b> Fighter, ground attack, reconnaissance (role prefix, UK).
<b>FFK</b>	Full-function keyboard.	<b>FGS</b> Fine-guidance sensor.
<b>FFL</b>	Forces Française Libre, so-called "free French" [WW2].	<b>Fgs</b> Gross thrust corrected to standard weight.
<b>FFM</b>	1 True-mass fuel flowmeter.	<b>FGV</b> Field-gradient voltage.
2	Far-field monitor.	<b>Fg Wg</b> Flying Wing (RAF).
<b>FEMA</b>	Federal Emergency Management Agency (US).	<b>FH</b> 1 Flight hour(s).
<b>FFMRRR, F<sup>2</sup>MR<sup>3</sup></b>	Folded fibreglass-mat rapid runway repair system.	2 Frequency-hopping.
<b>FFN</b>	Far-field noise.	<b>FHA</b> 1 Fleet hour agreement (engine support).
<b>FFNAC</b>	Fédération Française des Navigants de l'Aviation Civile.	2 Functional hazard assessment, or analysis.
<b>FFO</b>	1 Furnace fuel oil.	<b>FHC</b> Fluorinated hydrocarbon.
2	Fixed-frequency oscillator.	<b>f.h.p.</b> Friction horsepower [lost].
3	Full fuzing option.	<b>FHS</b> Flight-hardware simulator.
<b>FFP</b>	1 Firm fixed price.	<b>FHSS</b> Frequency-hopped spread spectrum.
2	FOV/focus/polarity.	<b>FHU</b> Force helicopter unit (helicopter portion of detached autonomous force).
3	Flight fine pitch.	<b>FHV</b> Fuel-heating value.
4	Fédération Française de Parachutisme [office, F-75012 Paris] (F).	<b>FHW</b> Fault-history word.
5	Frequent-flyer programme.	<b>FI</b> 1 Flying Instructor.
6	Free Flight Phase, followed by -1 or -2 (FAA).	2 Fault isolation.
7	Free-fall parachuting.	3 Fluid injection (TVC).
<b>FFPB</b>	Free-fall practice bomb.	4 Fatigue index.
<b>FFPLUM, FF-Plum</b>	Fédération Française de Planeur Ultra-léger Motorisé [office, F-94700] (F).	5 Flyaround initiation.
<b>FFPS</b>	FFP(7) site.	<b>F/I</b> Flight idle engine power.
<b>FFPV</b>	Fédération Française de Parachutisme Vol Libre (hang gliding).	<b>F<sub>i</sub></b> Any inertial reference frame.
<b>FFR</b>	1 Fuel-flow regulator.	<b>FIA</b> 1 Fédération Internationale d'Astronautique. [F-75015 Paris] (F).
2	Full flight regime, ie operative throughout each flight.	2 Future imagery, or imaging, architecture (NIMA).
3	Full flight release (engine certification).	<b>FI(A), FI/A</b> Flight instructor, aeroplane [CAA] (UK).
<b>FFRAT</b>	Full-flight-regime autothrottle.	<b>FIAS</b> Formation Internationale Aéronautique et Spatiale.
<b>FFRDC</b>	Federally Funded R&D Centers (US).	<b>Fiasts</b> Fully integrated aircrew synthetic-training service (RAF).
<b>FFS</b>	1 Full flight simulator.	<b>FIAT</b> 1 First installed article test.
2	Fee for service.	2 Field Information Agency, Technical (US Group Control Council 1945–6).
3	Formation Flight System (Honeywell), or formation-flying system [a TCAS].	<b>FIATA</b> Fédération Internationale des Associations de Transitoires ou Assimilés [International Federation of

## FIB

Freight Forwarders' Associations; office, CH-8050 Zurich] (Int.).

**FIB** Forwarding information base.

**FIBDATD** "Fix it but don't alter the drawings".

**Fiberloy** Family of composite materials based on boron fibres bonded in various resinous or plastics adhesives (Dow Chemical).

**FibeX** Computer-placed carbon-fibre epoxy (Spectrum).

**fibre** Word used loosely of FBL and other systems employing optical fibres for all data transmission [US **fiber**].

**Fibredux** Family of CFRP and hybrid prepreg resins (Ciba-Geigy).

**Fibrefrax H** High-temperature ceramic-fibre insulating material, available as bulk fibre, blanket, felt or paper.

**Fibreglass** Glass-fibre, either raw fibre (many forms) or bonded into matrix and moulded or otherwise formed [capital F in UK, in US **fiberglass**].

**Fibrelam** Plastic honeycomb sandwich panel mechanically resistant to spike heels and not affected by galley or other spillage (Ciba/Geigy).

**fibre optics** Branch of optics concerned with propagation of light along thin fibres each comprising core and sheath of different glasses or other transparent material; light entering one end is transmitted by successive internal reflections. In practice extremely fine fibres a few microns in diameter are made up into bundles of 100,000 or more.

**fibre-optics gyro** Instrument (not a gyro at all) for measuring rotations by means of coherent light passed simultaneously both ways around a loop (typically 300–500 m long) of monomode optical fibre, rotation being measured instantly and precisely by phase shift at output.

**fibrescope** Fibre-optic borescope.

**Fibs, FIBS** Flight information billing system.

**Fibua** Fighting in built-up areas.

**FIC** 1 Flight information center, or centre.

2 Finance committee (ICAO).

3 Film integrated circuit.

4 Flying [or flight] instructor course.

5 Frequency/identification/course.

6 Flight inspection computer, compares aircraft position with that derived from navaids.

**Fican** Federal Interagency Committee on Aviation Noise (US).

**Fick's law** Basic law of gaseous diffusion: mass flux  $j = \text{diffusion coefficient } D \text{ times differential } dC_1/dy$  where  $C_1$  is concentration of gas 1 and  $y$  is distance from surface.

**Ficon** Fighter conveyor, fighter carried to target by large bomber, to offer protection (USAF).

**Fidag** Federazione Italiana Dipendenti Aviazione Generale.

**fidelity** 1 Accuracy with which electronic or other system reproduces at output essential characteristics of input signal.

2 Handling \* is degree to which flight simulator replicates handling of real aircraft.

**FIDO** 1 Flight dynamics officer.

2 Fog Investigation and Dispersal Operation, UK method of dispersing fog in WW2 by burning fuel along runway edges.

3 Field integrated design and operations (Mars vehicle).

**Fids, FIDS** 1 Fault identification and detection system.

## field traffic

2 Flight information display set [ATC radar] or system [for passenger information].

3 Fire detection and suppression system.

**fiducial marks** Index marks on camera which form images on negative to determine position of optical centre or principal point of imagery; collimating marks.

**FIE** Flight instrument examiner.

**field** 1 Airfield, as in \* length.

2 Region of space within which each point has definite value; examples are gravitational, magnetic, electric, pressure, temperature, etc. If quantity specified at each point is vector, field is said to be vector \*.

3 Customer service, thus \* service, \* rep., \* report.

4 Operation at advanced base with austere facilities (military), thus \* maintenance.

**field alignment error** In ground DF station, error introduced by incorrect orientation of aerial elements.

**field coils** Two fixed coils of DF goniometer at right angles to each other and connected to two halves of aerial system.

**field extension** Organizational element performing operating functions that must be retained under direct control of parent staff office (USAF).

**field-handling frame** Portable frame attached to airship on ground to afford grasp to large handling crew.

**field inventory** Portfolio of used aircraft, parked and immediately available.

**field length** Distance required for takeoff and landing, accelerate/stop, RTO and other operations as specified in flight manual (see *balanced*\*).

**field maintenance** That authorised and performed in field (4) in direct support of operational squadrons and other units; normally limited to replacement of unserviceable items.

**field modification** One made in field (4), usually by FMK.

**field of regard** Total angular coverage of sensor; with fixed installation same as FOV (2, next), but if gimballed depends on FOV plus slewing and elevation limits.

**field of view** 1 Angle between two rays passing through perspective centre (rear nodal point) of camera lens to two opposite sides of format. Not to be confused with angle of view.

2 Total solid angle available when looking through sight, HUD or other optical system. In the case of a TV, FOV is defined as: wide, 4°; narrow, 0.9°; underscan, 0.45°.

**field operation** From forward airfield, esp. with unpaved runways.

**field performance** That associated with takeoff and landing, esp. in context of certification.

**field site** Completely unprepared stretch of terrain used in Harrier training.

**field strength** 1 Flux density, intensity or gradient; also called field intensity, although this term does not follow strict radiometric definition of intensity (flux per unit solid angle).

2 Electric field strength, units  $\text{Vm}^{-1}$ .

3 Signal strength; magnitude of electric or magnetic component in direction of polarization.

4 See *magnetic* \*.

**field takeoff** From airfield, not ship or catapult [naval a/c].

**field traffic** Surface vehicles on airfield.

## field training detachment

## filter centre

**field training detachment** Established to provide maintenance-orientated technical training, at operational location, on new systems and their aerospace ground equipment (USAF).

**FIES** Factor of initial engine spares.

**FIF** Fluorescent inspection fluid.

**f<sub>IF</sub>** Intermediate frequency (superhet. receiver).

**FIFO** 1 Fail-isolated/fail-operative.

2 First in, first out.

**FIFOR, Fifor** Flight forecast (Int.).

**15-m class** Most restrictive of the Ostiv/FAI classes for competitive gliding, including span not greater than 15m (49 ft 2 in).

**15-3-3-3** Alloy 76 Ti, 15 Va, 3 each Al, Cr, Sn.

**fifth-freedom traffic** Picked up by airline of country A from country B and flown to country C (see *freedoms*).

**fifth wheel** Vehicle [e.g., baggage trolley] steering by pivoted full-width axle.

**FIG** 1 Fighter interceptor group.

2 Flight-idle gate.

**fighter** Aircraft designed primarily to intercept and destroy other aircraft.

**fighter affiliation** Training exercise carried out by bombers, other heavy aircraft, ground or naval forces, in co-operation with fighters.

**fighter-bomber** Fighter able to carry air-to-surface weapons for ground attack and interdiction.

**fighter controller** Officer on staff of tactical air controller charged with co-ordination and evaluation of air warning reports and operational control of aircraft allocated to him. Also known as fighter director (see also *air controller, tactical air controller, tactical air director*).

**fighter cover** Patrol of fighter aircraft over specified area or force for purpose of repelling hostile aircraft.

**fighter-direction aircraft** Equipped and manned for directing fighter operations.

**fighter escort** Force of fighters detailed to protect other aircraft from attack by enemy aircraft.

**fighter sweep** Offensive mission by fighter aircraft to seek out and destroy enemy aircraft or targets of opportunity in allotted area.

**Fighting Area** A nominated area including south-east England (1925–36). Became part of RAF Fighter Command.

**fighting harness** Seat harness [fighter and similar a/c 1920s].

**fighting kite** Used in sport [originally China] in which objective is to cut rival's control cords.

**fighting top** Cockpit box for gunner(s) on upper wing of large early bombers, accessed by ladder from fuselage.

**fighting wing** Combat formation which allows wingman to provide optimum coverage and maintain manoeuvrability during max-performance manoeuvres.

**FIGS, Figs** Formation integrated gateway subsystem. Integrates radars, com. and airport systems gateways with VME-bus and LAN connections.

**figure 8 fuselage** See *double-bubble*.

**Figure-9 loop** Self-explanatory, aircraft progressively reducing [vertical-plane] turn radius to describe a 9.

**Figure of 8** Self-explanatory manoeuvre in the horizontal plane, in many countries required for A-license.

**figure of merit** 1 Single numerical value describing quality of real system as percentage or decimal fraction of ideal or theoretical ideal.

2 In particular, helicopter ideal hover power divided by actual.

**FIH** Flight information handbook.

**FIJPAé** Fédération Internationale des Journalistes Professionnels de l'Aéronautique.

**FIKI** Flight into known icing.

**FIL** Fountain-induced lift.

**FILA, Fila** Fighting intruder[s] at low altitude.

**Filac** Federazione Italiana Lavoratori Aviazione Civile.

**filament winding** Manufacture of pressure vessel (eg rocket-motor case) by winding continuous high-strength filament on mandrel, bonded by adhesive.

**File** Feature identification and location element (OSTA).

**filed flightplan** That filed by pilot or his designated representative, without any subsequent changes.

**FILG** Filling.

**fill, filling** Threads in fabric which run perpendicular to selavage; weft.

**fillers** 1 Paste or liquid used for filling pores of wood prior to applying paint or varnish.

2 Pulse pairs generated by random noise in unsaturated DME beacon to maintain 2,700/s.

**fillet** 1 Aerodynamic fairing giving radius at junction of two surfaces, especially wing trailing edge and fuselage or hull.

2 Fill which traditional weld makes at intersection of two parts.

3 Increased area of pavement at junctions of taxiways and runways to facilitate high-speed turn-offs and other manoeuvres.

**filling** Increase in pressure in centre of low (meteorological); opposite of deepening.

**filling sleeve** See *inflation sleeve*.

**film chip** One incorporating thin or thick-film technology.

**film cooling** Cooling of body by maintaining thin fluid (liquid, vapour or gas) layer over surface.

**filmed** IIT coated with ion-barrier film to prevent feedback damaging delicate photocathode.

**film-return satellite** Reconnaissance satellite which [possibly in a constellation of sensors] includes a camera using physical film, returned to Earth.

**Filour** Flying innovative low-observable unmanned research.

**FILS, Fils** Fault-isolation and location system, integrates Bite with other systems.

**FILT** Federazione Italiana Lavoratori Trasporti [trade union; office, I-00161 Rome] (Italy).

**filter** 1 See *centrifuge* \*, *momentum separation* \*, *dynamic particle* \*.

2 Capacitance and/or inductance and resistance designed to pass given band of RF only. High-pass, low-pass, band-pass and band-stop \* pass frequencies respectively above, below, between and outside desired frequencies. Frequencies at which attenuation falls by more than 3 dB are termed cut-off frequencies.

3 To study air warning information and eliminate any not of interest.

**filter centre** Location in aircraft control and warning system at which information from observation posts is filtered (3) for further dissemination to air-defence control and direction centres (DoD).

**filter crystal**

**filter crystal** Quartz crystal resonator used to control filter characteristics.

**filter element** Cleansing medium in filter (1) with dry matrix or liquid (often oil) film.

**filtering** 1 Analysis of signal into harmonic components.

2 Separation of wanted component of time series from unwanted residue (noise).

3 Suppression or attenuation of unwanted frequencies.

4 Cleansing of fluid flow of solid particles.

5 Process of interpreting reported information on vehicle movements to determine probable true tracks and, where applicable, heights or depths.

**Filur** Flying innovative low-observable unmanned research.

**FIM** 1 Fault-isolation monitoring [or manual].

2 Field-ion microscope.

3 Full indicator movement.

**FIN** Functional identification [or item] number.

**fin** 1 Vertical or inclined fixed aerofoil, usually at rear or on wingtip to increase directional stability.

2 Projecting flat plate to increase surface available to reject unwanted heat.

3 Those parts of stabilizers of kite balloon providing stability in pitch.

4 Shallow sharp-edged ridge around fixed or [more often] rotating part of gas turbine core, which in successive stages almost eliminates air or gas loss. The outer radius may be sealed by oil or abradable material.

**FinAF** Finnish air force.

**"final"** Inbound to active runway, called verbally by pilot when 4 nm from visible threshold.

**final approach** 1 IFR, flightpath inbound, beginning at \*\* fix and extending to active runway or to point where missed-approach procedure is executed.

2 VFR, flightpath in direction of landing along extended runway centreline from base leg to runway; hence "on finals".

**final-approach altitude** Height at start of final approach.

**final-approach fix** That from or over which published final IFR approach is executed.

**final-approach gate** Position on extended runway centreline above which landing aircraft is required to pass at time assigned by approach control.

**final-approach point** Start of final-approach segment of non-precision approach.

**final-approach segment** Final approach (1).

**final assembly** Assembly of major structural and sub-units which form completed aircraft; erection.

**final-assembly drawing** Undimensioned drawing calling out all major installations on aircraft; complete index to particular model or sub-type (see *callout notes*).

**Final clearance** Unambiguous authorization to V-bomber crew to make attack with NW, also called PRM (RAF).

**final controller** Radar controller employed in transmission of PAR (previously GCA) talk-down instructions, and in passing monitoring information to pilots not using PAR.

**final mass** Mass of rocket after burnout or cutoff.

**final monitor aid** Program for management of parallel runways (FAA).

**final procedure turn** Links base leg to approach.

**finals** Final approach (colloq.).

**final trim** Exact adjustment of ballistic missile or space launcher to desired cutoff velocity.

**fin carrier** Frame laced to channel patches on aerostat to distribute loads from fin.

**Finder** Acronym, flight-inserted detection expendable for reconnaissance.

**fine adjustment** Cockpit lever operating needle valve controlling fuel flow to engine, normally operated in conjunction with the air lever [c1908–25].

**fine data channel** Channel of trajectory-measuring system delivering accurate but ambiguous data; coarse channel resolves ambiguity.

**fineness ratio** Ratio of length of streamlined body to maximum diameter, or some equivalent transverse dimension.

**fine pitch** Governed propeller-blade angle most suitable for take-off and low-speed flight, between ground fine and range of coarser cruising settings.

**fine-pitch stop** Sets limit of blade rotation into fine pitch.

**fin flash** Rectilinear marking on fin, usually comprising stripes in national colours.

**finger** See *fingers*.

**finger-bar controller** Pilot flight-control input in which fingers rotate cylinder forward or backward for pitch control and rock sideways for roll.

**finger four** See *finger tip*.

**finger lift** Finger-operated latch on front or rear of throttle lever to prevent inadvertent selection of afterburner or reverser.

**finger patch** Aerostat envelope patch having radial 'fingers' to distribute load into fabric.

**fingers** Long corridors projecting at about 90° from airport terminal to provide sufficient length for large number of gates.

**finger-tight** Assembled so that item can readily be part-dismantled or stripped; usual state of prototype engine stored after cancellation.

**finger tip** Formation in which four aircraft occupy positions suggested by fingertips of hand held horizontally, palm down.

**finger twizzle** Twirl by finger signifying 'start engines'.

**fin girder** Main vertical fin member in rigid airship.

**finish** 1 External coating or covering of aircraft or part.

2 General appraisal by eye or touch of external surface quality of aircraft or part, esp. of all-metal construction.

**finite-amplitude wave** Shockwave generated at front or rear of supersonic body of finite dimensions.

**finite-displacement stick** Pilot's control column which transmits movements (even if small) and not electrical signals generated by force transducers.

**finite-element analysis** Representation of the infinite complexity of stress in a structure by breaking it down into small triangular cells, which can be treated mathematically.

**finite wing** Wing having tips, thus all real wings other than annular.

**finlet** Dorsal fin.

**Finnegan** Exercises involving detachment of NW-armed bomber[s] to dispersal base (RAF 1959–70).

**Finrae** Ferranti inertial-navigation rapid-alignment equipment.

**FINS, Fins** Fixed-imagery navigation sensor (Lantirn).

**FIO** Fully integrated optimization.

**FIP** 1 Flight instruction program (AFROTC).

## FIPS

## first-limit indicator

- 2 False-image projection, test of operator alertness.  
3 Full intermediate power.  
4 Failure-injection panel.  
5 Flight Information Publication (UK).
- FIPS** Flight-information processing system.
- FIR, Fir** 1 Flight Information Region.  
2 Finite impulsive response.  
3 Flight-incident recorder.  
4 Full indicator reading.
- Firams, FIRAMS** Flight-incident recorder and monitor system.
- FIRC** Flight-instructor refresher clinic.
- Fire** Flammes infra-rouge embarquées, IR payloads (F).
- fire** 1 To ignite rocket engine; start of main-chamber burn.  
2 To launch rocket.
- fire access door** Hinged flap, usually spring-loaded, through which fire extinguisher can be aimed when a/c parked.
- fire-and-forget missile** One with IR seeker or other self-homing capability.
- fire axe** Carried to enable crew to escape after crash or belly landing while on fire, normal exits unavailable.
- fireball** 1 Luminous sphere formed a few millionths of a second after detonation of nuclear weapon.  
2 Meteor with luminosity which equals or exceeds that of brightest planets.
- fireblocker** Furnishing fabric meeting specific requirements as barrier to fire.
- fire channel** Single data highway for C<sup>3</sup>I, esp. of SAM system (eg Hawk has 2, Patriot has 10).
- fire classification** Class A, wood, paper etc; B, petrol (gasoline), oil, other fuels, except, C, butane, propane, hydrogen etc.
- fire-control radar** One providing target-information inputs to a weapon fire-control system.
- fire-control system** System including radar(s) mounted on land, sea or air platform to provide exact data on target position and velocity before engagement with guns, missiles or other weapons.
- fire deluge system** Remotely controlled pipes, hoses and spray outlets, situated throughout launch-pad area of large missile or space launching site, which operate if there is a fire or explosion in the area.
- fired out** Fighter which has launched all its AAMs.
- fire floor** Essentially horizontal floor or other sheet designed to be fireproof [at least for significant time].
- friegate** In effect, the tap that, usually under computer control, governs dispensation rate of retardant in fire-fighting tanker.
- firepoint** Locations in main floor of [especially pressurized] aircraft provided with visual access and light in order to inspect underfloor area and establish cause of fire warning.
- fire point** Temperature at which material will give off vapour that will burn continuously after ignition (see *flashpoint*).
- fireproof** Rules include 'at least as well as steel'.
- fire pulse** Signal for remote control of fire (1); for fire (2) ususally called launch pulse.
- fire resistant** Rules include 'at least as well as aluminium alloy'.
- Fires** 1 Firefighters' integrated response equipment system (USAF).  
2 Fixed IR and enhance[d] survivability.
- Firetex** Fire-blocking material, a viscose carbonised fabric reinforced with aramid fibres.
- fire tunnel** Test facility for engine bay or other device for investigating temperatures, airflows, insulation, fuel leaks and fire suppression, etc.
- fire unit** Basic subdivision of large SAM system (ie not infantry-operated), usually with four to 12 launchers at one location.
- fire up** To start engine, especially first test of new type previously subjected only to motoring tests without combustion.
- firewall** 1 Fire-resistant bulkhead designed to isolate engine from rest of aircraft.  
2 Internet or Aeronet security barrier.
- Firewire** Stainless-steel capillary tube containing insulator with electric wire running down the centre. If heated above a critical temperature a current flows, triggering warnings and release of extinguishant (Graviner).
- firing chamber** Test cell for static firing of small horizontally mounted rocket or missile.
- firing console** Human interface with rocket engine or vehicle launch.
- firing envelope** For any given airspeed and aerial target, the 3-D box of sky within which a fighter can launch a guided missile and achieve interception.
- firing order** Sequence in which piston engine cylinders fire, invariably 1-3-4-2 or 1-5-3-6-2-4.
- firing pass** Flight of combat aircraft towards air or ground target in which weapons are fired.
- firing pit** Encloses rocket test stand on all sides except nozzle.
- firing test** Static operation of rocket.
- firing time** 1 Time between application of d.c. voltage to vacuum tube or solid-state device and start of current flow.  
2 Time between RF power and RF output in radar.  
3 Burn time.
- Firms** Alternative to Firams.
- FIRMU** Flight-incident recorder memory unit.
- firmware** This usually means the fixed structure supporting a moving element, such as the mountings for a gimballed radar antenna.
- First** Flexible independent radar skills trainer.
- first-angle projection** Side and plan show nearest faces of front elevation (US).
- first-article verification** Self-explanatory, confirmation that the first production item [part of a system or functioning device] fully meets the specification.
- first buy** Lockheed term for firm order.
- first day** First day of theoretical war, with part-loaded aircraft making vertical liftoffs. Later, defences are worn down, and aircraft make STOs with full weapons load.
- first hop** Briefly airborne during high-speed taxi test prior to first flight.
- first law of thermodynamics** Statement of conservation of energy for thermodynamic systems (not necessarily in equilibrium); fundamental form requires that heat absorbed serves either to raise internal energy or do external work.
- first-limit indicator** Cockpit instrument giving an

## first-line life

unmissable unquantified readout of vital engine parameters.

**first-line life** 1 Operational life of hardware in first-line service.

2 Time between delivery of missile or RPV and its destruction or withdrawal. For planning purposes usually five years.

**first-line service** Active operation in original design role with combat or training unit, or revenue service with air carrier.

**first motion** First visible motion of vehicle at start of mission.

**first officer** Civil airline rank = second pilot or copilot.

**first pilot** See *PIC*.

**first-run attack** Made immediately on a surface target not seen previously.

**first stage** Lowest of two- or multi-stage launch vehicle, first to be fired.

**first-tier customer** Purchaser [or lessee] of new aircraft.

**first-tier supplier** One supplying direct to prime contractor.

**firtree root** Usual gas-turbine rotor-blade root of tapered form with broached serrated edges providing multiple load-bearing faces.

**FIS** 1 Flight Information Service[s] [A adds automated, B adds broadcast, E adds en-route, O adds Officer].

2 Federal Inspection Services.

3 Flight instructors' school.

4 Fighter Interceptor Squadron.

5 Flight-instrument system.

6 Flight inspection system

**FISA** 1 Fédération Internationale des Sociétés Aérophilatéliques [office, moves around Europe] (Int.).

2 Foreign Intelligence Surveillance Act (US).

**FIS-A** Flight information service, automated.

**FIS-B** Flight information service, broadcast.

**fiscal year** Financial year; for US, 1 October to 30 September; for Britain, 1 April to 31 March; for France and Germany, calendar year.

**FIS-E** Flight information service, en-route.

**fishbone antenna** Coplanar elements in colinear pairs, coupled to balanced transmission line.

**fish-head** Naval aircrew (RAF, WW2).

**Fishpond** Active bomber radar giving bearing/distance of hostile aircraft (RAF 1943).

**fishtailing** 1 Using coarse rudder to swing tail from one side to another in repeated S-turns, an alternative manoeuvre to sideslipping to steepen approach.

2 Many aircraft [the author remembers the Oxford] proceeded in a mild zig-zag, which could not be arrested.

**fishtail nozzle** Ends in triangular portion with narrow slit nozzle.

**FISO** Flight Information Service Officer.

**fissile** Fissionable by slow neutrons.

**fission** Splitting of heavy nucleus into two approximately equal parts (nuclei of lighter elements), accompanied by release of large amount of energy and generally one or more neutrons.

**fissionable** See *fissile*.

**fission yield** Amount of energy released by fission in thermonuclear explosion as distinct from that released by fusion. The fission yield ratio, frequently expressed in per cent, is ratio of yield derived from fission to total.

**Fist** 1 Fire support team.

## fixed point

2 Flight-instrument and subsystem tasks.

3 Future integrated supply, or support, supply team.

**Fista** Flying IR signature technology aircraft.

**FIT** Floating-input transistor.

**fit** 1 Desired clearance, if any, between mating surfaces; eg push \*, shrink \*, force \*.

2 Total complement of avionic equipment in aircraft.

**FITAP** Fédération Internationale des Transports Aériens Privés.

**fit check** Test to ensure compatibility of mating parts, such as missile on launcher.

**FITE** Fusion interfaces for tactical environment.

**FITO** Forward indium-tin oxide.

**FITS** 1 Flir internal targeting system.

2 Fully integrated tactical system.

**fitter** Skilled metalworking tradesman.

**fitting** Assembly of parts mating with specified fit (1).

**FITVC** Fluid-injection thrust-vector control.

**five by five** Radio reception loud and clear. First figure denotes volume and second intelligibility, so "five by three" means loud but not very clear.

**Five-Power Defence Agreement** UK/Australia/Malaysia/NZ/Singapore.

**FIW** Fan in wing [V/STOL].

**fix** 1 Aircraft position established by any independent means unrelated to a previous position.

2 In particular, aircraft position established by intersection of two position lines. See *absolute* \*, *outer* \*, *running* \*.

3 Solution, possibly temporary, to technical problem (colloq.).

**fixed aerial** Aerial [antenna] in form of wire fastened to aircraft at both ends.

**fixed-area nozzle** One whose cross-section cannot be adjusted.

**fixed-base operator** Business operation at American airport usually including flying school, charter flights, sales agency for particular light aircraft and accessories, fuel/oil, maintenance and overhaul facilities and, sometimes, third-level or commuter airline.

**fixed-base simulator** One in which cab does not move.

**fixed-displacement pump** Fluid pump handling uniform volume on each repetitive cycle.

**fixed distance marker** Located 300 m (1,000 ft) from threshold to provide marker for jet aircraft on other than precision instrument runway.

**fixed-geometry** 1 Aircraft that does not have variable-sweep wings.

2 Engine that does not have variable inlet or nozzle.

**fixed gun** Gun fixed in aircraft to fire in one direction, usually forwards.

**fixed-gun mode** One for close-range snapshooting in which sightline is boresighted to gun line.

**fixed landing gear** One not designated to retract.

**fixed light** Constant luminous intensity when observed from fixed point.

**fixed-loop aerial** Not rotating relative to aircraft.

**fixed munition** 1 One used against a fixed target.

2 Gun ammunition in which projectiles are held in propellant cases.

**fixed-pitch propeller** One that has no provision for changing pitch of blades, and hence efficient at only one flight speed.

**fixed point** 1 Positional notation in computer oper-

## **fixed-price contract**

ations in which corresponding places in different quantities are occupied by coefficients of same power of base (see *floating point*).

2 Notation in which base point is assumed to remain fixed with respect to one end of numeric expressions.

**fixed-price contract** One which either provides for firm price, or under appropriate circumstances may provide for adjustable price; several types, designed to facilitate proper pricing under varying circumstances (DoD).

**fixed-price incentive contract** Has provision for adjustment by formula based on relationship which final negotiated total cost bears to negotiated target cost as adjusted by approved changes (DoD).

**fixed satellite** See *geostationary*.

**fixed slat** Forward portion of aerofoil ahead of fixed slot built into structure.

**fixed station** Telecommunication station in aeronautical fixed service.

**fixed tank** External tank that is non-jettisonable.

**fixed target** One that does not move relative to local Earth's surface.

**fixed weight** Total mass of aerostat in flying order without fuel, oil, dischargeable weight or payload.

**fix end** End of holding pattern flown over fix (1) at which aircraft enters pattern.

**fixer network** Radio or radar direction-finding stations which, operating in conjunction, plot positions of aircraft; fixer system (obs.).

**fixture** Small jig for detail subassembly.

**fixturing** The process of loading a workpiece into a fixture, determining its precise position and orientation, and adjusting the machinery program to accommodate future variations.

**fizzer** To be on the \* = to be on a disciplinary charge (RAF, WW2).

**FJ** 1 Fuel jettison.

2 Fast jet; DIC adds directed IR countermeasures, MAWS missile-approach warning system, OEU Operational Evaluation Unit, PT pilot training, TS test squadron.

**F<sub>j</sub>** Jet-engine thrust.

**FJA** Forward jamming antenna.

**FJCA** Future joint carrier [or combat] aircraft (UK).

**F(j)** Fourier transform of a function of time.

**FJS** Fast-Jet Squadron (A&AEE).

**FJTF** Fast-Jet Training Fleet (RAF).

**FJTS** Fast Jet Test Squadron (ATEC).

**FLWOEU** Fast Jet Weapons Operation [not operational] Evaluation Unit (RAF Coningsby).

**FKR** Cosmonautics federation (R).

**FL** 1 Flight level, usually expressed in hundreds of feet; thus FL96 = 9,600 ft.

2 Foot-lambert[s] (see *luminance*).

3 Fan lift.

4 Flight line.

5 Flashing light.

6 Foot-launched

**F/L** Forced landing (RAF).

**FLA** 1 Future large aircraft [aeroplane].

2 Foot-launched aircraft.

**flade** Fan blade.

**Flag, FLAG** 1 Floor level above ground.

2 Flemish Aerospace Group (Belg.).

3 Four-mode laser gyro, see *Flagship*.

## **flame stabilizer**

**flag** Small brightly coloured plate, often Day-Glo red or orange, or diagonally striped yellow/black, which flicks into view in panel instrument, spacesuit instrument or any other subsystem or device, to give visual warning of fault or impending difficulty such as loss of electric power or low fuel or signal level.

**flag carrier** 1 Airline designated as part of bilateral agreement to fly international route(s).

2 National state airline.

**Flage, FLAG** Flexible lightweight agile guided experiment (anti-missile).

**flagman** 1 Person carrying chequered flag (formerly) employed at US airports, and still seen in Russia and other CIS, to direct arrivals to signalman or airport marshaller for parking.

2 Person carrying bright flag on tall mast to guide aviation pilot towards end of each run.

**flag operator** *Flag carrier*.

**flagship** 1 Normal meaning can apply to airline service or individual aircraft, or [American, 1930–59] whole fleet.

2 Four-mode laser gyro software/hardware implemented partitioning, comprising Adiru, ADM, CDU, GNSSU and MSU.

**flag stop** Special unscheduled stop by scheduled airlift mission aircraft to load or unload traffic (USAF).

**flag tracking** Method of tracking helicopter rotor by holding fabric flag against blade tips coated with wet paint.

**flak** AAA fire.

**flak curtain** Self-explanatory protection of occupant[s] or vital equipment, usually multi-ply nylon fabric.

**flakship** Small German warship tasked with defending other vessels against air attack (WW2).

**flak-suppression fire** Air-to-ground fire used to suppress AA defences immediately before and during air attack on surface targets (DoD). This definition should be amended to allow use of ASMs, cluster bombs etc.

**FLAM** Future land-attack missile.

**flame attenuation** Attenuation of radio signal by ionisation in rocket exhaust.

**flame bucket** See *flame deflector*.

**flame chute** Concrete and metal duct carrying flame and gas from bottom of silo or test pit to surface.

**flame damper** 1 Pre-radar shroud or extension to piston engine exhaust pipe to prevent visual detection at night.

2 See *flame trap*.

**flame deflector** Deflects hot gas of vertical-launch rocket engine from ground or from launching structure.

**flame float** Pyrotechnic marker that burns on water surface. Principal purpose is to facilitate measurement of drift at night.

**flame front** Boundary of burning zone progressing through combustible mixture. For kerosene, the flow velocity must not exceed c10m (33ft)s<sup>-1</sup>.

**flame hardening** Hardening metal surface by flame.

**flameholder** Body mounted in high-velocity combustible flow to create local region of turbulence and low velocity in which flame is stabilized.

**flameout** Cessation of combustion in gas turbine or other air-breather from cause other than fuel shutdown.

**flamer** Aircraft on fire in air, especially in air combat.

**flame-resistant** Not able to propagate flame after ignition source is removed.

**flame stabilizer** Flameholder.

## flamestat

**flamestat** Sensor detecting abnormal high temperature in a [e.g. air conditioning] duct.

**flame trap** Filter in piston engine induction system to prevent passage of flame upstream after blow-back or backfire.

**flame tube** 1 Perforated tube designed for mixing of fuel and air, in which fuel is burnt in gas turbine; usually inserted as inner liner in combustion chamber for diluting and cooling flame (UK).

2 Interconnector between combustors or between afterburner gutters (US).

**Flan** Flying/floating local-area network.

**flanging machine** Metal-forming machine with high-speed plunger which bends up successive small portions of flange on moving workpiece.

**flank** 1 Lower side of fuselage or other aerodynamic body.

2 Sides of lower (inner radius) end of compressor or turbine blade.

**FLAP** Frankfurt, London, Amsterdam, Paris.

**flap** 1 Movable surface forming part of leading or trailing edge of aerofoil, esp. of wing, able to hinge downwards, swing down and forwards, translate aft on tracks or in some other way alter wing camber, cross-section and area in order to exert powerful effect on low-speed lift and drag. See following types: *double-slotted, dive-recovery, Fowler, Gouge, Junkers, Krüger, leading edge, manoeuvre, plain, slotted, split, triple-slotted, Youngman and Zapp*.

2 Side walls of thrust-augmenting ejector in powered-lift system, in fighters part of a retractable structure.

3 Hinged segment forming part of primary or secondary nozzle of afterburner.

4 Urgent activity (UK colloq.).

**flap angle** Angle between chord of flap and that of wing.  
**flap blowing** Discharge of HP compressor bleed air over lowered flaps to prevent airflow breakaway. Normally air issues at about sonic speed through slit facing across flap upper surface, flow attaching to flap through Coanda effect. Also called Attinello flap (see *BLC, super-circulation*).

**flaperon** Surface combining roll-control function of aileron with increased lift and drag function of flap; can be differentially operated.

**flap fan** Experimental concept in which flaps carry small fans driven by engine bleed air (perhaps eight fans on each flap) to maintain attachment and provide powered lift.

**flaplet** 1 Loosely, any small flap.

2 Narrow-chord flap with circular-arc LE and flat top/bottom forming TE of Coanda CCW.

**flappery** Flaps, especially if prominent on Stol aircraft (colloq.).

**flapping** Angular oscillation of helicopter rotor blade about flapping hinge.

**flapping angle** Angle between tip-path plane and plane normal to axis.

**flapping hinge** Sensibly horizontal pivot on helicopter main-rotor hub which allows blade tip to rise and fall.

**flapping plane** Plane normal to plane of each flapping hinge axis.

**flap-retraction-height** Variable but always over 1,000 ft (305 m) with aircraft at or above FUSS.

**Flaps** 1 Force-level automated planning experiment (AAFCE).

2 Flat-aperture parabolic surface (antenna or mirror).

## flashing light

**flap setting** Predetermined angle of flap (1) for takeoff, landing or other flight condition.

**flaps-extended speed** The highest speed permissible with flaps in a prescribed extended position.

**flaps-up safety speed** Minimum TAS at which aircraft maintains positive ROC with flaps retracted.

**flap-type control** The common type of flight control surface.

**FLAR** Federatsii Lyubitelei Aviatsii Rossii, Federation of aviation amateurs (R).

**Flair** Fixed low-altitude intermediate-range, surveillance radar.

**flare** 1 Noun and verb, final nose-up pitch of landing aeroplane to reduce rate of descent close to zero at touchdown. It starts at the point of departure from the glideslope.

2 Distance sides of planing bottom of marine float or hull flare out from centreline.

3 Pyrotechnic aerial device for signalling or illumination; parachute \* illuminates large area when released at altitude; wingtip \* illuminates ground when landing.

4 Inverse taper (ie opening out) at tail of cylindrical body, as at base of rocket vehicle.

5 Eruptions from Sun's chromosphere, which may appear within minutes and fade within an hour; eject high-energy protons, cause radio fadeouts and magnetic disturbances on Earth.

6 Fixed source of ground or water illumination, of several types, usually burning kerosene or related fuel (generally obs.).

**flare-augmentation system** Electronic feedback on fixed-wing STOL to achieve minimum landing field length.

**flare demand** Coded Autoland signal commanding flare (1).

**flare dud** Nuclear weapon which detonates with anticipated yield but at altitude appreciably greater than intended; a dud in its effects on target (DoD).

**flare out** See *flare* (1).

**flare path** 1 Line of flares (6) or lights down one side or both sides of runway to provide illumination (generally obs.).

2 In the modern world this means the trajectory described in a landing *flare* 1.

**flare-path dinghy** Attends flare path laid over water for marine aircraft.

**Flash** 1 Folding lightweight acoustic sonar [or system] for helicopter.

2 Flying laser self-defence system against seeker-head missiles.

**flash** 1 Basically rectangular pattern of vertical bars in national colours painted on military aircraft, usually covering portion of fin.

2 White semicircular or circular badge worn in headgear of aircrew cadet.

**flashback** Sudden upstream travel of flame in flow of combustible mixture in enclosed system.

**flash/bang/smoke** Signifies training target disabled.

**flash burn** Caused by radiation from nuclear explosion.

**flasher unit** Regular make/break switch in circuit of light which flashes rather than rotates.

**flashing light** Intermittent aeronautical surface light in which light periods are clearly shorter than dark, with repeated cycle. Usually has published frequency.

## flashing off

**flashing off** Drying of surface of film or finish until safe to gentle touch.

**flash lobe** Sudden peak in radar signal caused by radome [also one word].

**flashover** 1 Phenomenon in which material exposed to intense radiation suddenly ignites over its entire surface.

2 Sudden discharge between conductors with very large potential difference.

**flashpoint** Temperature at which vapour of substance, such as fuel, will flash or ignite momentarily. Lower than fire point.

**flash suppressor** Attachment to muzzle of gun which reduces or eliminates visible light emitted.

**flash welding** Electric welding by partial resistance welding under low pressure, heating by electric arc, and application of large compressive pressure forcing surplus weld out of joint.

**FLAT** Flight-plan aid tracking.

**flat** With horizontally opposed cylinders.

**flatbed** Transport aircraft (so far only conceptual) for conveying ISO containers on flatbed fuselage.

**flat diameter** Diameter of circle enclosing canopy of flat parachute when spread out on plane surface.

**flat-Earth navigation** If the vehicle speed and distance travelled are small it is possible to ignore Coriolis and centripetal effects.

**flat four** Four-cylinder, horizontally opposed piston engine.

**flat-H** Piston engine with two superimposed rows of opposed cylinders.

**flathatting** Flying at lowest possible safe height (US colloq.).

**flat-head rivet** Thin-headed rivet used internally or where round or countersunk heads are for any reason not advisable.

**flat pad** Ship-mounted ballistic-missile launcher isolated from ship motion (colloq.).

**flat-panel instrument** With LCD display.

**flat parachute** Parachute whose canopy consists of triangular gores forming regular polygon when laid out flat.

**flat pitch** Ground fine pitch.

**flat-rated** 1 Engine throttled or otherwise restricted in output at low altitudes and thus able to give constant predictable power at all FLs up to given limit, shown as kink point on plot of power: altitude.

2 Engine restricted in output in cold ambient conditions and thus able to give constant predictable power in all air temperatures up to given published limit; eg \* to 28.9°C.

3 Usually \* combines (1) and (2). Hence, flat rating.

**flat riser** VTOL aircraft able to take off with fuselage substantially horizontal (term not normally applied to helicopters and other rotorcraft).

**Flats** Flight-line automatic test set (Varo).

**flat sequence** Display aerobatic routine imposed by low cloudbase.

**flat six** Six-cylinder, horizontally opposed piston engine.

**flat spin** Spin at large mean angle of attack but with longitudinal axis of the aircraft nearly horizontal; recovery difficult and prolonged because, with aircraft fully stalled, ailerons, elevators and rudder are ineffective; nose-up position and rotation carries slipstream away

## flexible air-data system

from tail. Anti-spin parachute can assist positive recovery.

**flat template** Representation on two-dimensional material of dimensions, areas and other characteristics of curved part; also known as layout template.

**flattened-X** Delta-3.

**flattening out** 1 "In alighting, the transition between the approach glide and the horizontal motion before making contact with the earth" (BSI).

2 Many authorities add recovery from a dive to level flight.

**flat-top** Aircraft carrier (colloq.).

**flat zone** Zone within indicated course sector or ILS glidepath sector in which slope of sector characteristic curve is zero.

**FLAVIR** Flapless air vehicle integrated industry research (UK).

**FLB** Association of airline operators (Austria).

**FLC** 1 Fuel and limitation(s) computer.

2 Flight-level change.

**FLCH** 1 Flechette(s), for piercing armour.

2 Change in flight level.

**FLD** Fault location device (wiring).

**fld** Field.

**FLE** Future logistics enterprise.

**FLEEP** Flying lunar-excursion experimental platform. One-man rocket-powered platform intended to enable astronaut to make quick hops on lunar surface.

**fleet** All aircraft of one type used by same operator. Hence \* age, \* youth, average flight time of fleet.

**fleet ballistic missile submarine** Submarine designed to launch ballistic missiles.

**fleet carrier** CV, large surface vessel equipped to launch, recover and maintain powerful fixed-wing aircraft in any theatre.

**fleet leader** Aircraft in [usually airline] fleet having greatest flight time.

**fleet noise level** Average noise level throughout fleet.

**fleet performance monitoring** Confidential use of quick-access recorders to inspect actual way pilots fly [airline] aircraft, and in particular whether airspeeds, rates of descent, etc, are within limits.

**Flem** Fly-by landing excursion mode.

**Flettner** Aileron tab.

**Flettner control** See *servo tab*.

**Flettner rotor** Cylinder spinning on axis normal to airstream, generating transverse thrust/lift. In theory could provide both lift and thrust, but no successful \* aircraft has been flown.

**FLEX** Flexible takeoff.

**Flexadyne** Proprietary (Rocketdyne) formulation of solid propellant.

**Flexar** Flexible adaptive radar.

**flexbeam** Torsionally compliant spar, typically of CFRP laminates, attaching helicopter rotor blade to hub and flexing to accommodate varying blade pitch and coning angles.

**flexibility** Ability of hardware, including aircraft, to operate efficiently over wide range of conditions; eg long or short sectors, high or low level.

**flexibility factor** Used in helicopter rotor stress calculations to make up for structure's flexibility.

**flexible air-data system** Versatile microprocessor-based

## FLID

## flight coupon

DADC outputting MIL-1553B, Arinc 429, analog and IFF transponder.

**flexible blade** 1 Helicopter rotor blade with trailing-edge or balance tabs.

2 Helicopter rotor blade in which pivots are replaced by flexible structure.

**flexible elastomer skin** Reduces RCS by hiding joints and discontinuities.

**flexible flight deck** Post-WW2 concept of aircraft carrier whose aircraft would need no landing gear.

**flexible gun** Clearly a nonsensical idea: what is meant is pivoted, ball-mounted or in any other way manually aimed independently of the aircraft.

**flexible takeoff, FTO** Takeoff technique in which for TOW below MTOW, less than maximum engine thrust is selected. For given WAT condition, this thrust is computed by intersection of TOW and aircraft performance to comply with regulations, giving a theoretical “ambient temperature” Tf. Thrust selected is that which would be available at full power at Tf. FTO saves engine costs, reduces noise and extends engine life.

**flexible tank** Bag-type tank.

**flexible [flex] targeting** Mission is launched by local commander with choice of targets and weapons to attack suddenly seen target.

**flexible wall** Used in wind tunnels, engine air inlets and other ducts subject to large range of flow and Mach number; may be perforated to extract boundary layer.

**Flex-tracks** The first step towards complete user-preferred routing, available [2006] on a trial basis over routes from Australia to Asia, and the US Pacific coast.

**flexural axis** Locus of flexural centres, points at which applied load produces pure bending without twist (note, on swept wing pure bending results in apparent twist, ie loss of incidence).

**flexural wash-out** Apparent reduction in angle of incidence from root to tip as swept wing deflects upward under load.

**flexure** Bending under load.

**flex-wing** Foldable or collapsible single-surface wing for micro or hang glider.

**FLG** 1 Flashing light.

2 Falling (also Flg).

**FLI** 1 Fighter lead-in.

2 First-limit indicator.

**flicker** Subjective sensation resulting from periodic fluctuation in intensity of light at rates less than about 25/30 times a second, preventing complete continuity of images.

**flicker control** See *bang-bang control*.

**flicker marking** Various black-white schemes to render rotating propeller blades more visible on ground.

**flicker rate** Refresh rate for CRT information below which flicker becomes noticeable; dependent on eye's persistence of vision and persistence of CRT phosphor.

**flicker vertigo** Caused by light occulting (flickering) at frequencies from four to 20 per second (eg with single-propeller aircraft headed towards Sun at low rpm), producing nausea, dizziness or unconsciousness.

**flick roll** 1 Essentially a horizontal spin, made by slowing to spin-entry speed with engine throttled back and then applying hard back stick and full rudder. Result should be a controlled very rapid 360° roll.

2 “A rapidly executed roll” (B.S., 1940).

**FLID** Flight identification.

**Flidras** Flight-data relay and analysis system.

**flight** 1 Movement of object through atmosphere or space sustained by aerodynamic, aerostatic or reaction forces, or by orbital speed.

2 An instance of such movement.

3 Specified group of aircraft engaged in common mission.

4 Basic tactical unit of three or four aircraft.

5 Flight sergeant (colloq., abb.).

6 Radio call sign, Flight Directory (NASA).

7 Particular scheduled air-carrier service, with three or four-figure identifying numbers, either routinely or on particular day.

8 Fighting formation comprising two elements each of two aircraft (US, 1981 onwards).

**flight advisory** Message giving advice or information broadcast to airborne aircraft or interested ground stations.

**flight assist** Provision of maximum assistance to aircraft lost or in distress by flight-service stations, towers and centres (US).

**flight attitude** 1 Defined by inclination of three vehicle axes to relative wind.

2 Defined relative to Earth, ie local vertical.

**flight augmentation computer** Main AFCS component providing yaw damping, pitch trim and flight-envelope monitoring and protection.

**flight bag** 1 For personal equipment of flight crew member.

2 Hang-glider body bag.

**flightboard** Rigid sheet, at least A4 size with reinforced corners, on which can be displayed flight information, quick-erase writing panel and many other items.

**flight cap** Legally imposed arbitrary limit on number of flights (arrivals or departures) at airport, either throughout year or between particular [night] hours.

**flight case** Superseding pilot case to describe large [soft or rigid] briefcase.

**flight characteristic** Feature of handling, feel or performance exhibited by aircraft type or individual example.

**flight check** Callsign prefix for navaid or other calibration/inspection (FAA).

**flight compartment** See *flight deck* (1).

**flight computer** Computer (2).

**flight control** Specifically, control of trajectory.

**flight-control data concentrator** Transmits info, such as control-surface position, to FDIU and displays, indicates failure status to FWCs and displays, and memorizes failures for central maintenance computer.

**flight-control primary computer** In charge of generating control laws and controlling surfaces.

**flight controls** Those governing trajectory of aircraft in flight.

**flight-control secondary computer** Controls flight-control power system, spoilers and rudder trim and limits; if FCPC fails, also takes over Elac and yaw damper.

**flight control system** See *control system*.

**flight control unit** Primary flight-deck interface with AFCS providing autopilot modes, SPD/MACH, HDG SEL, ALT SEL and similar functions; some include autothrust.

**flight coupon** Actual ticket or ticket book issued by air carrier to passenger.

## flight crew

**flight crew** Personnel assigned to operate aircraft.

**flight cycle** Sequence of operations and conditions, different for airframe, propulsion and each system or equipment item, which together make up one flight.

**flight data recorder** See *flight recorder*.

**flight deck** 1 Compartment in large aircraft occupied by flight crew.  
2 Upper deck of aircraft carrier.

**flight department** Part of large company responsible for providing air travel [executive aircraft or airline] whenever needed.

**flight despatcher** See *despatcher*.

**flight director** 1 Flight instrument generally similar to attitude director giving information on pitch, roll and related parameters.  
2 Panel controller for autopilot.  
3 Most senior member of large wide-body cabin crew.

**flight-director attitude indicator** Manned-spacecraft display indicating attitude, attitude error and rate of pitch, yaw and roll.

**flight duty period** See *crew duty time*.

**flight dynamics** General subject of motion of aerodyne and laws which govern it.

**flight effects** Changes in relationships as an aircraft accelerates from rest to cruising speed, notably velocity shear at jet boundary.

**flight engineer** Aircrew member responsible for powerplant, systems and fuel management, and also sometimes for supervising turnaround servicing. Today rare except R and military.

**flight envelope** 1 See *gust envelope*.  
2 Curves of speed plotted against altitude or other variable defining performance limits and conditions within which equipment must work. Commonly assessed at three levels: operational \*, for normal flying; service \*, defined by service ceiling, normal limiting IAS etc.; and permissible \*, including limiting manoeuvres.

**flight envelope monitoring** AFCS function providing computation of  $V_{MIN}$ ,  $V_{MAX}$  and angle-of-attack limits.

**flight-envelope protection** System in FBW [Airbus] aircraft which cannot normally be over-ridden by [eg hijacker] pilot which automatically commands climb or turn to avoid hitting an obstacle.

**flight fine pitch** Finest propeller blade angle available in flight. Weight on wheels may remove \* stop, enabling drag to be increased.

**flight flutter kit** Installation, together with instrumentation, of 'bonkers' or other devices to induce flutter in flight-test aircraft.

**flight-following** Maintaining contact with specified aircraft to determine en route progress.

**flight idle** Lowest engine speed available in flight, set by \*\* stop, mechanical limit released to ground-idle position at touchdown.

**flight indicator** Instrument combining lateral inclinometer, fore-and-aft inclinometer and turn indicator (obs.).

**flight indicator board** Display in airport terminal showing arrivals and departures of airline flights.

**flight information centre** Unit established to provide flight information service and alerting service.

**flight information region, FIR** Airspace of defined dimensions within which flight information and alerting services are provided by air traffic control centre.

## flighthpath deviation

**flight information service** Service giving advice and information useful for safe and efficient conduct of flights. In good weather provides listening watch only.

**flight inspection** 1 By specially equipped aircraft, of accuracy of navaids.  
2 Periodic examination of flight crew and ATC controllers.

**flight instruments** Those used by pilot(s) to fly aircraft, esp. those providing basic information on flight attitude, speed and trajectory.

**flight integrity** Close relationship between two friendly combat aircraft manoeuvring for mutual support.

**flight jacket** Half-length zipped jacket of nylon with polyester filling, usually dark blue or olive/sage green. A traditional type is goatskin or fleece-lined sheepskin.

**flight level, FL** Level of surface of constant atmospheric pressure related to datum of 1013.25 mb (29.92 in mercury), expressed in hundreds of feet; thus FL 255 indicates 25,500 ft (see *QFE*, *QNH*).

**flight-line** 1 Ramp area of airfield, where aircraft are parked and serviced.  
2 In reconnaissance mission, prescribed ground path across targets.

**flight Mach number** Free-stream Mach number measured in flight.

**flight management system** Automatic computer-controlled system with autothrottle, possible Mach-hold, and complete control of navigation, including SIDs and STARs. Offers "menus" for minimum cost, minimum fuel burn or other objectives. Relieves workload, increases precision. Hence FMST, \* trainer, synthesizes all these functions.

**flight manual** Book prepared by aircraft manufacturer and carried on board, setting out recommended operating techniques, speeds, power settings, etc, necessary for flying particular type of aircraft. Known to airlines as operations manual.

**flight mechanic** Pre-1935 title of flight engineer.

**flight mechanics** One of the two components of flight dynamics, whose role is to establish the right balance between stability, manoeuvrability and control power.

**flight number** See *flight (7)*.

**flight office** On a GA airfield, centre for booking pleasure flights and carrying out domestic business, but not concerned with ATC or visiting pilots.

**flight panel** Accepted definition: panel grouping all instruments necessary for continued flight without external references. Preferable: panel grouping available flight instruments.

**flighthpath** Trajectory of centre of gravity of vehicle referred to Earth or other fixed reference. In following five definitions H signifies \* in horizontal plane and V in vertical plane.

**flighthpath angle** Acute angle between flighthpath (V) and local horizontal, shown on FPA display by resolving G/S and V/S.

**flighthpath computer** See *course-line computer (H)*.

**flight-path controller** Digital system for Coast Guard (UK) helicopters comprising Doppler, 'radalt', attitude gyro and accelerometers to control low-altitude hover in absence of visual reference. Modes include autotransition, up/down, ability to overfly target.

**flighthpath deviation** Angular or linear difference between track and course of an aircraft (H).

## flightpath recorder

**flightpath recorder** Instrument for recording angle of flightpath (V) to horizontal.

**flightpath sight** In HUD, direct aiming point showing distant point through which aircraft will pass (V, H).

**flightpath vector** Prediction of future flightpath which replaces traditional flight director in advanced EFIS, especially to protect against windshear.

**flight plan** 1 Specified information relating to whole or portion of intended flight (2); filed orally or in writing with air traffic control facility.

2 Common working document, both in spacecraft and at all ground stations during manned or unmanned space flight. Separate \*\* issued for lunar or planetary surface operations.

**flight-plan correlation** Means of identifying aircraft by association with known flight plans.

**flight platform** See *helipad*.

**flight profile** Plot of complete flight (2) in vertical plane, usually altitude plotted against track distance.

**flight process board** In ATC centre, displays all current FP strips.

**flight-progress strip** ATC aide-memoire: paper strip typically 25 mm × 200 mm, coloured for traffic direction, giving one flight's c/s, FL, ETA as amended; slid into FP board until passed to colleague at handover.

**flight-proximity demonstration** Flight in which a receiver aircraft formates behind a tanker even though neither may be equipped [yet] to supply or receive fuel.

**flight rating test** One in which member of flight crew demonstrates ability to comply with requirements of particular licence or rating.

**flight-readiness firing** Short-duration test of in-service space launcher, or other rocket vehicle, on launcher.

**flight recorder** Device for automatically recording information on aircraft operation. Main type is flight data recorder (FDR), also colloquially called crash recorder or 'black box', although invariably bright orange. Records 50 or more parameters, including following mandatory channels: altitude, airspeed, vertical acceleration, heading, elapsed time at 1s intervals (UK also requires pitch, and usually control-surface positions, high-lift surface positions, engine speeds and flight-crew speech are also included). Such recorders are designed to survive crash accelerations, impacts, crushing and fire, and often carry underwater transponders or beacons. Normally recording medium, eg multi-track steel tape, is recycled every 25 h. Cockpit voice recorder (CVR) stores all speech on flight deck or cockpit, including intercom and radio. Maintenance recorders, eg AIDS, are linked by serial data highways to hundreds of transducers and other inputs recording many kinds of information (temperatures, vibrations, pressures and electronic parameters) to yield advance information of impending fault conditions or failures and improve system operation and economy. Highways lead to various logic and acquisition units, some for quick-look and others long-term; separate highway to protected FDR often provided.

**flight reference card** Carried in cockpit to provide quick detailed list of vital actions in event of all system failures or emergencies commonly encountered, with recommendations, suggestions and prohibitions.

**flight regime** State of being airborne, governing many systems and modes unavailable on ground.

## flight time

**flight release certificate** Issued for aircraft with Permit to Fly (UK CAA).

**flights** Always plural, the offices [usually on the air side of hangars] and nearby aircraft parking areas of operational units on a permanent RAF station (becoming archaic usage).

**flight-safety information management system** Proposed unclassified database of accidents, incidents and malfunctions reported by participating air forces to improve safety of military aircraft.

**flight schedule monitor** Shared by FAA and user community, is the decision-making tool that forms basis of current flight information and air-traffic demand at each airport.

**flight service station** Facility providing flight assistance service (FAA).

**flight shed** Traditional British term for hangar in which prototypes are completed and readied for flight and subsequently are kept. Not normally associated with series production.

**flight simulator** Electronic device that can simulate entire flight characteristics of particular type of aircraft, with faithful reproduction of flight deck; used to test and check out flight crews, esp. in coping with emergencies, and (military) in completing combat missions according to role; or as design and engineering tool during aircraft development.

**flight sister** Female nursing officer trained for aeromedical duties.

**flight space** Space above and beyond Earth available for atmospheric or space flight.

**Flight Standards District Office** Handles all matters within assigned geographic area (FAA).

**flight station** 1 Flight crew position away from flight deck.

2 Base for marine aircraft (WW1).

**flight status** Indication of whether a given aircraft requires special handling by air traffic services.

**flightstick** The inceptor of an entertainment or educational simulator; not normally in an aircraft.

**flight strip** 1 Auxiliary airfield on private property, farmland or adjacent to highway.

2 See *flight progress strip*.

**flight structural mode excitation** Allows pilot to command deterministic signals, such as swept-frequency sine waves, from FCC to excite all aircraft's flexural modes.

**flight suit** One-piece overall garment with various pockets, zips and velcros.

**flight supplement** Added to price of airline ticket to cover such factors as additional fuel burn and airport time-slot charges.

**flight surgeon** Physician (invariably not surgeon) trained in aeromedical practice whose primary duty is medical examination and care of aircrew on ground.

**flight test** 1 Test of vehicle by actual flight to achieve specific objectives.

2 Test of component mounted on or in carrier vehicle to subject it to conditions of flight.

3 Flight rating test.

**flight test vehicle** Special aircraft, missile or other vehicle for conduct of flight tests to explore either its own capabilities or those of equipment or component parts.

**flight time** 1 Elapsed time from moment aircraft first

## flight-training device

moves under its own power until moment it comes to rest at end of flight. For flying boats and seaplanes, buoy-to-buoy time (see *block time*).

2 For gliders and sailplanes, time from start of takeoff until end of landing.

3 For vehicles released in flight from parent carrier, measured from moment of release.

4 Aggregate of \*\* of all flights made by same basic structure or other hardware item.

**flight-training device** Invariably, this is synonymous with flight simulator.

**flight vector** Direction of travel; except in still air, not the same as azimuth of longitudinal axis. Essentially = track.

**flight visibility** Average forward horizontal distance from cockpit (assumed at typical light-aircraft FL) at which prominent unlighted object may be seen and identified by day and prominent lighted object may be identified by night.

**flightway** The airspace immediately beyond the end of a runway or other takeoff path; this concept has fallen into disuse.

**flight weight** Similar to production item; not a battleship test construction.

**flightworthy** Ready for flight; for aircraft, airworthy.

**Flight Zero** Brief unplanned flight, caused by sudden event during fast taxi or other testing prior to Flight 1.

**flimsy orders** Printed on onion-skin paper, can be eaten.

**flinger ring** Uses centrifugal force to inject W/M [in some Turbomeca engines, fuel] from entry to engine compressor.

**FLIP, Flip** 1 Flight information publication.

2 Floated lightweight inertial platform.

**flip-flop** 1 Bistable multivibrator; device having two stable states and two input signals each corresponding with one state; remains in either state until caused to flip or flop to other.

2 Bistable device with input which allows it to act as single-stage binary counter.

**flipper** 1 Elevator (US colloq.).

2 Before turning on final, flaps, pitch, power [some add roll].

**FLIR, Flir** Forward-looking IR.

**FLIS** Federal Logistics Information Systems (US).

**Flit** Fighter lead-in training (USAF, Holloman).

**FLL** 1 Flight line (two words) level (UK/NATO).

2 Fördergesellschaft für Luftschiffbau und Luftschiffahrt eV (G).

**FLM** 1 Flightline maintenance, or mechanic (US).

2 Foot-launched microlight.

3 Focused-lethality munition.

**FLMTS** Flight line maintenance test set (Kollsman).

**FLO** 1 Flow control [of traffic]; -E adds East, -W West (ICAO).

2 Defence logistics organization (Norway); /Luft adds Air.

**Flo** Floodlights available on landing.

**f.lo** Local-oscillator frequency.

**float** 1 Horizontal distance travelled between flare and landing or alighting (see *ground effect*).

2 Watertight body with planing bottom forming alighting gear of \* seaplane. Also wingtip \*.

3 Ability of control surfaces to trail freely in airstream except when commanded by input; reckoned negative when surface deflected away from relative wind and posi-

## floor locks

tive when (because of overbalance ahead of hinge axis) surface moves against it.

4 Buoyant capsule in carburettor [carbureter].

**floatation** See *flotation*.

**float displacement** Mass of water displaced by totally submerged seaplane float.

**floated gyro** Floating gyro.

**floated position** That assumed by flight-control surface [esp. manual] in absence of pilot input.

**float gear** Floats (2) applied as modification to landplane.

**floating ailerons** Designed to float (3).

**floating gudgeon pin** Free to rotate in both piston and connecting rod.

**floating gyro** Mass supported by hydrostatic force of surrounding liquid.

**floating lines** In photogrammetry, lines connecting same two points of detail on each print of stereo pair; used to determine whether or not points are intervisible, and drawn directly on prints or superimposed by transparent strips.

**floating mark** Mark or dot seen as occupying position in three-dimensional space formed by stereoscopic pair, used as reference in stereoscopy.

**floating point** EDP (1) positional notation in which corresponding places in different quantities are not necessarily occupied by coefficients of same power; eg 186,000 can be represented as  $1.86 \times 10^5$ . By shifting \*\* so number of significant digits does not exceed machine capacity, widely varying quantities can be handled.

**floating reticle** One whose image can be moved within FOV.

**float light** See *flare* (3).

**floatplane** See *float seaplane*.

**float seaplane** Aeroplane supported on water by separate floats (2), usually 2 or 3.

**float-type carburettor** Head of fuel supplied to jet is controlled by float (4) and needle valve.

**float valve** Fluid valve regulated by float acting on level in container.

**float volume** Ratio of seaplane gross weight to mass of unit volume (traditionally 1 ft<sup>3</sup>) of water.

**FOLLS** Fresnel-lens optical landing system.

**flood** To overfill float chamber of carburettor, hence flooded.

**flooder control** Simple inceptor, usually a pull-wire, with which piston-engine float chamber can be flooded manually to provide rich mixture for starting.

**flood flow** 1 Unrestricted supply of hot high-pressure air to cockpit either for demist/deicing, or in emergency, or by auto switch triggered by excessive cabin altitude.

2 Has similar (various) meanings in oxygen systems.

**floodlight** Light providing general illumination over particular area.

**flood valve** Controls flow of fire extinguishant.

**floor** Notionally, the hangar \*; thus, place of work, esp. for A&P.

**floor-loaded** Aircraft is in factory for refurbishment or rework.

**floor loading** 1 Actual number of aircraft being modified.

2 Maximum [or actual] number of passengers.

**floor locks** Rows of attachments which interface with seating or VLDs.

## floor vents

**floor vents** Pass used cabin air to pressurized or non-pressurized lower fuselage.

**flops** Floating-point operations per second, hence M-\*<sup>\*</sup>, Giga-\*.

**FLOT, Flot** Forward line of own troops (formerly called Feba, forward edge of battle area).

**flotation** Quality of a wheel landing gear of operating from soft ground.

**flotation bags, collars** Inflatables used to provide buoyancy and stability for sea-recovered spacecraft.

**flotation gear** 1 Inflatable bags carried inside RPV, target or missile test vehicle to provide buoyancy after ditching.

2 Emergency inflatable bags surrounding landing gear of shipboard helicopter [or, historically, carried on, or in, carrier-based landplane].

**Flo Trak** Patented arrangement of large-area plates fitting around landing-wheel tyre for enhanced flotation, esp. to permit combat aircraft to use soft surface.

**flow augmenter** Usually means ejector, but also applied to inducer at entry to centrifugal pump.

**flowback** Runback of water from wing leading edge in icing conditions.

**flow chart** Graphical symbolic representation of sequence of operations.

**flow control** Measures designed to maintain even flow of traffic into airspace or along route. Chief feature is acceptance of each aircraft into pre-booked slot at entry to controlled airspace, at agreed gate time, to provide orderly ATC service which does not become overloaded.

**flow control system** One form of main control for gas-turbine engine: fuel-pump delivery pressure is function of rpm, output being controlled to maintain set dP across throttle valve for any set air-inlet condition; ancillaries take care of transients and limitations. See *proportional* \*.

**flow disrupter** Small hinged or retractable plate intended to promote intentional stall.

**flowdown** The multi-stage process by which a set of requirements are progressively subdivided into the smallest indivisible hardware items. Essentially synonymous with Work breakdown structure.

**flow fence** Kevlar fabric shield surrounding top and sides of ejection-seat occupant.

**flowmeter** Instrument which measures fluid (gas or liquid) flow; numerous types based on venturi pressure drop, speed of free-spinning turbine, pitot pressure and many other principles; measure can be velocity at point, near-average velocity or, with density input, mass flow. See *integrating* \*.

**flow rake** See *rake*.

**flow regime** Particular type of fluid flow (see *continuum* \*, *free-molecule* \*, *laminar* \*, *slip* \*, *turbulent* \*).

**fl oz** Fluid ounce.

**FLPFM** Foot-launched powered flying machine, eg, wheelless micro or engined parachute.

**FLPP** Future Launcher[s] Preparatory [or Preparation] Programme (2002, ESA+R).

**FLRCM** Future long-range cruise missile (UK).

**FLR** Forward-looking radar.

**FLRE** Flare.

**FLS** 1 Foreign Liaison Staff (MoD).

2 Fuel-level sender.

**FLT, Flt** Flight (unit).

**FLTA** Forward-looking terrain-avoidance.

## flush air-data system

**FLTCAL** Flight calibration.

**FLTCK** Flight check.

**FLT CON, Flt Ctrl** Flight control.

**FLTP** Future launcher technology programme (ESA, 1999, never implemented).

**Flt Pln** Flight plan.

**FLTR** Flightline tape-reader.

**FLTS** Flight Test Squadron (USAF).

**FltSatCom** Fleet satellite communication system; also clumsily written all capitals (USN).

**FLTWO** Flight watch outlet.

**FLUC** Fluctuating.

**flueries** See *fluidics*.

**fluid** Liquid or gas.

**fluid dynamics** Study of fluid motion.

**fluid element** Second or supporting element in *fluid four*.

**fluid four** Tactical formation in which second element is loosely spread in both vertical and horizontal planes to enhance manoeuvrability, look-out and mutual support.

**fluid gallon** See *gallon*.

**fluidic nozzle** Jet-engine nozzle in which fluidic control is used to vary vectoring, profile and area.

**fluidics** Branch of technology akin to electronics but using instead of electrons air or other fluid flowing at low pressure through pipes, valves and gates for control of external systems; one advantage is relaxed upper temperature limit.

**fluidity** Reciprocal of viscosity.

**fluidized bed** Container of finely divided solid particles supported in liquid-like state by upcurrent of air or other gas.

**fluid mechanics** Study of static or moving fluids and reactions on bodies (includes aerodynamics, aerostatics, hydrodynamics, hydrostatics).

**fluid ounce** Non-SI unit of volume, UK \* =  $1/160$  Imp. gal. = 28.4131 cc; US \* =  $1/160$  US gal. = 23.6588 cc.

**fluid resistance** See *drag*.

**fluid seal** Normally refers to a labyrinth shaft seal in which the peripheries of the sealing rings on the inner shaft are slightly immersed in oil in a rotating outer casing. See *hydraulic seal*.

**fluorescein** Proprietary chemical supplied as solid block attached by lanyard to aircrew dinghy. When dropped into sea stains surface fluorescent greenish yellow.

**fluorescence** Emission of photons, esp. visible light, during absorption of radiation of different wavelength from other source; photoluminescence (see *luminescence*, *phosphorescence*, *scintillation*).

**fluorescent testing** Examination of item coated in fluorescent ink by UV light, to reveal crack as a bright line.

**fluorine** Reactive yellow-green gas, used as liquid (BPt -188°C) oxidant in rockets (Isp 410 with LH<sub>2</sub>) or in many cryogenic compounds such as oxygen difluoride (OF<sub>2</sub>); \* <sup>-18</sup> is radionuclide of half-life 110 min.

**fluorocarbons** Generally resemble hydrocarbons, but F instead of H makes them more stable; many uses.

**fluoroscope** Instrument with fluorescent screen supplied by processed signals from X-ray tube, used for immediate indirect viewing inside metal or composite structures.

**fluoroscopy** X-ray TV.

**flush air-data system** One whose sensors do not protrude beyond the skin of the aircraft.

## flush antenna

**flush antenna** One conforming with external shape of vehicle.

**flush deck** Whole ship upper deck at same level.

**flush intake** Not protruding, orifice in skin of vehicle.

**flush on warning** Take off immediately radar evidence suggests hostile missile attack so that, when airfield is hit, aircraft are just out of dangerous radius of thermonuclear warhead.

**flush rivet** Head is flush with surface into which it is countersunk.

**flush weld** Plug or butt weld which leaves no weld material on surfaces.

**fluted** Skin stiffened by evenly spaced parallel semi-circular channels. External \* cannot be aligned with complex slipstream.

**flutter** 1 High-frequency oscillation of structure under interaction of aerodynamic and aeroelastic forces; basic mechanism is that aerodynamic load causes deflection of structure in bending and/or twist, which itself increases imposed aerodynamic load, structure overshooting neutral position on each cycle to cause load in opposite direction. Distinguished by number of degrees of freedom (bending and torsion of wing, aileron and other components are considered separately), symmetry across aircraft centreline, and other variables. When heating involved subject becomes aerothermoelasticity (see *classical* \*, *hard* \*, *soft* \*).

2 Radio beat distortion when receiving two signals of almost same frequency.

**flutter model** Flexible model with mass distribution, flexure and other features designed so that flutter qualities simulate those of full-scale aircraft.

**flutter speed** Lowest EAS at which flutter occurs.

**fluvial** Adjective meaning that seaplane [widest meaning] is intended to operate from calm water only. Opposite = maritime.

**flux** 1 Generally, quantity proportional to surface integral of normal (90°) field (eg, magnetic) intensity over given cross-section.

2 Volume, mass or number of fluid elements or particles passing in given time through unit area of cross-section; eg luminous \*, measured in lumens (abb. lm).

3 Magnetic \* can be thought of as number of lines of force passing through particular coil or other closed figure; symbol  $\Phi$ , unit weber Wb.)

4 Materials used in welding, brazing and soldering to clean mating surfaces, and/or form slag, which helps separate out oxides and impurities by flotation and exclude oxygen.

**flux density** 1 Unit of magnetic \*\* is Wb/m<sup>2</sup>, or tesla (T).

2 Neutron \*\*, and particle physics generally, is particles per unit cross-section per second multiplied by velocity,  $\Delta\phi/\Delta t = nv$ .

**fluxgate** Sensitive detector giving electrical signal proportional to intensity of external magnetic field acting along its axis, used as sensing element of most remote-indicating compasses; also called fluxvalve.

**fluxgate compass** Uses fluxgate to indicate, subject to corrections, direction of magnetic meridian.

**fluxvalve** See *fluxgate*.

**FLW** 1 Forward-looking [i.e. predictive] windshear radar.

2 Follow[s].

## flying position

**fly a desk** Retirement from professional flying (e.g., senior officer).

**fly-away cost** Published retail price of GA aircraft, with specified avionics fit, ignoring spares, training or support.

**fly-away disconnects** Launch-vehicle umbilicals on rigid arms which swing clear under power.

**flyback** Controlled descent through atmosphere of returning aerospace-plane.

**fly-back period** That during which CRT spot returns from end of one line to start of next when in raster-scan mode.

**fly-back time** Time, usually ns or  $\mu s$ , for each fly-back period.

**fly-back vehicle** Space vehicle intended to be reusable.

**flybar** Flying by auditory reference.

**fly before buy** Philosophy of flight evaluation of new aircraft type, esp. by military (government) customer for combat aircraft.

**fly-by** 1 Interplanetary mission in which TV and instrumented spacecraft passes close to target planet but does not impact or orbit it.

2 Slow flight past tower to verify aircraft configuration or possible damage.

**fly-by-cable** Mechanical links join cockpit to PFCUs.

**fly-by-light** Flight-control system with signalling by optical fibres.

**fly-by-speech** Flight-control system with input signalled by voice of pilot (various research programmes).

**fly-by-wire** Flight-control system with electric signalling.

**flyco** 1 Abbreviation for Wing Commander, Flying, at an RAF station.

2 Position aboard aircraft carrier from which all aircraft launches and recoveries are controlled.

**Flygtekniska Föreningen** Society of Aeronautics (Sweden).

**Flygtekniska Försökanstalten** Aeronautical Research Institute (Sweden).

**fly-in** Informal gathering of private and club aircraft at particular airfield, usually with a relaxed programme of events and competitions.

**flying blind** Piloting without external cues.

**flying boat** Seaplane whose main body is a hull with planing bottom; US = boat seaplane.

**flying cable** Connects captive or kite balloon to winch.

**flying club** Civilian group formed to assist its members to fly light aircraft as owner, hirer, pupil or passenger. It need not itself own an aircraft, or an airfield. First UK was Midlands Aero Club, 3 September 1909.

**flying controls** See *control system*.

**flying diameter** Overall diameter of circular parachute canopy in normal operational descent.

**Flying Farmers** Association of over 400 airstrip owners [not necessarily farmers] (UK).

**flying grading** See *grading*.

**flying machine** Powered aerodyne; common pre-1914, today humorous or derogatory.

**flying order book** Set of rules governing the flying of aircraft owned by a club (UK usage), or by club members.

**flying pay** Extra emoluments payable to military aircrew when actively engaged in flying operations.

**flying position** Attitude of aircraft when lateral and longitudinal axes are level or in flight attitude; esp. when

aircraft on ground is supported in this attitude. Note: flight attitude varies with airspeed.

**flying qualities** Loosely, stability and control as perceived by the pilot; documented in MIL-1797, previously MIL-F-8785C (US).

**flying rigging** Distributes loads into balloon from flying cable.

**flying roundup** Event, usually annual, at which passengers, usually handicapped children, are given flights, often in vintage transports (US).

**flying saucer** Popular, descriptive, name of the most common species of UFO.

**flying shears** Rotary system for cutting long web of sheet metal or other material moving at high speed.

**flying speed** 1 Loosely, minimum airspeed at which aeroplane can maintain level flight (preferably, positive climb) in specified configuration.

2 Another definition: speed reached on takeoff at which pilot has full control [but only for climbing straight ahead]. In modern terms  $V_2$ .

**flying spot** Rapidly moving spot of light, usually generated by CRT, used to scan surface containing visual information.

**flying stovepipe** Ramjet (colloq.).

**flying-tab control** See *servo tab*, Flettner.

**flying tail** Use of whole horizontal tail as primary control surface.

**flying testbed** Aircraft or other vehicle used to carry new engine or other device for purpose of flight testing.

**flying the ball** 1 Loosely, flying IFR, from traditional turn/slip indicator.

2 Correctly flown VFR carrier approach using mirror sight.

**flying the needle** Navigating along airways by VOR.

**flying time** See *flight time*.

**flying weight** See *flight weight* (engine).

**flying wing** Aeroplane consisting almost solely of wing, reflecting idealised concept of pure aerodynamic body providing lift but virtually devoid of drag-producing excrescences.

**flying wires** Diagonal cables/wires placed under tension in 1g flight and used to join lower anchor (low on fuselage or within biplane cellule) to higher anchor further outboard on wing; also known as lift wires.

**fly-off** 1 Competitive in-flight demonstration of performance and other qualities between two or more rival aircraft built to same requirement to determine which will be chosen for procurement.

2 Without hyphen, to take off from a ship, esp. by free takeoff.

**fly-over noise** Noise made by aircraft over particular point, usually near airport on inbound/outbound track, chosen for noise measurements. *Approach/takeoff noise*.

**flyover reference location** A point chosen for measurement of flyover noise.

**fly space** Simulated volume of sky, especially above a terrain board.

**FM** 1 Frequency modulation or modulated; instantaneous frequency of EM carrier wave is varied by amount proportional to instantaneous frequency of modulating (intelligence-carrying) signal, amplitude and modulated power remaining constant.

2 Frequency measurement.

3 Fan marker.

4 Flight manual.

5 Facilities management.

6 Figure of merit.

7 Fissile material.

8 From.

9 Fighter, multiplace (USAAC 1936–41).

**f<sub>M</sub>** Mode frequency [FCS airspeed].

**f<sub>m</sub>** Modulating frequency.

**FMA** 1 Flight-mode annunciator or annunciation.

2 Fleet Management, or Manager, agreement.

3 Final monitor aid.

4 Federacion Mexicana de Aeronáutica.

**FM/AM** 1 Amplitude modulation of carrier by frequency-modulated subcarrier(s).

2 Alternate FM and AM operation.

**F<sub>max</sub>** 1 Maximum thrust.

2 Peak thrust of rocket engine.

**FMC** 1 Flight management computer [F adds function, DL data-link, S system, U unit].

2 Fully mission-capable (USAF).

3 Forward motion compensator, or compensation.

4 Fatigue-monitoring computer.

**FMCS** FMC (1) or (4) system.

**FMCT** Fissile-Material[s] Cutoff Treaty (repeatedly postponed).

**FMCW** Frequency-modulated continuous [rarely, carrier] wave.

**FMD** Flight management display.

**FMDA** Federation Mexicana de los Deportes Aeros (Mexico DF).

**FME** Failure modes and effects [A adds analysis, CA criticality analysis, S summary, TA task analysis], all self-explanatory tools for risk assessment.

**FMEA** See previous.

**FMEP** Friction mean effective pressure, torque measured on calibrated brake.

**FMF** 1 Foreign military financing.

2 Flight-management function.

**FMG** Flight management guidance (C adds computer, EC envelope computer, S system).

**FMGC** Flight management and guidance control (system).

**FMGEC** See *FMG*.

**FMI** Functional management inspection.

**FMICW** FM (1) intermittent [or interrupted] continuous wave.

**FMK** 1 Flyvematerielkommandoen (Denmark).

2 Field modification kit.

**FML** Frequency memory-loop.

**FM marker** Fan marker, transmits fan-shaped pattern of coded identity signals upwards, usually across one leg of radio range station.

**FMMWRA** Forward-looking MMW radar altimeter.

**FM-9** Fuel modifier No 9, which with a carrier fluid forms Avgard.

**FMO** Flight Maneuver Operations Center (NASA).

**FMOF** First manned orbital flight.

**FMOP** Frequency modulation on pulse.

**FMP** 1 Full [or flight] mode panel.

2 Flow management position.

3 Foreign military program.

4 Fleet management program[me].

**FMPG** Flow Management Planning Group (ICAO).

## FMQG

**FMQG** Fuel measurement and quantity-gauging; C adds computer, S System.

**FMS** 1 Flight-management system; T adds trainer.

2 Field maintenance squadron (USAF).

3 Frequency-multiplexed subcarrier.

4 Foreign military sales (DoD).

5 Federation of materials societies.

6 Fuel-management system.

7 Flexible manufacturing systems.

8 Full-mission simulator.

**FMSC** Frequency Management Sub-Committee (NATO).

**FMSP** Flight-mode selector panel.

**FMST** Flight-management system trainer.

**FMT** Full-mission trainer.

**FMTAG** Foreign Military Training Affairs Group (US).

**FMTI** Future missile-technology initiative (USA).

**F/MTI** Fixed/moving target indicator.

**FMTS** Fleet [of aircraft] management and tracking system (Aero-C).

**FMU** 1 Flight-management unit.

2 Fuel-metering, or management, unit.

3 Flow [of air traffic] management unit.

**FMV** Försvarets Materielverk (Defence Materiel Administration, Sweden).

**F<sub>N</sub>** Nozzle drag correction.

**F<sub>n</sub>** 1 Net thrust.

2 Receiver noise.

**FNA** 1 Fédération Nationale Aéronautique (parent body of flying clubs, F).

2 Final approach.

**FNBA** Fédération Nationale Belge d'Aviation.

**FNBDT** Future narrow-band digital terminal.

**FNC** Favoured-nation clause.

**FNCP** Flight navigation control panel.

**FNL** 1 Flight Navigator's Licence (UK).

2 Fleet noise level.

**FNLN** Fine line, on radar indicating significant turbulence.

**FNMOC** Fleet Numerical Meteorology and Oceanography Center.

**fnp** Fusion point.

**FNPT** Flight [and] navigation procedure[s] trainer.

**FNS** 1 Strategic nuclear forces (F).

2 Fortified Navier-Stokes algorithm.

**FNT** Front [+GNS = frontogenesis = front forming;

LYS = frontolysis = decaying].

**FNY** French Navy [Anglicised usage].

**FO** 1 Foreign object.

2 Fibre optics (resulting in numerous other FO acronyms).

3 Fail operational, or operative (see *FOS*, *FOOS*).

4 First Officer.

5 Flag Officer.

6 Fractional ownership.

7 Forward observer.

**F/O** 1 Flying Officer (RAF).

2 First Officer (civil).

3 Fuel/oil.

**f<sub>0</sub>** Frequency, prior to Doppler shift.

**FOA** 1 Field Operating Agency, unit of USAF distinct from major command.

2 Follow-on attack (no precise definition).

## FOD

**3** Försvarets Forskningsanstalt, Swedish defence research establishment (merged 2001 into FOI).

**4** Future offensive aircraft (C adds capability, S system).

**FOAC** 1 Flag Officer, Aircraft Carriers.

2 Future offensive air capability.

**FOAEW** Future organic airborne early-warning.

**foam carpet** Layer of foam put down on runway or other space by fire tenders to cushion impact of aircraft making wheels-up landing.

**foamed plastics** Foaming agent provides minute voids to create low-density material used for insulation (thermal, mechanical shock etc), or to increase structural rigidity; often foamed in place within structure.

**foam monitor** Turret-mounted foam gun on crash-fire vehicle.

**foaming space** Free vapour volume above fuel in tank.

**foam strip** Foam carpet.

**FOARC** Fractional Ownership Aviation Rulemaking Committee.

**FOAS** Future Offensive Air System [more recently, Support] (UK).

**FOB** 1 Forward operating base.

2 Fuel on board (suggest undesirable usage, confusion with established non-aero acronym free on board).

**FOBS** Fractional-orbit bombardment system.

**FOC** 1 Foreign-object check.

2 Full (or final) operational, or operating, capability.

3 Flares/off/chaff.

4 Faint-object camera.

5 Fibre-optic control, or cable, or computer.

6 Final operational clearance.

7 Fuel/oil cooler.

8 Flight-operational commonality, making possible mixed-fleet flying.

9 Formal offer to customer.

**FOCA** Federal Office of Civil Aviation (Swiss).

**focal length** Distance from optical centre of lens or surface of mirror to principal focus.

**focal plane** That parallel to plane of lens or mirror and passing through focus.

**focal point** 1 See *focus*.

2 Air Staff agency or individual designated as central source of information or guidance on specific programme or project requiring co-ordinated action by two or more Air Staff agencies (USAF).

**Focas, FOCAS** 1 Fibre-optic communications for aerospace systems (USAF).

2 Flag Officer Carriers and Amphibious Ships (RN).

3 Focused ordnance controller with aimpoint selection (USAF).

**FOCR** Final operational clearance recommendation.

**FOCSI, Foci** Fibre-optic control-system integration.

**focus** 1 Point at which parallel rays of light meet after being refracted by lens or reflected by mirror.

2 Point having specific significance relative to geometrical figure such as ellipse, hyperbola or parabola.

**FODMS** Fibre-optic[s] data multiplex system.

**FOD** 1 Foreign-object damage [or debris].

2 Fibre-optic[s] data [B adds bus, C control, H highway, L link, MS multiplex systems and S system].

3 Flight Operations Department (UK CAA).

4 First operational delivery.

## Fodcom

**Fodcom** Flight Operations Department communication, issued as necessary (CAA).

**FODCS** Fibre-optic[s] digital control system.

**FODMS** Fibre-optic[s] data multiplex system.

**FOD plod** Duty of removing from taxiways and runways anything that might cause FOD.

**F/ODS, Fods** Fire/overheat detection system.

**FODT** Fibre-optic[s] data transmission.

**FOES** Fibre-optic engine sensor.

**FOFA** Follow-on forces attack.

**FO/FO** Flame-on/flame-out.

**FOF3** Flag Officer 3rd Flotilla, responsible for all naval aviation (UK, RN).

**FOG** 1 Fibre-optic[s] guidance.  
2 Fibre-optic[s] gyro.  
3 Flight-operations group (RAeS).

**fog** 1 Form of cloud in surface layers of atmosphere caused by suspended particles of condensed moisture or smoke, reducing visibility to less than 1 km. Advection \* results from arrival of warm humid air over cold surface; radiation \* from cooling of water vapour created by evaporation during day by cold ground on clear night; sea \* by condensation of moisture in warm air over cold sea (essentially advection).

2 See cabin \*.

**Foglite** Finding obscured ground targets using laser imaging of the target environment (USAF + industry).

**FOG-M, Fog-M** Fibre-optic[s], guided missile (USA).

**fog of war** Notional idea invented to explain ‘own goals’ in recent conflicts (US).

**FOHE** Fuel/oil heat exchanger.

**Föhn, foehn** Dry wind with strong downward component, warm for season, characteristic of mountainous regions.

**FOI** 1 Follow-on interceptor (USAF).

2 Totalförsvarets Forskningsinstitut [defence/aerospace research, Sweden].

3 Flight Operations Inspectorate (CAA).

**FOIA** Freedom of Information Act (US).

**foil** 1 Lifting surface of hydrofoil landing gear.

2 Spanwise trailing-edge members, one upper and one lower, forming integral part of compound wing.

**FoIP** Fax over Internet Protocol.

**FOL** 1 Forward operating location.

2 First-order logic.

**fold** Joint in wing of carrier aircraft enabling it to be folded. Incorporates one or more horizontal, skewed or vertical hinges.

**folded combustor** Gas-turbine annular combustion chamber in which, to reduce engine overall length, the flow makes two 180° turns, leaving at a reduced chamber diameter to match high-speed turbine.

**folded dipole** Two parallel, closely spaced dipole antennas connected at ends, with one fed at centre.

**folded fell seam** Fabric seam which has both edges folded and located in same place between fabric layers.

**folding fin** 1 Aircraft or missile fin hinged axially at base to lie flat prior to launch.

2 Rocket or missile fin hinged transversely to emerge from housing slot, as in FFAR.

**folding wing** One hinged outboard of root to enable overall dimensions to be reduced when aircraft must enter hangar, esp. on carrier.

**foliage penetration** Fopen, challenging objective of wide

## Foracs

range of EM-radiating systems, especially with MTI; other acronyms Lobstar, TUT.

**follow-on** Anything considered to be second or subsequent generation in development, esp. within same manufacturing team.

**follow-on contract** One whose terms repeat those for earlier stage of same programme.

**follow-on development tests** Tests during acquisition phase after completion of formal Cat II tests; consist of updating changes or additions not available previously (USAF).

**follow-on production** Serial production immediately subsequent to completion of development or previous production batch.

**Folta** Forward operating location training area.

**FOM** 1 Figure of merit.

2 Federation object model [simulation].

**FOMA** Flag Officer Maritime Aviation (UK).

**FOMC** Fibre-optic micro-cable.

**FONA** Flag Officer, Naval Aviation (UK).

**Fonda** Future optical network distribution for aerospace (AgWestland).

**fone** Telephone (FAA).

**Foo fighters** UFOs (US, 1946–60).

**FOO** Forward observation officer (FAC2).

3 Area covered by airline route network [generally relevant to hub/spoke and similar regional carriers].

**FOOS** Fail-operational, fail-operational, fail-safe.

**foot** Non-SI unit of length, = 0.3048 m by definition.

**foot-candle** Non-SI unit of luminance = 1 lm/sq ft = 10.76 lux.

**foot-lambert** See *lambert*.

**foot-launched** Micro or powered parachute strapped to pilot’s back.

**foot motor** Foot-operated hydraulic motor used to energise wheel brakes.

**foot-pound** Unit of work or energy, = 1.35582 J.

**foot-poundal** Unit of work or energy, = 0.042140 J.

**foot-pound-second system** Non-SI system of units still used in US; also called Imperial.

**footprint** 1 Area around airport enclosed by selected contour for LPN, EPNL, NNI or other noise measure.

2 Possible recovery area for spacecraft plotted from re-entry point.

3 Area covered by airline route network [generally relevant to hub/spoke and similar regional carriers].

**foot-thumper** Stall-warning device that triggers oscillating plunger in rudder pedal when stall imminent.

**foot-to-head acceleration** Ambiguous, means accelerating force acting on body from head to feet, negative g.

**footwell** Recess in outer skin of [usually combat] aircraft, often covered by spring-loaded flap, to enable crew to board without ladder.

**FOP** 1 Forward operating paid.

2 Fired outside parameters.

**Fopen** Foliage penetration, or penetrating (SAR, TUT).

**FOQA** Fleet [airline] or flight-operations, or operational, quality assurance (FAA).

**FOQNH** Forecast regional QNH.

**FOR** 1 Fail-operative redundant.

2 Field of regard.

**Foracs** Fleet operational readiness and calibration system.

## Forcap

## form, fit and function

**Forcap** Force CAP, combat air patrol maintained over-head a task force (USN).

**Force, FORCE** Flight Operations Research Centre of Excellence.

**force** SI unit is Newton (N), which gives mass of 1 kg acceleration of  $1 \text{ ms}^{-2} = 0.101968 \text{ kgf}$ ,  $0.22482 \text{ lbf}$ ,  $7.230658 \text{ pdl}$ ,  $3.597 \text{ ozf}$ ,  $10^5 \text{ dynes}$ ; reciprocals include  $1 \text{ lbf} = 4.44822 \text{ N}$ ,  $1 \text{ kgf} = 9.80665 \text{ N}$ .

**force balance transducer** Output from sensing member is amplified and fed back to element which causes force-summing member to return to rest position.

**force coefficients** Aerodynamic forces, eg lift and drag, divided by dynamic pressure  $\frac{1}{2}\rho V^2 S$ .

**force combat air patrol** Patrol of fighters maintained to protect task force against enemy aircraft.

**forced convection** Process by which heat is transported by mechanical movement of air (cooling systems, meteorology).

**force diagram** Vector presentation of force(s) acting on object, length and direction of each vector representing magnitude and direction of one force. If diagram forms closed polygon, forces are in equilibrium. If diagram fails to close, gap indicates unbalanced force. Hence, force polygon.

**forced landing** Made when aircraft can no longer be kept airborne, for whatever reason.

**forced oscillation** One in which response is imposed by excitation; if excitation is periodic and continuing, oscillation is steady-state.

**forced vibration** See preceding entry.

**force fit** Mating parts in which male dimension exceeds female (see *fit*).

**force gradient** Relationship between pilot input force and aircraft response, e.g., degrees roll per second per pound of lateral force on stick.

**force majeure** Literally, no choice; reason for crossing a frontier at other than a designated point of entry (now archaic).

**force rendezvous** Navigational checkpoint at which formation of aircraft or ships joins main force.

**force-sensing controller** Pilot's primary flight-control input (stick/pedals) which senses applied force without noticeable movement.

**force structure** Currently effective operational inventory (US).

**force vector** Line in force diagram representing force magnitude, direction and point of application.

**Fords** Fleet [airline] operational reliability data system.

**fore-and-aft level** Gravity-controlled indicator of pitch attitude (arch.) Usually a glass tube in form of triangle part-filled with coloured liquid.

**forebody** 1 The front portion of a body in atmospheric flight; in \* stroke can mean front half of fuselage.

2 Planing bottom of float or hull upstream of step.

**forebody stroke** Low-aspect-ratio extensions of wing at root along sides of fuselage; like LERX and glove [which taper more sharply] they generate powerful vortices at high AOA to improve handling in extreme positive-acceleration manoeuvres.

**forecast** Statement of expected meteorological conditions at given place during specified period; air-navigation \* includes wind velocity at selected heights, cloud, visibility, precipitation, ice formation, and barometric pressures at airfields and sea level.

**foreflap** Leading member of double or triple-slotted flap.

**foreign air carrier** One registered in foreign country, except in case of multinational carriers (eg SAS or Air Afrique) in collaborating countries.

**foreign military sales** Portion of United States military assistance authorised by Foreign Assistance Act (1961 as amended); differs from Military Assistance Program Grant Aid in that it is purchased by recipient country.

**foreplane** Horizontal aerofoil mounted on nose or forward fuselage to improve take-off and low-speed handling, esp. of delta aircraft where wing lift is lost because of upward movement of elevons.\* can be fixed or retractable, fixed-incidence or rotating, and have slats, flaps or elevators.

**forerudder** Rudder at front of aircraft.

**Forester** F open [foliage-penetrating] reconnaissance, surveillance, tracking and engagement radar (USA).

**forging** Shaping metal softened by heating by slow, rapid or repeated blows, with or without a shaped female die or male/female dies.

**forked rod** Piston engine connecting rod having forked bearing on crankshaft, fitting over big end of matching blade-type rod.

**forklift capacity** Of cargo item, provided with an integral pallet, tineways or forklift entries.

**FORM** First-order reliability method.

**formability** Unquantified measure of ease with which material can be shaped through plastic deformation.

**Formac** Fibre-optic medium-access controller.

**format** 1 Size and shape of map, chart or photo negative or print.

2 One of several selectable types of presentation for instrument (eg ADI or HSI) or display, such as moving map, radar map, alphanumerics, attitude indication, flight planning or en route.

3 Fortran matrix abstraction technique.

**formation** Ordered arrangement of two or more vehicles proceeding together, especially in a geometric pattern.

**formation flight** More than one aircraft which, by prior arrangement between pilots, navigate and report as single aircraft; FAA formation limits are no more than one mile laterally or longitudinally and within 100 ft vertically from leader.

**formation-flight control system** Developed at UCLA to perfect autonomous formation flight.

**formation light(s)** Fitted to aircraft to enable other aircraft to formate on it at night.

**formatted** Electronically processed to be compatible with particular format (2).

**form block** Block or die usually made of wood, zinc, steel or aluminium, over or into which sheet metal is formed.

**form die** One which performs bending and sometimes light drawing operations upon flat blank.

**form drag** Pressure drag minus induced drag.

**former** Light secondary structure added to maintain or improve external shape; eg around basic box fuselage to give curved cross-section, or extra false wing ribs ahead of front spar to maintain profile where curvature is sharp.

**form factor** Physical overall dimensions of a body, especially one carried externally, taken into account not so much aerodynamically as to avoid hardware conflicts.

**form, fit and function** F<sup>3</sup>, essentially self-explanatory, the

three baseline factors determining whether a new hardware item can immediately replace its predecessor in a functioning system.

**forming** Forcing flat material to assume desired contours and curves, esp. compound curvatures, by such means as drop hammer, flanging machine, hydraulic press, stretch press, hand forming etc.

**forming roll** Bends sheet metal into cylinders of various diameters and other single-curvature shapes.

**Form 700** In many English-speaking air forces, document signed by captain on taking over aircraft to signify that he is satisfied that every pre-flight maintenance inspection has been completed.

**formula costs** Direct operating costs for transport aircraft as calculated to ATA formula, which assumes indirect costs as 100 per cent of direct and standardized values for passenger, freight and mail revenues.

**Formula 1** Air-racing rules, laid down by FARA, for uniform class of racers (includes engine not over 200 cubic inches, wing not less than 66 square feet, empty weight not less than 500 lb, fixed landing gear and carefully defined cockpit/windshield geometry).

**Formula V** Lightweight FARA class with VW-derived engines.

**FORS** 1 Foreign airlines representatives (Sweden).  
2 Fibre-optic rate sensor.

**Forte** Fast on-orbit recording of transient events.

**Fortran** Formula translator; computer language.

**Forty-five line** Trajectory at 45° to horizontal, flown in either direction, thus up-\* line and down-\* line (advanced aerobatics).

**forward aeromedical evacuation** Provides airlift for patients between battlefield and initial and subsequent points of treatment within combat zone.

**forward air controller** Member of tactical air control party who, from forward ground or airborne position, controls aircraft engaged in close air support of ground troops (DoD).

**forward air control post** Mobile tactical air control radar used to extend coverage and control in forward combat area.

**forward compatibility** The degree to which a device or system will meet future legislation or be compatible with future development.

**forward lock** Prevents selection of reverser except after landing; disabled by oleo deflection or, if possible, bogie-beam tilt.

**forward oblique** Oblique photograph of terrain directly ahead.

**forward operating base** Airfield used indefinitely to support tactical operations without establishing full support facilities.

**forward operating location** Forward operating base.

**forward path** In a functioning system, the path from demand to output.

**forward scatter** Scattering of radiant energy into hemisphere of space bounded by plane normal to incident radiation and lying on side toward which radiation was advancing; opposite of backward scatter.

**forward slip** See *sideslip*.

**forward speed** Component of speed in horizontal plane.

**forward stagnation point** Point on leading edge of body in airstream which marks demarcation for airflow on either side; boundary-layer air is stationary.

**forward supply point** En route or turnaround station at which selected aircraft spares are prepositioned for support of assigned mission(s).

**forward sweep** Opposite of sweepback, wing tips being further forward than roots.

**forward tilt** Of helicopter rotor, forward angular deviation of locus of centroid of blade sections from plane of rotation.

**forward tilt wing** See *slew-wing aeroplane*.

**FOS** 1 Fail-operational, fail-safe.

2 Faint-object spectrograph.

3 Fibre-optics sensor (or sensing, or system).

4 Family of systems.

5 Fleet operations standards.

6 Forward observer system.

**FOSA** Fondation des Oeuvres Sociales de l'Air (F).

**FOSC** Fibre-optic satellite communications.

**FOSI** 1 Formatting output specifications instance.

2 Family of systems integration, or integrator (AFRL).

**FOSON** Follow-on stand-off weapon.

**FOSS, Foss** Fibre-optic sensor, or sensing, systems.

**FOST** Flag Officer, Sea Training.

**foster parent** Company contracted to provide service support, possibly extending to major modification and update, for an imported type of military aircraft.

**FOT** 1 Frequency of optimum transmission.

2 Fibre-optic twister for making inverted image upright.

3 Flight-operations Telex.

4 Follow-on operational test (USAF).

5 Future-oriented technologies.

**FOT&TE** Follow-on test and evaluation (continues after entry to service, USAF).

**FOT&FOE** Inserts final operational.

**FOTD** Fibre-optic towed decoy.

**FOTM** Flight operations training manager.

**fouling** Unwanted deposition on points of piston engine spark plug.

**fount** Range of characters for electronic display.

**fountain** Vertical rising column of hot air, usually plus entrained debris, formed by jets of VTO jet aircraft hovering at low level; on impact with fuselage can exert undesired suckdown effect; alternatively, can be made to increase lift.

**fountain sheet** Vertically rising wall between adjacent jets in hovering VTO.

**four-bank eight** Flight training manoeuvre similar to figure of eight except that outer portions of loops are not circular but consist of two 45° turns linked by short, straight flightpath.

**four-course beacon** See *radio range*.

**4-D** 3-D plus time, usually latitude, longitude, altitude and time.

**4-D R-nav** Terminal guidance sufficiently accurate to put arrival's wheels on runway within guaranteed window of  $\pm 10$  s.

**four greens** Gear locked down and landing flap setting.

**Fourier expansion** Expansion of waveform or other oscillation in terms of fundamental and harmonics.

**Fourier integral** Representation of  $(x)$  for all values of  $x$  in terms of infinite integrals.

**Fourier series** Representation of function  $f(x)$  in interval  $(-L, L)$  by series consisting of sines and cosines with

common period  $2L$ ; when  $f(x)$  is even, only cosine terms appear, when odd, only sine terms appear.

**4midable** Requirement/benefit definition study leading to 4-D meteorological databases (Euret).

**four-minute turn** See *standard turn*.

**four-poster** Jet engine for VTOL with two front fan nozzles and two rear core-jet nozzles, which in VTOL mode provides lift from four jets in rectangular pattern; or an aircraft equipped with such an engine.

**four-way cross** Airshow manoeuvre in which two pairs of aircraft roll wings vertical to pass in a close head-on.

**four-wing configuration** See *cruciform wing*.

**FOV** Field of view; EA adds eye angle relative to head.

**FOVE** Fleet operations versatile environment [cockpit interface].

**FOW** 1 Family of weapons.

2 Fibre-optic wire.

3 Fly-over waypoint.

**Fowler flap** Special form of split flap that moves at first rearwards and then downwards along tracks, thus producing initial large increase in lift and at full deflection giving high lift and drag for landing.

**Fowss** Fibre-optic wing-shape sensing.

**fox away** Verbal code: "AAM has been fired or released" (DoD).

**Fox Code** Air-combat numeral code, usually: 1, SARH missile selected; 2, IR missile selected; 3, guns; 4, fired outside parameters to distract enemy. There is an alternative, used to report method used to dispose of adversary: 1, radar, AAM; 2, IR AAM; 3, gun(s); 4, made opponent fly into ground.

**FP** 1 Flight progress.

2 Fluoro-polyamide.

3 Flight path.

4 Full potential (aerodynamic flow).

5 Fixed-price.

6 Weather forecast (US states).

7 Fuel, petroleum.

8 Framework Programme [followed by a number] (EU).

$f_p$  Freezing point.

**FPA** 1 Fire Protection Association (UK).

2 Flight-path angle.

3 Flying Physicians' Association [office, Lake Bluff, IL, US].

4 Flight-path accelerometer.

5 Focal-plane array.

6 Forward pitch amplifier (SAAHS).

7 Flat-plate antenna.

**FPAC** Flight-path acceleration.

**FP area** Food-preparation area.

**FPAS** 1 Focal-plane array seeker.

2 Flight-profile advisory system.

**FPASS** Force-protection airborne surveillance system.

**FPB** 1 Fuel preburner.

2 Functional payload block.

**FPC** 1 Flight-path control, or controller, or command.

2 Flight-profile comparator.

**FPCC** Flight propulsion control coupling.

**FPCD** Flat-panel colour display.

**FPCS** Flight-path control system, or (F-15 S/MTD) set.

**FPC2** Force protection command and control.

**FPD** 1 Flight-planning document.

2 Flat-panel display.

3 Fee per departure.

4 Freezing-point depressant.

5 Flight-proximity demonstration.

6 Force Protection Directorate [2005–] (RAF).

**FPDA** Five-Power[s] Defence Agreement, or Arrangements [which see].

**FPDS** Feasibility pre-definition study.

**FPDZ** Free-fall parachute drop zone; A adds activity (CAA, UK).

**FPE** Fédération des Pilotes Européennes (federation of European women pilots).

**FPEPM** Floor proximity emergency-escape-path marking.

**FPEPA** Fixed-price with economic price adjustment [i.e., not fixed].

**FPF** Fixed-price firm.

**FPG** Force per g.

**FPGA** Field-programmable gate array.

**FPI** 1 Fluoropolyimide.

2 Fixed-price incentive.

3 Fluorescent penetrant inspection.

**FPIF** Fixed-price incentive firm.

**FPIS** 1 Fixed-price incentive contract with successive targets.

2 Forward propagation by ionospheric scatter.

**FPIWA** First-pass in-weather attack.

**FPL** 1 Flight-plan message, ie filed flight plan.

2 Full performance level (FAA 1 air-traffic controllers).

3 Fluctuating pressure (rarely, power) level(s).

4 See *f-pole line*.

5 Full programme launch.

**FPLN** Flight plan.

**FPLR** Full programme launch review.

**FPM** 1 Flightpath miles.

2 Feet per minute (ft/min preferred).

3 Fleet performance monitoring [or monitor].

4 Flight-performance module (AFMSS).

5 Fibre/fiber placement mandrel.

6 Flight-plan message.

**FPMU** Fuel-pump monitoring unit.

**FPN** Fixed-pattern noise.

**FPNM** Feet [altitude] per nautical mile.

**FPO** Force Protection Organization [2005–] (RAF).

**FPOV** Fuel preburner oxidiser valve.

**FPP** 1 Fixed-pitch propeller.

2 Ferry Pilots' Pool.

**FPPS** Flight-plan processing system.

**FPR** 1 Fan pressure ratio.

2 Fixed price, redeterminable.

3 Federal Procurement Regulation (US).

4 Flight-plan route.

5 Flat-plate radiometer.

6 Final proposal revision[s].

**FTRA** FPR (2) of A-type.

**FPRM** 1 Flight phase related mode.

2 Fuel-pipe repair manual.

**FPS, fps** 1 Foot-pound-second system.

2 Feet per second.

3 Fine-pitch stop.

4 Fuel production and storage [O adds offshore].

5 Flight-progress strip.

6 Fast packet switch.

**FPSA** Focal-plane staring array.

**FP70** Low-expansion firefighting foam, hydrolyzed protein plus perfluorocarbon surfactant (Angus).

**FPSP** Flight-progress-strip printer.

**FPSR** Foot-pound-second Rankine, traditional British system of engineering units.

**FP strip** *Flight progress.*

**FPTS** Forward propagation by tropospheric scatter.

**FPU** Fin processor unit.

**FPV** Flight-path vector.

**FQGS** Fuel-quantity gauging system.

**FQHE** Fractional quantum Hall effect.

**FQI** Fuel-quantity indicator, or indication.

**FQIS** FQI switch or system.

**FQMS** Fuel-quantity management system.

**FQP** Flow quality probe.

**FQPSK** Feher-patented phase-shift keying.

**FQPU** Fuel-quantity processor, or processing, unit.

**FQR** Formal Qualification Review.

**FQT** 1 Formal qualification testing.  
2 Frequent.

**FQTI** Fuel-quantity totaliser indicator.

**FR** Fineness ratio.

**F/R** 1 Function reliability.  
2 Final run.

**FR** 1 Flight refuelling.  
2 Flight recorder.  
3 Fighter reconnaissance.  
4 Forward relay (ATC).  
5 Fuel remaining.  
6 Frame.  
7 Falling rapidly.  
8 From.  
9 Federal Register (US).

**Fr** 1 Aerodynamic loading (force) due to Rth mode.  
2 Frictional force.

**fr** Fuel required.

**f<sub>r</sub>** 1 Radar p.r.f. [sometimes F<sub>r</sub>.]  
2 Resonant frequency.

**FRA** 1 First-run attack.  
2 Fuel-risk aversion.  
3 Flap-retraction altitude.  
4 See *fracto*.

**fractional** Fractionally owned [adjective and noun].

**fractional distillation** Heating crude petroleum to moderate temperature at atmospheric pressure and condensing different fractions separately.

**fractional orbit bombardment system** ICBM initially launched into low Earth orbit, enabling warhead[s] to arrive on target from any direction.

**fractional ownership** Aircraft, usually bizjet, is registered to prearranged [usually small] group, each having equal allocation of annual flight time. Today there are many variations.

**fractionation** Use of large numbers of small (nuclear) warheads, esp. in counterforce attack; hence to fractionate.

**fracto-** Prefix, clouds broken up into irregular, ragged fragments.

**FRAD** Frame relay access device.

**FRADU, Fradu** Fleet Requirements and Air Direction Unit (UK).

**FRAG** Fatigue Research Advisory Group.

**fragmentary order** Abbreviated form of operation order which eliminates need for restating information contained

in basic operation order (DoD). Usually a daily supplement to SOOs governing conduct of specific mission.

**fragmentation bomb** Charge contained in heavy case designed to hurl optimum fragments on bursting.

**frag order** Fragmentary order.

**FRAIS** Functional requirements for airport ground-movement control and management interconnection system.

**FRAM, Fram** 1 Fleet rehabilitation and modernization.  
2 Ferroelectric RAM (1).

**Fram** Ram drag.

**frame** 1 In photography, single exposure within continuous sequence.

2 Transverse structural member of fuselage, hull, nacelle or pod, following its periphery.

3 Of engine, structural transverse diaphragm carrying main shaft bearing.

4 Picture area scanned in radar, TV, video or CRT (US = field).

**frameless canopy** Single blown transparency in metal peripheral frame.

**frame of reference** See *reference axes*.

**frame relay** New standard for handling small packets of high-speed burst data over WANs.

**frame time** Symbol t<sub>f</sub>, time required to scan one frame in radar search.

**framing pulses** Transmitted in TV/video, SSR, IFF, ATCRBS and similar systems to synchronize transmitted and received timebases.

**franchise** Legal right of a carrier to fly for hire or reward on a given route, without obligation to do so.

**frangible** Designed to, or likely to, shatter on impact.

**Frap** Fragmenting-payload, gun [initially 28-mm Mauser] projectile comprising 180 slender (1-g) tungsten-alloy needles.

**FRAS** 1 Free-rocket anti-submarine.

2 Fuel-resources analysis system.

**FRAT** 1 Flight-readiness acceptance test.

2 Fuzzy reasoning adaptive thresholding.

**fratricide** Shooting down friendly, esp. in air/air engagement.

**fraudulent echo** Radar echo produced by DECM.

**Fraunhofer region** The region sufficiently far from a radiating antenna for the antenna to be considered as a point source.

**frax** Fractional ownership (colloq.).

**FRC** 1 Flight reference card.

2 Fibre-reinforced [or fibrous refractory] composite (or concrete).

3 Future rotorcraft capability.

4 Federal Radio Commission (US).

5 Full route clearance.

6 Flight-rules computer [air-launched missiles].

**FRCI** 1 Flexible reusable carbon insulation.

2 Fibrous refractory composite insulation.

**FRCS** Field-replaceable connector system.

**freak** Verbal code meaning frequency in MHz (DoD).

**FRED, Fred** 1 Flexible routine[s] for engine development.

2 Fuzzy reasoning edge detection.

**Freda** Mnemonic, prior to joining circuit: fuel tank selection/radio frequency/engine temperatures and pres-

sures/directional gyro and compass in agreement/altimeter setting.

**freddie** Air-intercept controlling unit (DoD).

**free-air anomaly** Difference between observed and theoretical gravity computed for latitude and corrected for elevation above or below geoid.

**free-air overpressure** Unreflected pressure in excess of ambient created by blast wave from explosion.

**free airport** One at which people and goods may be trans-shipped without customs charges or examination.

**free-air tunnel** Aerodynamic or other test with specimen moved through atmosphere, eg on aircraft or rail flatcar or rocket sled.

**free atmosphere** That portion of Earth's atmosphere, above planetary boundary layer, in which effect of Earth's surface friction on air motion is negligible, and in which air is usually treated (dynamically) as ideal fluid. Base usually taken as geostrophic wind level.

**free balloon** One floating untethered.

**free-balloon concentration ring** Ring to which are attached ropes suspending basket and to which net is secured; also known as load ring.

**free-balloon net** Distributes basket load over upper surface of envelope.

**freeboard** In a marine aircraft, the vertical distance from the loaded waterline to the lowest opening through which water could enter.

**free-body principle** Stress-analysis procedure that involves isolating structure, considering it to be held in equilibrium by loads acting upon it.

**free-call** Change frequency [non-mandatory ATC advisory].

**free canopy** Cockpit canopy that is non-jettisonable.

**freedoms** Basic rights for the air carriers [airlines] of all nations, negotiated between governments:

1 To fly across another's territory, without landing.

2 To make technical [non-traffic] stop, landing at another's territory to refuel or for any other non-traffic reason.

3 Right to set down, to bring passengers or goods to another country.

4 Right to pick up, to bring passengers or goods from another country.

5 Right to fly to a foreign state, pick up traffic and convey it to third state. In US often called Beyond rights.

6 Right to pick up traffic from a foreign state, convey it to a third and return to one's own.

7 Right to carry traffic between two foreign states without calling at one's home territory.

**free drop** Dropping packaged equipment or supplies without parachute.

**free electron** Not bound to an atom.

**free fall** 1 Fall of body without guidance, thrust or braking device.

2 Free motion along Keplerian trajectory, in which force of gravity is counterbalanced by force of inertia.

3 Parachute jump in which parachute is manually activated at discretion of parachutist, or automatically at pre-set altitude.

4 Acceleration g under standard conditions, = 9.80665 ms<sup>-2</sup>.

**free-fall altimeter** Worn by parachutist in free-fall jump to deploy parachute at pre-set altitude.

**free-fall(ing) bomb** Bomb without guidance.

**free-fall landing gear** Designed to be lowered by force of gravity, and possibly wind load.

**free-fall model** Unpowered model for spinning or other tests intended to fall freely after release.

**free fan** Name promoted by Boeing for UDF and propfan propulsion to avoid image of 'propeller'.

**free-field testing** In the open air.

**Free Flight** Programme 'to provide controllers and NAS users with tangible functional enhancements' (FAA). Broadly, it puts decisions regarding commercial traffic over the US in the hands of pilots, monitored from the ground.

**free flight** 1 Without guidance except, possibly, simple stabilizing autopilot.

2 In air-carrier operations, captain can select his own FL and flight path, ATC intervening only to prevent conflict.

**free-flight model** One normally ground-launched and self-propelled, usually instrumented for aerodynamic or flutter measures.

**free-flight tunnel** One in which model can be observed in free flight, ie unmounted or fired from gun.

**free-form fabrication** Flexible manufacturing method for rapid development of prototype parts.

**free gun** Capable of being aimed independently of the aircraft.

**free gyro** Two degrees of freedom, spin axis may be oriented in any specified attitude and not provided with erection system.

**free jet** Fluid jet after emission from nozzle.

**free-jet test** In an open hypersonic airflow, rather than having air pumped into inlet.

**freelance** Verbal code: "Self-control of air-intercept aircraft is being employed" (DoD).

**free-molecule flow** 1 Flow regime in which mean free path is at least ten times typical dimension of flying body, as at height above 180 km.

2 Flow about body in which collisions between molecules of fluid are negligible compared with collisions between these and body.

**free parachute** Deployed manually by parachutist, not by static line.

**free-piston engine** Any of several types in which hot gas is generated between pistons oscillating freely in linear or toroidal cylinders.

**FREEER** Free-route experimental encounter resolution.

**free radical** Atom or group of atoms broken away from stable compound by application of external energy; often highly reactive.

**free-return trajectory** One in which crippled spacecraft would fall back to Earth.

**free rocket** Unguided rocket.

**free scan** DME operating mode providing distance to all DMEs within LOS.

**free space** Ideal homogeneous medium possessing dielectric constant of unity and in which there is nothing to reflect, refract or absorb energy.

**free-spinning tunnel** Vertical wind tunnel used to test spinning characteristics using free models.

**free-standing propellant** Not case-bonded.

**free stream** Fluid outside region affected by aircraft or other body.

**free-stream capture area** Cross-sectional area of column of air ingested by jet engine, esp. ramjet.

## free streamline

**free streamline** One passing well away from moving body. Streamline separating fluid in motion from fluid at rest.

**free-stream Mach number** Mach number of body measured in free stream, unaccelerated by body's presence.

**free-stream velocity** Usually means difference between body's velocity and undisturbed air, symbol  $V_a$ .

**freestyle** Aerobatic routine selected by pilot, not preset. Similarly \* skydiving, not following a preset sequence.

**free takeoff** From aircraft carrier, not using catapult.

**free turbine** One that drives output shaft to propeller or helicopter rotors, and is not connected to compressor.

**free-vortex compressor** Axial compressor designed to impart tangential velocities inversely proportional to radius from axis.

**free-vortex flow** Persisting in fluid remote from source or solid surface, eg tornado.

**freewheel** Sprag clutch or other device which permits helicopter rotor system to continue to rotate even if input shaft from main gearbox is arrested.

**freewing** Wing freely able to rotate about spanwise axis, thus having incidence determined by relative wind while AOA remains constant [the reverse of conventional aeroplane].

**freeze** 1 To arrest dynamic operations, eg in simulator training.

2 Radar mode which, once commanded, permits one more scan; emissions then cease and display remains active but frozen until \* button is pushed a second time.

3 See *freezing*.

**freeze-out** Method of controlling humidity by condensing water vapour, and possibly carbon dioxide, over cold surface.

**freezing** 1 Stage in design when all major features are irrevocably settled, thus enabling detail design to start.

2 Manually arresting input to display, leaving static (prior) situation for study.

3 Sudden locking of flight-control system, preventing movement.

4 Sudden onset of panic causing pilot [usually pupil] to 'lock solid' on flight controls, possibly with abnormal strength.

**free zone** Customs-free area.

**freight** Cargo, including mail and unaccompanied baggage but excluding express.

**freight consolidating** Process of receiving shipments of less than carload/truckload size and assembling them into carload/truckload lots for onward movement to ultimate consignee or break-bulk point.

**freight container** See *container*.

**freight doors** Designed to take freight, vehicles or containers.

**French landing** With plenty of power on.

**Frenstor** Freezing-point sensor.

**Freon** Trade name for family of halogenated hydrocarbons containing one or more fluorine atoms, including CFCs, widely used as refrigerant medium (eg in vapour-cycle air conditioning), as fire extinguishant and as aerosol propellant.

**freq, FREQ** Frequency.

**frequency** 1 Reciprocal of primitive period of time-periodic function, symbol  $f$ , units (SI) Hz, (fps units) cycles per second.

## frequency response

2 Number of services operated by airline per day or per week over particular route.

**frequency agility** The ability to generate an output whose frequency is variable. This is a basic ECCM technique. In the case of radars the magnetron or other waveform generator can be tuned to give a different frequency on each scan. There are many other FA methods for communications and other emissions. The objective is invariably to prevent hostile jamming.

**frequency band** Continuous range of frequencies extending between two limiting values; EM bands are listed in Appendix 2.

**frequency bias** Constant frequency added to signal to prevent its frequency falling to zero.

**frequency channel** 1 Band of frequencies which must be handled by carrier system to transmit specific quantity of information.

2 Band of frequencies within which station must maintain modulated carrier frequency to prevent interference with stations on adjacent channels.

3 Any telecommunications circuit over which telephone, telegraph or other signals may be sent.

**frequency departure** Variation of carrier frequency or centre frequency from assigned value.

**frequency deviation** 1 Maximum difference between IF (1) of FM wave and frequency of carrier.

2 In CW or AM transmission, variation of carrier frequency from assigned value.

**frequency distortion** Produced by unequal amplification of signals or reproduction of sounds of different frequency; usual criterion for high-fidelity reproduction is level amplification over 20-15,000 Hz.

**frequency division multiplex** Telecommunications allowing two or more signals to travel on one network simultaneously by modulating separate subcarriers, suitably spaced in frequency to prevent interference.

**frequency drift** Slow change in frequency of oscillator or transmitter with time.

**frequency equation** Relates phase speed to wavelength and to physical parameters of system in linear oscillation; also known as dispersion equation.

**frequency hopping** Unpredictable continual and rapid changes of frequency of radar or other military electronics to defeat hostile ECM.

**frequency modulated radar** One in which range is measured by interference beat frequencies between transmitted and received FM waves.

**frequency modulation, FM** Instantaneous frequency of modulated wave differs from carrier by amount proportional to instantaneous value of modulating wave. Combination of phase and frequency modulation commonly referred to as FM.

**frequency monitor** Stabilized receiver giving audible or visual indication of any departure of transmitter from assigned frequency.

**frequency pairing** Association of each VOR frequency with a specific DME channel to reduce workload and errors.

**frequency parameter** Ratio of airspeed to product of frequency of oscillation and representative length of oscillating system.

**frequency response** 1 Portion of EM spectrum sensed within specified limits of error.

2 Response as function of excitation frequency.

## frequency scanning

**frequency scanning** Pattern of radar-antenna movement formed by successive beams having different azimuth and frequency.

**frequency-selective** Response only to narrow frequency band.

**frequency-selective surface** Large family of frequency filters made up of band-pass or band-stop designs, eg loaded slots of various geometries, or doubly periodic arrays of metal elements or apertures in a conductive frame creating a plane-wave transmission with properties which are frequency-dependent. Fighter radomes are becoming treated with \*, on the outside [fragile] because internal \* could be destroyed by lightning strike.

**frequency shift-keying** System of telegraph signalling in which keyed signal imposes small frequency shift on carrier; frequency changes of received signal are converted to amplitude changes.

**frequency swing** Peak difference between maximum and minimum frequencies of FM signal.

**frequency tolerance** Extent to which carrier (or centre of emission bandwidth) is permitted to depart from authorized frequency because of instability.

**frequency-wild** Electric power system whose frequency is not stabilized but varies with rotational speed of generators.

**frequent flyer** Fare-paying passenger rewarded for being good customer. [Varies with carrier].

**FRES** Future rapid-effects system.

**Frescan** Frequency scanning.

**Fresnel lens** Form of echelon lens for generating parallel beam [familiarly used in lighthouses].

**Fresnel mirror** Two planar mirrors joined at one edge, angle between them being almost 180°, for generating interference fringes.

**Fresnel zone** Any spatial surface between transmitter and receiver, or radar and target, over which increase in distance over straightline path is equal to integer multiple of half wavelength. Loosely, the antenna near field.

**Frespid** Frequency response identification (software).

**FRET, Fret** First round effect[s] on target.

**fretting** Rubbing together of solid surfaces, esp. slight movement but high contact pressure.

**FRF** 1 Frequency-response function.

2 Flight-readiness firing.

**FRFC** Full-range flow control.

**FRFI** Fuel-related fare increase.

**FRGN** Foreign.

**FRH** Flap-retraction height.

**friction** Force generated between solids, liquids or gases opposing relative motion.

**friction coefficient** Friction (static, on point of relative motion, or dynamic) divided by perpendicular load pressing surfaces together.

**friction horsepower** Indicated horsepower minus brake horsepower.

**friction layer** Planetary boundary layer.

**friction lock** Device in which friction is used to prevent unwanted movement; eg of throttle levers. Usually adjustable up to a positive lock.

**friction range** For a given longitudinal trim setting, the range of airspeeds that can be flown stick-free due to FCS friction.

**friction wake** That downstream of streamlined non-lifting body.

## frontogenesis

**friction welding** Welding by rotating two parts together under load until surfaces are on point of melting and then forcing together to squeeze out joint material, simultaneously arresting rotation.

**Friendly** Functional requirement identification development methodology (Euret).

**friendly** Not hostile, contact positively identified as such (DoD).

**FRIG** Floated rate-integrated (or integrating) gyro.

**Frise aileron** Aileron having inset hinges and bevelled along upper leading edge; when lowered forms continuation of wing upper surface but when raised nose protrudes below wing, increasing drag and equalising aileron drag in banked turn.

**FRL** 1 Fuselage reference line.

2 Flyover reference location.

**FRM** 1 Failure-related mode.

2 Fault-report[ing] manual.

3 Flammability-reduction means [tank explosion].

**FRMALS** Fédération Royale Marocaine de l'Aviation Légère et Sportive [Rabat Chellah] (Morocco).

**FRMG** Forming (weather report).

**FRMN** Formation (weather report).

**FRMR** Frame reject[ion].

**FRMS** Fatigue risk management system.

**FRN** Federal Radionavigation Plan, to phase out non-satellite navaids from 2010 (US DoT).

**FRNG** Firing.

**FRO** Failure requiring overhaul.

**FROB** Failure Review Oversight Board.

**FROD** Functionally related observable differences.

**FROG** Free rocket over ground.

**frog** Free-fall sport-parachuting position with body horizontal face-down, arms stretched parallel horizontal and lower legs vertical.

**front** 1 Boundary at Earth's surface between two contrasting air masses; usually associated with belt of cloud and precipitation, and more or less sharp change in wind (see *cold* \*, *occluded* \*, *stationary* \*, *warm* \*).

2 Occupant of front cockpit of tandem-seat aircraft, especially if aircraft commander (colloq., usually US/NATO).

**frontal area** Projected cross-section area of body viewed from front.

**frontal attack** Air intercept which terminates with heading crossing angle greater than 135° (DoD).

**frontal weather** To be expected in front; clouds, rain, temperature variation and other phenomena.

**front casing** Where this term is used in connection with a turbofan engine, it means that position of the fan case actually surrounding the fan, designed to survive FBO.

**front course sector** That situated on same side of localizer as runway.

**front crew** This usually means pilots.

**front end** Various meanings, including (1) system location (actual geometry immaterial) where EDP program is developed, and editing, compiling and peripheral access take place. (2) Start of major design process, long before appearance of hardware.

**front enders** Flight crew members, esp. in military transport (colloq.).

**front ignition** Solid rocket motor with igniter at end of filling or grain furthest from nozzle.

**frontogenesis** Process which produces discontinuity in

**frontolysis**

atmosphere or increases intensity of existing front, generally caused by horizontal convergence of air currents possessing widely different properties.

**frontolysis** Process which tends to weaken or destroy a front.

**front stagnation point** See *forward stagnation point*.

**Fropa** Frontal passage.

**Frost** Fast read-out optical storage technology.

**frost** Small drops of dew which freeze upon contact with object colder than 0°C such as aircraft passing from cold air into warmer humid air. Glazed \* (rain ice) is layer of smooth ice formed by rain falling on object at below 0°C. Hoar \* is white semi-crystalline coating.

**frost point** Temperature of air at which frost forms on solid surface at same temperature.

**Froude efficiency** Basic element of propulsive efficiency:

$$\frac{2U}{V+U} \text{ where } U \text{ is TAS and } V \text{ is velocity of propulsive jet}$$

or propeller slipstream relative to the aircraft.

**Froude number** Non-dimensional ratio of inertial force to force of gravity for fluid flow; reciprocal of Reech number;  $N_{fr} = v^2/lg$ , where  $v$  is characteristic velocity and  $l$  characteristic length (may be given as square root of this ratio).

**frozen** No further design changes permitted.

**frozen smoke** Acoustic/thermal insulation [colloq. airogel said to be lowest-density semi-rigid material, able to support  $10^3 \times$  own mass].

**frozen stick** Terrifying situation in which pilot cannot overcome stick force needed to recover from steep dive.

**FRP** 1 Fibre-reinforced plastic[s] or plywood.

2 Flight-refuelling probe.

3 Fuselage replacement programme.

4 Federal radio navigational plan.

5 Fares and Rates Panel.

6 Full-rate production.

7 Fleet response plan.

**FRPA** Fixed reception pattern antenna.

**FRPC** Federal Research and Production Centre, [English rendition] (R).

**FRQ** Frequent, frequency.

**FRR** 1 Flight-readiness review.

2 Final readiness review.

**FRS** 1 Fan rotation speed ( $N_1$ ).

2 Fighter, reconnaissance, strike (role prefix, UK).

3 Fleet Replacement Squadron (USN, USMC).

4 Flying Refresher School (RAF).

5 Field Repair Squadron (RAF).

6 Flammability reduction system.

7 Flight reconstruction system (FOQA).

**FRSI** Flexible reusable silica, or surface, insulation.

**FRST** Frost.

**FRTO** Flight radio-telephony operator.

**FRTOL** 1 Flight radio temporary operating license.

2 Flight R/T operator licence (UK).

**FRTV** Forward repair and test vehicle.

**FRU** 1 Forward Repair Unit (RAF).

2 Fleet Requirements Unit (RN).

**fruiting** SSR responses of aircraft to interrogation by other stations or responses of different aircraft to interrogation by other stations, in either case not synchronized with desired response by aircraft interrogated by own station; hence defruiting usually simple.

**fruit salad** Impressive rows of medal ribbons (UK, colloq.).

**FRUSA** Flexible rolled-up solar array.

**FrW** Friction welding.

**FRWD** Fast-reaction weapons demonstration.

**FRZ** 1 Freeze (information or display).

2 Flight Restricted Zone [e.g. within 15 n.m. of Washington Reagan] (FAA).

**FS** 1 Fuselage station.

2 Frame station.

3 Fail-safe.

4 Fighter Squadron.

5 Front spar [often F.S.].

6 Flight simulator.

7 Feasibility study.

8 Full-supercharge gear.

9 Factor[s] of safety.

10 French standard [approach lighting].

**Fs** Fractostratus.

**f<sub>s</sub>** 1 Signal frequency.

2 Shear stress [up to near u.t.s.].

**f<sub>fs</sub>** Not acceptable for ft/s.

**FSA** 1 Final squint angle.

2 Force-structure aircraft (US).

3 Fuel-savings advisory; S adds system and see *FSA/CAS*.

4 Frequency-spectrum availability.

5 Future strike aircraft (USAF).

6 Flight-spoiler assembly.

**FSA** Flight simulator for advanced aircraft (NASA).

**FSA/CAS** FSA (3) cockpit avionics system.

**FSAF** Future surface-to-air family (title often in French) (Int.).

**FSAGA** First sortie after ground alert.

**FSAS** 1 Fuel-savings advisory system.

2 Flight-service automation system.

**FSAT** 1 Full-scale aerial target.

2 Federal service of air transport (R).

**FSB** 1 Fan-stream burning.

2 Fasten seat-belts.

3 Flight Standardization Board (US).

4 Federal security service (R).

**FSC** 1 Force-sensing control[er].

2 Fuel-saving[s] computer.

3 Forward shaped-charge warhead.

4 Flight Safety Committee (UK).

5 Flight-safety critical.

**FSCC** Flap/slat control computer[s].

**FSCL** Fire-support co-ordinating line.

**FSCM** Federal supplier [or supply] code of manufacturer, or for manufacturers (US).

**FSCP** Flap/slat control processor.

**FSCRS** Flight-safety confidential reporting system [not same as Chirp].

**FSCTE** Fire Service Central Training Establishment (UK).

**FSD** 1 Full-scale deflection.

2 Full-scale development.

3 Federal Security Director (TSA).

4 Full-spectrum dominance.

5 Flying scholarships for the disabled.

6 Specification prefix for aero gas turbine fuels and lubricants (Sweden).

**FSDG** Fan-shaft-driven generator.

**FSDO**

- FSDO** Flight Standards District Office (FAA).
- FSDPS** Flight service data-processing system (FAA).
- FSE** 1 Fleet-supportability evaluation.  
2 Field-service engineer, or evaluation.
- FSED** Full-scale engineering development.
- FSEM** Flight Simulator Engineering and Maintenance Conference [Annapolis, MD21401] (US).
- FSEO** Fire Support Element Officer (MAOCC).
- FSEU** Flap/slat electronics unit.
- FSF** 1 Flight Safety Foundation ['provides leadership to over 600 member organisations in 75 countries'; main office, Alexandria, VA22314-1756] (US, Int.).  
2 Svenska Flygsporthörbundet (Sweden).  
3 Full-scale fatigue; S adds specimen, T test.  
4 Forward Supply Flight (RAF).
- FSG** 1 Fluid-sphere gyro.  
2 Fans stakeholder group.  
3 Flight Simulation Group (RAeS, C adds Committee).
- FSI** Field service instruction.
- FSII** Fuel-system icing inhibitor.
- F-Sims, FSIMS** Flight-safety information-management system.
- FSK** Frequency-shift keying.
- FSL** 1 Full-stop landing, aircraft brought to halt.  
2 Forecast Systems Laboratory (NOAA).  
3 Fast serial link.
- FSM** Flight schedule monitor.
- FSME** Flight structural-mode excitation.
- FSN** 1 Factory serial number.  
2 Federal stock number.  
3 Field-service notice.  
4 French-speaking nations.
- FSO** 1 Free-space optical (USAF).  
2 Front-sector optronics.
- FSOL** Flight-safety occurrence list.
- FSOV** Fuel shut-off valve.
- FSP** 1 Flight [progress] strip printer.  
2 Flexible sustainment program.  
3 Fragment-simulator projectile (test of armour).  
4 Function signalling panel.  
5 Flir-stabilized payload.  
6 Flight-screening program (USAF).
- FSPF** Military production authority (Iraq).
- Fspil** Inlet spillage drag correction.
- FSPM** Flight-strip printing module.
- FSP/UPT** Flight-screening program and undergraduate pilot training (USAF).
- FSQP** Feasible sequential quadratic programming.
- FSR** 1 Frequency set-on receive; S adds system.  
2 Field-service representative.  
3 Flight safety reporting.  
4 Further special refit.
- FSRI** Florida Space Research Institute (Federal funding, US).
- FSRS** 1 Frequency-selective receiver system.  
2 Flight-safety recording system.
- FSS** 1 Flight Service[s] Station (FAA).  
2 Flight Standards Service (FAA).  
3 Flying Selection, or Support, Squadron (RAF).  
4 Frequency-selective surface[s].  
5 Fixed satellite service[s], or fixed-service satellite.  
6 Micro class, single-seat.  
7 Fire-suppression system.  
8 Flow-separation suppression; E adds element.

9 Flight-support system.  
10 Flight Superintendent, Simulators.

**FSSP** Forward-scattering spectrometer probe.

**FSSR** Federal Safety Standard Regulations.

**FST** 1 Flight-simulation test.

2 Fuel-spike test.

3 Full-scale tunnel.

4 Fuel-system trainer (F-22).

**FSTA** Future strategic tanker aircraft.

**FSTP** Full-spectrum threat protection.

**FSU** 1 Flir sensor unit.

2 File server unit.

**Fsu** Ultimate shear strength.

**FSVL** Fédération Suisse du Vol Libre (Switzerland).

**FSVT** Federal service of air transport; equivalent to FAA (R).

**FSW** 1 Forward-swept wing.

2 Friction-stir welding.

**FT** 1 Fault-tolerant.

2 Fast-track.

3 Fourier transform.

4 Functional test.

5 Terminal forecast.

6 False target; G adds generator, I imagery, LO lock-on, R rejection.

7 Feet [confusing].

**F-T** Flight-time (diagram).

**ft** Foot, feet.

**f(t)** Function of time.

**FTA** 1 Fatigue-test article.

2 Fast tactical attack.

3 Fire-track area.

4 Fault-tree analysis.

**FTAAS** Fast-time acoustic-analysis system.

**FT-ADIR** Fault-tolerant air-data inertial reference; S adds system, U unit.

**FTAE** First-time-around echo.

**FTAJ** Frequency/time ambiguity jamming.

**FTB** Flying, or flight, testbed.

**FTC, ftc** 1 Fast time constant.

2 Federal [and also Fair] Trade Commission (US).

**ftc** Foot-candle [contrary to SI].

**FTCA** Future Tactical Combat Aircraft.

**FTCCP** Flight-training candidates checks program (US Dept. of Justice).

**FTD** 1 Field Training Detachment (USAF).

2 Foreign Technology Division (USAF).

3 Flight-training device[s].

4 Flight-test development [usually preceded by pre-], or display.

**FTDC** Fault-tolerant distributed computing.

**FTDW** Flying Training Development Wing (RAF).

**FTE** 1 Flight-test engineer.

2 Flight technical error.

3 Full-time equivalent (personnel).

**FTEP** Full-time error protection.

**FTESS** Fixed trailing-edge secondary structure.

**FTF** Flygtekhniska Föreningen (Sweden).

**FTG** 1 False-target generator.

2 Fitting.

**FTH** 1 Full-throttle horsepower.

2 Further.

**FTI** 1 Fixed time interval.

2 Fixed target imagery, or indicator, or indication.

- 3 Fast tactical imagery.  
 4 Flight test instrumentation.  
 5 Fictional threat image.  
 6 Flight-training instructor.  
 7 Association of aeronautical engineers (G).  
 8 Flight-time integration.  
 9 Federal Telecommunications Infrastructure (FAA).
- FTIR** Fourier transform of IR [S adds spectroscopy].
- FTIT** Fan-turbine inlet temperature.
- FTK** Freight tonne-kilometre(s).
- ftL** Foot-lambert (non-SI unit of luminance or brightness).
- ftL, FTL** Flight-time limitation.
- FTLB** Flight-Time Limitation Board (UK).
- FTLO** 1 Fast-tuned local oscillator.  
 2 False-target lock-on.
- FTM** 1 Frequency/time modulation.  
 2 Flight-test mission objective(s).  
 3 Fleet technical management.
- ft/min** Feet [climb or descent] per minute.
- FTNW** Future tactical nuclear weapon.
- FTO** 1 Flexible take-off.  
 2 Flying training organization.  
 3 Federation of Tour Operators (UK).
- FTP** 1 Functional test, procedure.
- FTPP** Fault-tolerant power panel.  
 2 File transfer protocol.
- FTR** 1 Failed to return.  
 2 Flat-tyre radius.  
 3 False-target rejection.  
 4 Future transport rotorcraft.
- Ftr** Fighter.
- FTRG** Fleet Tactical Readiness Group (USN).
- FTS** 1 Flying Training School.  
 2 Fatigue-test specimen.  
 3 Federal Telecommunications System.  
 4 Flexible turret, or track, system.  
 5 Flight termination system (UAV).
- ft/s** Feet per second, which see for conversions.
- FTSA** 1 Fault-tolerant system architecture.  
 2 Fédération Tunisienne des Sports Aériens [office, Tunis 1001] (Tunisia).
- FTSC** Fault-tolerant spacecraft (or spaceborne) computer.
- FTTU** Fliegender Technologie-trager unbemannt = unmanned technology testbed (ETAP).
- FTU** 1 Forward transmitter unit.  
 2 Ferry Training Unit (RAF).  
 3 Formal Training Unit (USAF).
- F<sub>tu</sub>, F<sub>TU</sub>** Ultimate tensile strength; F often italic.
- FTV** Flight test vehicle.
- FTW** Follow-through warhead.
- FTX** Field training exercise.
- F<sub>ty</sub>** Yield strength in tension.
- FTZ** Foreign trade zone, secure duty-free area at airport legally outside territory administered by local customs authority.
- FU** 1 Fuel uplifted.  
 2 Fire unit.  
 3 Forecast upper wind.
- FU, Fu** Smoke (ICAO).
- fu** Fuel used.
- FUA** Flexible use of airspace (UK, 2004–).
- FUCE** Far-ultraviolet camera experiment.

**fudge factor** Multiplying factor to allow for unknowns (colloq.).

**FUE** Full unit equipped.

**fuel** Substance used to produce heat by chemical or nuclear reaction; usual chemical reaction is combustion with oxygen from atmosphere or from rocket oxidant (see *kerosene, petrol, propellant*).

**fuel accumulator** Container for storing fuel expelled during starting cycle to augment flow momentarily at predetermined fuel pressure.

**fuel additive** Any material or substance added to a fuel to give it some desired quality; eg tetraethyl lead added as an anti-explosion ('knocking') agent.

**fuel advisory departure** Procedure to save fuel by holding aircraft prior to engine start, rather than at destination stack.

**fuel-air explosive** Selected liquid fuels which on warhead impact are scattered in fine cloud of large volume alongside target; this is then detonated (combining with atmospheric oxygen) less than 1 s after impact with blast effects generally greater than that of same mass of conventional explosives.

**fuel-air mixture analyser** Measures piston engine air-to-fuel ratio. Chemical \*\*\* measures absorption of CO<sub>2</sub> by substance such as sodium or potassium hydroxide; physical (electro-chemical \*\*\*) measures difference in electrical resistance between two sampling cells, one open to air and other to exhaust.

**fuel blending facility** One having authority to mix hydrocarbon fractions to produce piston or turbine fuels to specification, with correct additives.

**fuel burn** *Fuel consumption*.

**fuel bypass** Maintains fuel pressure in carburettor float chamber of supercharged piston engine at fixed level above carburettor air pressure.

**fuel capacity** Unless otherwise stated means actual volume of tank(s), not of system, and has no relevance to usable capacity.

**fuel cell** Device which converts chemical energy directly into electricity; differs from storage battery in that reactants are supplied at rate determined by electrical load.

**fuel chop** Sudden cutoff of supply, for whatever reason.

**fuel consumption** Measured on volume and mass basis; 1 mpg = 0.354 km/1 (UK), 0.425 km/1 (US); 1 gal/mile = 2.825 1/km (UK), 2.353 1/km (US); including payload, 1 tonne-km l<sup>-1</sup> = 2.868 UK ton-miles/UK gal; reciprocal is 0.348.

**fuel control and monitoring computer** Measures and indicates fuel volume and mass, controls refuelling to selected levels whilst monitoring pumps and valves, monitors and controls tank temperatures, and controls tank utilization sequence to minimize wing bending moment and control c.g.

**fuel control unit** Governs engine fuel supply in accordance with pilot demand, ambient conditions and engine limitations.

**fuel-cooled** Cooled by fuel, either en route to engine or recirculated back to tank (see *regenerative cooling*).

**fuel cost** Cost of fuel as proportion of total DOC, typically [all gas-turbine aircraft] 20 to 25 per cent.

**fuel cut-off** Device for cutting off the supply of metered fuel to cylinders or a combustion chamber.

**fuel dipper** Automatic adjustment of fuel flow to turbine

## **fuel dumping**

engine, usually triggered to reduce flow at specific time, eg when firing guns or when any kind of upset disturbs inlet airflow to cause rapid rise in TGT.

**fuel dumping** Release of fuel in flight to bring weight down to MLW in emergency.

**fuel flowmeter** See *flowmeter*.

**fuel-flow regulator** Central element of gas-turbine engine CASC, driven by engine and incorporating two governors, pressure-drop and speed control, and two variable-orifice sliding valves, the VMO and the PDC (6).

**fuel grade** Quality of piston engine petrol (gasoline), esp. as defined by anti-knock rating; previously called octane number. Usual grades are 80 (dyed red), 100 (green), 100L (green or blue, lower TEL content) and 115 (purple).

**fuel injection** Inevitable in diesel or compression-ignition engines; term normally refers to Otto-cycle piston engine with mechanical injection of measured quantities of fuel either into carburation induction system or directly to cylinders. Unlike carburettor, \*\* unaffected by aerobatic or evasive manoeuvres and not prone to icing or fire hazards.

**fuel jettison** Rapid discharge of fuel from aircraft in emergency.

**fuel-jettison time** That required to reduce weight from MTO to MLW.

**fuel lag** Deliberate short delay in injection of one propellant into rocket thrust chamber to establish particular ignition sequence.

**fuel-lubricated** Use of aircraft fuel as sole lubricant of a [usually rotating] item; usually the item is designed to continue to run in the absence of fuel.

**fuel manifold** Peripheral main pipe with branch pipes distributing fuel to all burners of gas turbine.

**fuel metering unit** In modern gas-turbine aircraft, the [usually electronic] device which responds to signals from the EEC to modulate fuel flow according to engine demand. Part of a Fadec, if this is fitted.

**fuel nozzle** In a gas turbine engine these atomise or vapourise the fuel to ensure very rapid burning in a short linear distance; see *Simplex*, *Duplex*, *Lubbock*, *airspray*, *vaporizing*.

**fuel-pressure switch** Ensures full current is not applied to electric starter until fuel pressure has reached predetermined level.

**fuel pump** In a traditional piston-engined aircraft, usually a single gear-type pump driven by the engine, often supplemented by a priming pump operated manually. In a modern jet aircraft, usually an electrically driven LP pump (often called a tank booster pump), commonly inducer+centrifugal, delivering to an HP on the engine (commonly gear type driven off the engine HP shaft). Other \* include the *ejector pump*.

**fuel-quantity indication** Simple aircraft still often use a float-type gauge, but most fuel systems have one or more capacitance or ultrasonic probes in each tank, their output being shaped and summed electronically to convert level to mass.

**fuel savings advisory** Provides command to pilots using flight-path optimization algorithms and Flight Manual data for L/D and thrust. An additional mode can be preset for T-O/ldg parameters.

**fuel shift** Gross long-term movement of fuel [eg, caused by prolonged steep climb], can be very dangerous.

**fuel shut-off** See *cut-off*.

## **full-pressure suit**

**fuel sink** Total heat capacity of fuel as receptacle for surplus onboard energy; unit should be J.

**fuel sloshing** Gross short-term movements of fuel or oxidant in part-empty tank.

**fuel spike test** Tests engine surge margin.

**fuel starvation** Fuel in tank[s] is for some reason prevented from reaching engine[s].

**fuel state** The precise quantity of fuel in the tank[s] of an aircraft; quality of the fuel is irrelevant.

**fuel tank** See *bag tank*, *integral tank*, *rigid tank*, *drop tank*.

**fuel tester** Hand-held transparent tube, incorporating slot-head and Phillips-head drivers, for checking contamination.

**fuel trimmer** An adjustment on gas-turbine fuel control to achieve a precise value of N<sub>2</sub> (NPC), adjusted to ISA sea-level for a particular engine, repeated after major overhaul and recorded on data plate.

**fuel vent** Small pipe used to equalize pressure inside and outside tank.

**FUF** Favourable unbalanced field.

**fupo, FUFO** Full-fuzing options (NW).

**FuG** Radio equipment (G).

**fuh** Fuel mass at given height (usually rocket).

**Führer weather** Sunshine, blue sky (WW2 Luftwaffe).

**Fu L, FuL** Fuhrungsstab der Luftwaffe (G).

**full annealing** Heating above critical temperature, or crystalline-transformation point, followed by slow cooling through range of transformation; results in relief of residual stress, greater ductility, increased toughness but lower strength.

**full-authority control** Control system, today usually electronic but could be fluidic, which provides complete management function [of engine(s), system(s), or complete aircraft], with pilot serving as passive observer. Early example is Fadec, from which FAFC differs in lacking transient control intelligence, eg to control compressor airflow.

**full flight regime** Designed to operate throughout each flight, eg FFR autothrottle.

**full-flight simulator** Provides total reproduction of flight deck, qualified to FAA Level D.

**full-flow oil system** Gas-turbine [usually advanced turbofan] lubrication system without a pressure-relief valve, filters and coolers being protected against extreme pressures by bypasses.

**full fuzing options** For NW, air drop, air burst, ground burst, contact burst, time-delay after parachute-retarded, laydown retarded or free-fall.

**full house** No parking stand left at terminal.

**full indicator movement** Micrometer readings may be taken at any point on a part being measured.

**full lateral** Describes FMC or FMS (1) exercising total authority via AFCS from just after takeoff until final approach.

**full mission trainer** Simulator capable of duplicating complete mission [initially for F-22] with any malfunction; can network with others.

**full performance level** Category of most highly qualified air traffic controllers (FAA 1).

**full-pressure suit** Completely enclosing wearer's body and able to sustain internal gas pressure convenient to human functions (see *partial pressure suit*, *water suit*, *spacesuit*).

## full rudder, aileron or elevator

## fusible plug

**full rudder, aileron or elevator** Hard-over demand signal by pilot or flight-control system moving surface to limit of travel.

**full-scale aerial target** Expendable target for air-combat training with size similar to manned fighter. Invariably means a retired fighter converted as an RPV.

**full-scale development** Period when system or equipment and items for its support are tested and evaluated; intended output is pre-production system which closely approximates final product, documentation for production phase, and test results which demonstrate product will meet requirements (USAF).

**full-scale tunnel** Wind tunnel for testing complete aircraft.

**full-span stall** 1 In the case of a wing, self-explanatory, a stall extending from tip to root, or root to tip.

2 In an axial compressor, a stall affecting the full radial dimension (span) of each rotor and stator blade.

**full-wave rectifier** Two elements in split circuit rectify both positive and negative halves of waveform, currents combining unidirectionally at output.

**fully active** See *active*.

**fully developed flow** Flow of viscous fluid over solid surface on which boundary layer has reached full thickness and velocity distribution remains constant downstream.

**fully expanded nozzle** Normally, nozzle of jet engine, esp. rocket, whose supersonic divergent portion expands jet to ambient pressure at exit plane.

**fully factored** Multiplied by ultimate factor of safety.

**fully FBW** No mechanical backup, because aircraft could not be flown manually.

**fully feathering** See *feathering*.

**fully grown dimension** Dimension of part after process that results in enlargement, esp. high-temperature creep under tensile load.

**fully ionised plasma** All neutral particles have lost at least one electron. With hydrogen no further ionisation is possible; other atoms can be further excited.

**Fulta** Federazione Unitaria Lavoratori Trasporti Aereo (I).

**Fulton system** Folding recovery system on nose of aircraft for retrieving space capsules and other parachuted loads in mid-air; used in modified form for repeated pick-up of persons or other loads from ground.

**fumble factor** Factor of safety.

**Functional Airspace Block** Newly created national parcels of European airspace intended to replace inefficient national airspaces (Single European Sky).

**Functional Hazard Analysis** Standardised procedure for examining all kinds of failure and considering their actual or potential ultimate effects, categorised as: catastrophic [ $<1 \times 10^{-9}$  per flight hour], hazardous [ $<1 \times 10^{-7}$ ], major [ $<10^{-5}$ ] or minor [ $<1 \times 10^{-3}$ ].

**functionally shaped controls** Manual controls shaped to confirm their function, eg terminating in miniature wheel or flap.

**fundamental frequency** 1 Of periodic quantity, lowest component frequency of sinusoidal quantity which has same period.

2 Of oscillating system, lowest natural frequency; normal associated mode of vibration is fundamental mode.

3 Reciprocal of period of wave.

4 Lowest resonant antenna frequency without added inductance or capacity.

**fundamental units** Mass, length and time, from which all other units are derived. Main systems in use are SI, foot-pound-second, centimetre-gramme-second and metre-kilogramme-second.

**funding** Process of finding and securing political approval for sums of money needed for military programmes (US).

**fungus** Generalised term for life-forms growing at fuel/air interface in tank.

**funicular polygon** See *force diagram*.

**funk** General term for com. radio (G).

**funnel** 1 Safe approach area centred on ILS glidepath and normally considered to extend  $0.5^\circ$  above and below and  $2^\circ$  left and right; aircraft inside \* should be able to land.

2 Pre-1950 term for final approach area to runway, esp. any lighting or other guidance system for channelling aircraft to runway.

**fu<sub>0</sub>** Fuel mass at liftoff.

**FUR** Future utility rotorcraft.

**furaline** French rocket fuel; aniline with traces of anti-corrosive additive.

**furlong** Non-SI unit of length, = 201.168 m.

**furlough** 1 Leave of absence (holiday with pay) from armed forces (US).

2 Laying off (holiday without pay) from airline during traffic downturn or from similar cash-strapped employer (US).

**furnishing** Non-structural cabin interior trim, seats, galley, toilet, baggage racks and associated features in commercial aircraft.

**furnishing mock-up** Whole or part of cabin prepared for particular customer's evaluation and refinement.

**FUS** 1 Far-UV spectrometer.

2 Flexible use of airspace.

**FUSE** Far-UV Spectroscopic Explorer.

**fuse** Linkage in operating system or structure so designed that, if the system or structure becomes overloaded, it fails at this place. Without a suffix, a weak link in an electrical circuit, usually a conductor with a low MPt. Not to be confused with *fuze*.

**fuse bolt, fuse pin** Mechanically weak link at a point of high stress in a structural system, such as attachment for engine or landing gear.

**fusee** Pyrotechnic squib installed in solid-propellant case to ignite charge over whole length.

**fuselage** Main body of an aerodyne, absent in all-wing designs; when tail is attached to booms, called nacelle; with planing bottom called hull.

**fuselage dihedral effect** Effect of the fuselage on roll stability in sideslip, generally positive with a high wing.

**fuselage number** Identity of aircraft (R, USSR).

**fuselage reference line** Straight line used as reference from which basic dimensions are laid out and major components located; usually along plane of symmetry and at convenient height.

**fuselage shielding** Disturbance to normal ram airflow into side-mounted intake to fuselage engine in yawed flight.

**fuse pin** Strong non-redundant pin attaching engine, or engine pylon, to airframe.

**fusible plug** Several types, most important being fitted in

main landing wheels; if temperature rises to dangerous value (at which tyre could burst) after excessive braking, \*\* blows and releases pressure in controlled manner.

**fusion** 1 So-called thermonuclear process whereby nuclei of light elements combine to form nucleus of heavier element, releasing very large amounts of energy; can be controlled and sustained.

2 Collection and integration of outputs from all of a range of sensors and warning systems, hence *IDF*.

3 Generally, data processing.

**fusion bomb** One using energy of thermonuclear fusion.

**fusion power density** Power generated per unit volume in controlled thermonuclear plasma; using deuterium at  $10^{16}$  particles/ml and 60 kV, \*\*\* is about 1 kW, as kinetic energy of reaction products.

**fusion reactor** Reactor in which thermonuclear fusion takes place.

**fusion welding** Fusing edges of two base metals by using a welding flame to melt edges of metals, and a welding rod, which is similar in composition, to fuse or weld two metals together.

**FUSS** Flaps-up safety speed.

**future air-navigation systems** Wide range of incoming navaids including satnavs, Glonass, GNSS, FMS, FNC, new R-navs and Mode-S.

**future cycle accumulation** Number of LCF or operating (mission) cycles operator plans to accumulate on given hardware.

**FUV** Far ultra-violet.

**fuze** Device or mechanism designed to start detonation of high explosive under proper conditions of heat, impact, sound, elapsed time, proximity, external command, passage of electric current or other means, and usually without danger of detonation before weapon is armed.

**fuzzy logic** Programming based on instructions not precisely specified numerically but on best estimates between 0 (false) and 1 (true).

**FV** 1 Flight visibility.

2 Prefix to three-figure designators of alloys [mainly stainless steels] developed by Firth-Vickers (UK).

3 Finite volume [mesh code].

**FVA** Federación Venezolana de Aeroclubes (Venezuela).

**F<sub>VAC</sub>** Vacuum thrust.

**FVB** Fleet Viability Board (USAF).

**FVC** Forebody vortex control [T adds technology].

**FVD** Fluorescent vacuum display.

**FVLPR** Hang-gliding federation (Puerto Rico).

**FW** 1 Fiscal week.

2 Fixed wheel (sailplane).

3 Failure warning.

4 Filament-wound, see *filament winding*.

5 Fighter Wing (USAAF, USAF).

6 Frequency-wild.

**f.w.** Full wave.

**FWA** Flight watch area.

**FW&A** Fraud, waste and abuse.

**FWC** 1 Filament-wound cylinder, or case.

2 Flight, or fault, warning computer.

3 Flight watch centre.

**FWCS** Flight-watch control station.

**FWD** Falling-weight deflectometer.

**fwd** Forward.

**FWE** 1 Foreign weapons evaluation (US).

2 Fighter Wing Equivalent.

**FWETE** Foreign weapons equipment technology evaluation (US DoD).

**FWF** Firewall forward, the engine compartment of single-engine tractor aeroplane.

**FWHM** Full wave, half modulation.

**FWOC** 1 Forward wing operations centre (RAF).

2 Fleet Weather & Oceanographics Centre (UK).

**FWS** 1 Fighter Weapons School (USAF).

2 Flight warning system.

3 Fire warning system.

4 Filter wedge spectrometer.

**FWW** Fighter Weapons Wing.

**FWWS** Food, water and waste subsystems.

**FX** Fuel type unspecified.

**F<sub>x</sub>** Helicopter aerodynamic force parallel to plane of rotor disc [disk].

**f(x)** Function of x (math).

**fXML** Federated extensible markup language.

**FY** Fiscal year; US government runs 1 Oct. to 30 Sept.

**F/Y** First-class and economy or tourist.

**FYDP** 1 Five-year defence plan.

2 Future years defense program(US).

**FYDS** Flight director/yaw-damper system.

**F/Y ratio** Fission/yield ratio.

**F<sub>Z</sub>** Helicopter aerodynamic force normal to plane of rotor disk [disc].

**FZ, FZG** Freezing; **FZDZ** freezing drizzle, **FZFG** fog,

**FZRN** rain.

**fZ** Transverse VSI (magnetic) component.

**FZP** Fresnel zone plate.

# G

- G** 1 Giga, multiplied by  $10^9$ .  
 2 Geostrophic force.  
 3 Geared (US piston engines).  
 4 Universal gravitational constant =  $6.6705 \times 10^{-11}$  Nm $^2$ kg $^{-2}$ .  
 5 Stress imposed on body due to applied force causing acceleration.  
 6 Gun (US DoD).  
 7 Shear modulus, rigidity.  
 8 Aircraft category, single-engine transport (USN 1939–42).  
 9 Aircraft category, glider (USA 1919–26 and USAF 1948–55).  
 10 Aircraft category, gyroplane [autogiro] (USAAC 1935–39).  
 11 Role prefix, air-refuelling tanker (USN 1958–62).  
 12 Role prefix, parasite carrier (USAF 1949–55).  
 13 Status prefix, permanently grounded (US from 1924).  
 14 Guard (suffix to serial on secret aircraft, UK, or to radio frequency).  
 15 Uncontrolled (airspace).  
 16 Green.  
 17 Gust[s].  
 18 Ground control.  
 19 Gain (radio).  
 20 Group.  
 21 Geschwader (G).  
 22 Sonobuoy size 419-mm long.  
 23 Conductance (also Ω); unit, siemens.  
 24 Graphite.  
 25 Gauss.  
 26 Generator.  
 27 Record category: parachuting (FAI).  
**g** 1 Acceleration due to Earth gravity, international standard value being  $9.80665 \text{ m/s}^2$ , assumed at standard sea level in atmosphere; often *g*, italic.  
 2 Gram[me]s.  
 3 Grid.  
 4 Suffix, gauge pressure.  
 5 Suffix, height AGL.  
**G<sup>3</sup>** Gadolinium-gallium garnet.  
**°G** Grid [degrees].  
**g-break** Sudden change of aircraft trajectory away from previous straight line in lateral or upward direction, eg following fast low-level run over airfield before landing.  
**G-display** Rectangular, target is at centre (when radar aerial is aimed at it) and grows lateral ‘wings’ as range is closed; aiming errors result in appropriate displacements of blip from centre.  
**g-force** Inertial force, that needed to accelerate mass, usually expressed in multiples of gravitational acceleration.  
**G-layer** Layer of free electrons in ionosphere occasionally observed above F<sub>2</sub> layer.  
**g-loc** Pilot blackout and LOC induced by severe and sustained vertical acceleration.  
**g-meter** Indicates acceleration, usually in vertical plane.  
**G-seat, g-seat** Seat simulating Z-axis acceleration, occupant normally wearing g-suit.  
**G-Star** A spatial temporal anti-jam receiver for GPS-guided weapons.  
**g-suit** Worn by pilot or astronaut; exerts pressure on abdomen and lower parts of body to prevent or retard collection of blood below chest under positive acceleration. Not necessarily pressure suit.  
**g-tolerance** Tolerance of subject, human or device, to acceleration of specified level and duration. In case of human, usually vertical [head/toe direction].  
**GA** 1 General aviation.  
 2 Gas analysis.  
 3 Gimbal angle.  
 4 Group accounting.  
 5 See *general-arrangement drawing*.  
 6 Go-around.  
 7 Military code for lethal nerve gas developed (G, 1937) as Tabun.  
 8 Ground attack aircraft category (USA 1919–24).  
 9 Goggle autoejector.  
 10 Grazhdanska Aviatsiya, civil aviation (R).  
 11 Grid amplifier, or array.  
 12 Genetic algorithm[s].  
**G/A** 1 Ground to air.  
 2 Glycol/alcohol.  
**G<sub>a</sub>** In flight-control channel, the equivalent transfer function for differential ailerons.  
**GAA** 1 General Aviation Association, [office, Bankstown, NSW] (Australia).  
 2 General Aviation Alliance [October 2004-] (UK).  
 3 Grid-array amplifier.  
**GAAA, GA<sup>4</sup>** Global Airline Alliance Adherence Agreement (Int.).  
**GAAC** 1 General Aviation Awareness Council [at RAeS, London W1J 7BQ] (UK).  
 2 General Aviation Airports Coalition (US).  
**GAACC** General Aviation Airworthiness Consultative Committee (UK).  
**GAAP** Generally accepted accounting principles.  
**GaAs** Gallium arsenide.  
**GAATS** Gander automated air-traffic system.  
**GAC** 1 Gust-alleviation control.  
 2 Go-around computer.  
**GACA** General Authority of Civil Aviation (Saudi Arabia).  
**GACC** 1 Ground-attack control capability.  
 2 General Aviation Consultative Committee (CAA, UK, from 1997).  
**GACS** Generic ATN com. service.  
**GACW** Gust above constant wind.  
**gadget** Code, radar equipment; type of equipment indicated by letter, followed by colour to indicate state of jamming: green \*, clear; amber \*, sector partially jammed; red \*, sector completely jammed; blue \*, completely jammed (DoD).  
**GADO** General Aviation District Office (FAA).  
**gadolinium** Lanthanide metal, Gd, isotopes are alpha-emitters.

**GADS** Generic aircraft display system.

**GAF** German air force [UK usage].

**Gafact** German air force ATM co-ordination tool.

**Gafor** General-aviation forecast for VFR, met. briefing service in many European countries.

**GIA/G** Ground to air to ground.

**gage** Gauge (US).

**gaggle** Group of aircraft (say, five to 20) flying together but with no semblance of formation.

**GAIN, Gain** Global aviation [or analysis and] information network (US, collects safety information).

**gain** 1 General term for increase in signal power in transmission, usually expressed in dB.

2 Increase or amplification; antenna \* (\* factor) is ratio of power transmitted along beam axis to that of isotropic radiator transmitting same total power; receiver \* (video \*) is amplification by receiver. Calculation for radars is usually equal to area of sphere of unit radius divided by area subtended on that sphere by solid angle equal to the 3-dB beam.

**Gains, GAINS** GPS air-data [or aided] laser inertial navigation system.

**GAIS** General ATC information system [mainly Wx].

**GAIT** 1 General aviation infrastructure tariff (Australia).

2 Ground-based augmentation and integrity.

**gaiter** Fireproof flexible cover over a pipe or tube, e.g. to prevent ingress of abrasive dust.

**Gal, gal** Non-SI unit of small acceleration, gal (Galileo) =  $10^5 \text{ ms}^{-2}$  = 1,000 mgal.

**gal** Gallon, type not specified.

**GALAT, Galat** Groupement Aviation Légère de l'Armée de Terre (F).

**GALCIT** Guggenheim Aeronautical Laboratory, Caltech.

**galena** Lead sulphide, PbS, used in IR cells.

**Galarkin** One of the most rigorous methods of solving structural dynamics problems.

**gallery** 1 Gas-turbine fuel manifold.

2 Fluid conduit formed within three-dimensional volume of material, eg drilled through body of pump.

**galley** Aircraft kitchen with provision for heating prepacked meals.

**galling** Pitting or marring of finished surface, esp. bearing surface, because of fretting.

**gallium** White metal, Ga, density 5.9, MPt 29.78°C, \*-68 radionuclide of half-life 68 min.

**gallon** Non SI unit of liquid volume. Imperial \* = 4.546087 litres = 277.42 cu in = 1.20095 US \*, US\* = 3.785412 litres = 231 cu in by definition = 0.83267 Imperial \*.

**galvanic corrosion** Electrolytic action caused by contact of dissimilar metals or formation of oxygen cell in contact with metal.

**galvanising** Coating of metal, esp. steel sheet, by dipping in bath of molten zinc; protects from galvanic corrosion.

**galvanometer** Instrument which measures electric current passed through pivoted coil in magnetic field. With shunted external resistance, used as ammeter; with series resistance, voltmeter.

**GAM** 1 GPS-aided munition[s].

2 Ground-attack missile.

3 Ground-to-air missile, = SAM.

4 German army [UK usage].

**GAMA** General Aviation Manufacturers' Association Inc. [1970-; office, Washington, DC20005] (US).

**GAMAA** Gate management and airport analysis (software).

**Gambica** Association for the instrumentation, control and automation industry [London SE1 7SW] (UK).

**Gambit** General anti-material [US materiel] bomblet with improved terminal effects.

**GAME** Generalised automated maintenance environment (USN).

**Game** GPS approach-minima estimator.

**Games** GPS anomalies monitoring equipment suite.

**GAMM** Generalised air (or airlift) mobility model, baseline study using real military cargo spectrum (USAF, USA).

**gamma** 1  $\gamma$ , ratio of specific heats of gas.

2 Logarithmic function; ratio of contrast of transmitted scene to that of received display.

3 Flight path angle.

4 SI unit of very small changes in magnetic flux density; \* (not abbr.) = 1nT.

**gamma,  $\gamma_1$**  Ratio of viscous damping to critical damping.

**gamma plot** Flight path angle plotted against airspeed.

**gamma rays** High-energy, short-wavelength EM radiation; very penetrating, similar to X-rays but nuclear in origin and usually more energetic. Symbol  $\gamma$ .

**GAMS** General airline management simulation.

**Gamta, GAMTA** General Aviation Manufacturers and Traders Association [merged 2004 into BBGA, staying in same Aylesbury office] (UK).

**GAN** Global area network.

**GaN** Gallium nitride.

**G&C** Guidance and control.

**gang drill** Series of drill presses in close proximity on one bed, or drills operated simultaneously through interconnected chucks.

**gang start** All [multiple] engines start simultaneously.

**gantry** Large crane for erection and servicing of launch vehicles; \* straddles vehicle and runs on tracks crossing launcher and work area.

**GANTT** General Agreement on National Trade and Tariffs.

**GAO** 1 General Accounting Office (US).

2 Government Accountability Office (US).

3 Groupe Aérien d'Observation (F).

**GAP/Gap** 1 General-aviation propulsion (NASA/industry).

2 GPS airborne pseudolite.

3 Ground-accident prevention (FSF).

4 Gas analysis package.

**gap** Distance between chords of any two adjacent superimposed wings of same aircraft, measured perpendicular to chord of upper wing at any point on its leading edge.

**GAPA** 1 Ground-to-air pilotless aircraft.

2 General Aviation Pilots' Association (US).

**Gapan** Guild of Air Pilots and Air Navigators [ 1 October 1929, livery company of City of London since 1936; office, London WC1R 5DJ] (UK).

**gap coding** Precise gaps in radio transmissions, or intervals of silence, used to represent letters, words or phrases.

**GAPCU** Ground and auxiliary power control unit, combines GPCU/APU-GCU.

**GAPE, Gape** General-aviation pilot education (FAA).

**gap-filler** Radar used to supplement long-range surveillance radar in area where coverage is inadequate.

**gaping** Discontinuity of skin profile caused by distortion or deflection of landing-gear doors, access doors and other separate panels intended to lie flush.

**gapless ice guard** 1 Fitted within intake mouth; used in conjunction with automatic alternative inlet.

**GAPP** 1 Geometric/arithmetic parallel processor, or processing.

2 Ground-accident prevention programme.

**gapped ice guard** Mounted forward of air intake to provide a gap which does not ice up.

**gapping** Gap [increased clearance, intended or otherwise] between TE of compressor rotor blades and LE of next stator.

**GAPS** Generic acoustic processing system (DSTL).

**gap-squaring shears** Tool used for squaring and cutting sheet metal; similar to squaring shears but able to slit long sheet.

**GAPU** Ground auxiliary power unit.

**GAR** 1 Ground abort rate.

2 Geopotential altitude range.

**GARA** General Aviation Revitalisation Act, passed by US Congress 1994 to limit manufacturers' product liability, especially for aircraft over 18 years old.

**garbage** 1 Miscellaneous hardware in orbit or deep space; usually material ejected or broken away from launch vehicle or satellite.

2 EDP (1) software or program which has been degraded or in any other way rendered imperfect or unreliable, or output therefrom.

**garbling** Indecipherable responses from two aircraft both at exactly same slant range of about 4 km (corresponding to 20.3 µs pulse interval) to SSR interrogation; caused by fact both sets of reply pulse trains are synchronised and superimposed (see *degarbling*).

**garboard strake** That section of plating on a seaplane hull which extends fore and aft and is adjacent to the keel.

**GARC** Groupe Aérien Régionale de Chasse (F).

**GARD** General address reading device.

**gardening** Aerial minelaying (RAF code name, WW2).

**Gardian** General area-defense integrated anti-missile laser.

**GARI** Ground acquisition receiver/interrogator.

**GARP** Global Atmospheric Research Programme.

**GARS** Gyrocompassing attitude reference system.

**Garteur** Group for Aeronautical Research and Technology in Europe.

**GAS** Global-positioning adaptive-antenna system.

**gas bag** Flexible gas container of rigid airship; also known as gas cell.

**gas-bag alarm** Indicates when predetermined gas-bag pressure has been reached.

**gas-bag net** Mesh of cordage or wire to retain bag in position.

**gas-bag wiring** Mesh of circumferential and longitudinal wiring enclosing each bag to take pressure and transmit lift.

**gas bearing** Bearing for rotating assembly, usually high-speed, in which all forces are reacted by dynamic forces generated in contained volume of dry filtered gas, often He or N.

**gas bleedoff** Bleeding-off of hot combustion gas from rocket engine for pressurizing or driving turbomachinery.

**GASC** Ground Air Support Command (USAAF).

**gas cap** Gas immediately in front of hypersonic body in atmosphere; compressed and heated, and if speed is sufficiently high becomes incandescent.

**Gasco** 1 General-Aviation Safety Council [formed 1965 as GAS Committee, office, Rochester Airport, ME5 9SD] (UK).

2 Ground Air Support Command (GASC was preferred).

**gascolator** Filter fitted at lowest point of fuel system [archaic US usage].

**gas constant** Constant factor R in equation of state for perfect gas;  $\text{kJ/kg K} = 185.863 \text{ ft-lbf/lb } ^\circ\text{R}; 8,314.34 \text{ J/kmol/K}$  for particular gas; specific  $** r = R/m$  where m is molecular weight (see *Boltzmann*).

**gas dynamics** Study of gases under high velocity, temperature, ionisation and other extreme conditions prohibiting compliance with aerodynamic laws.

**gaseous electronics** Study of conduction of electricity through gases, involving Townsend, glow and arc discharges, and collision phenomena on atomic scale.

**gaseous fuels** Those stored in aircraft in gaseous form, GH<sub>2</sub> being possible example (see *Blaugas*).

**gaseous rocket** Bipropellant or monopropellant rocket utilising gaseous fuel and/or oxidiser.

**GASF** General Aviation Strategy Forum [being formed 2006] (Europe).

**gas film** Boundary layer on inner surface of combustion chamber.

**gas generator** 1 Device for producing gases, hot or cold, under pressure. In some tip-drive helicopters \* comprised gas-turbine core engines.

2 Gas-turbine core engine, eg turbofan minus LP turbine and fan or turboprop minus LP turbine, gearbox and propeller.

3 Major component supplying working fluid for turbopump of liquid rocket engine.

**gash** Surplus, or pilfered (RAF, WW2).

**gas hood** Cowl or ports in outer cover of airship through which gas can escape from inside hull.

**gasifier** Machine for producing flow of hot gas, normally by combustion of fuel compressed by mechanism extracting energy from flow; free-piston and other systems but not gas turbine.

**Gasil** General-aviation safety information leaflet [published quarterly by CAA] (UK).

**gas laser** One in which lasing medium is gaseous, eg HeNe, CO<sub>2</sub>, Ar.

**gas laws** Thermodynamic laws applying to perfect gases: Boyle-Mariotte, Charles, Dalton, equation of state. Also called perfect or ideal \*\*.

**gas main** Fabric hose running length of airship and having branches to gas bags for inflation.

**gas misalignment** See *jet misalignment*.

**gas motor** Mechanical drive system energised by high-pressure gas from combustion of solid fuel, usually single-shot.

**gas oil** Residual hydrocarbon fuel left after distillation of gasolines and kerosenes from particular petroleum fraction. Can yield diesel oil and, by cracking, gasolines.

**gasoline** Blends of hydrocarbon liquids, almost all petroleum products boiling at 32°/220°C, used as piston engine fuel. See *octane number*, *petrol*.

**gas-operated** Automatic weapon in which initial rear-

ward motion of moving parts, unlocking breech, is caused by piston moved by gas bled from barrel.

**GASP** General Aviation Strategic Plan, being developed for 2004–08 (TSA).

**gasper system** Low-pressure fresh-air supply piped to individual controllable outputs above each passenger or serving each crew-member.

**gas pressurization** Feeding liquid propellant for rocket engine by piping high-pressure gas to dispel it from tank, with or without use of flexible liner; eliminates need for turbopump.

**gas producer** See *gas generator* (1) or (3).

**Gasrig** Universal rendition of GASRWG.

**gas ring** Spring ring for maintaining gastight seal between piston and cylinder.

**gas rudder** See *gas vane*.

**GASRWG** General Aviation Safety Review Working Group [CAA, industry and RAeS, 2002–] (UK).

**GASS** 1 Garde Aérienne Suisse de Sauvetage (Switz.), same initials in Italian but SRFW in German.

2 General air and surface situation (NATO).

**gassing** Replenishing gas balloon with fresh gas to increase purity or make up for losses.

**gassing factor** Quantity of gas required by aerostat over period of one year, ordinarily expressed as percentage of gas volume.

**gas starter** Early (1920 onwards) method of starting multi-engined aircraft using airborne compressor set supplying compressed air or over-rich mixture to cylinders of each engine in correct sequence.

**gas temperature** TET is usually measured between first stators and rotor, TGT at a point between stages and EGT can be same as JPT.

**Gaston** Génération d'APT (auto-programmed tool) standard pour trajectoires d'outils normalisées (F).

**gas triode** See *thyatron*.

**gas trunk** Duct between gas-bag valve and gas hood.

**gas tube** Electronic tube (valve) containing gas under very low pressure.

**gas turbine** Engine incorporating turbine rotated by expanding hot gas. In usual form consists essentially of rotary air compressor, combustion chamber(s), and turbine driving compressor.

**gas-turbine numerology** Stations within an engine are designated by numbers used as inferior suffixes which vary with engine configuration; in a simple turbojet the numbers are: 1, entrance to inlet duct; 2, entrance to compressor; 3, compressor delivery; 4, turbine entry; 5, turbine exit; 6, entry to nozzle; 7, in plane of nozzle. A two-spool engine with afterburner has numbers 1 to 10. A different set of suffixes identifies the shafts in a multishaft engine, 1 being LP, 2 HP or IP, and 3 HP or free-turbine in a three-shaft engine.

**gas valves** Both rigid and non-rigid airships require valves to enable excess pressure in the gas bags or ballonets to be relieved. Lifting gas is released [automatically or manually] at the top, and air from valves on the underside.

**gas vane** Aerodynamic TVC in jet of rocket (see *jet vane*).

**gas volume** Volume of aerostat gas at SL.

**gas welding** Fusion welding with hot gas flame; eg oxy-acetylene on steels and oxy-hydrogen on aluminium.

**GAT** 1 General air traffic.

2 General aviation terminal.

3 Greenwich apparent time.

**Gatco, GATCO** Guild of Air Traffic Control Officers [1954, office GU1 2ND] (UK).

**GATE, Gate** German Airport Technology and Equipment ev (association, 34 members).

**gate** 1 Point of passenger emplanement at airport.

2 Point at which commercial flight starts, or enters new sector of controlled airspace.

3 Removable lock to limit maximum travel of control lever (eg throttle) under normal conditions.

4 Position(s) on extended runway centreline above which inbound aircraft are required to pass at time assigned by approach control.

5 In air intercept: 'Fly at maximum possible speed for limited period' (DoD).

6 Control electrode of any device, esp. input connection to FET.

7 To control passage of signal in electronic circuits.

8 Circuit having output and input so designed that output is energised only when required input conditions are met, eg AND-\*, OR-\*, NOT-\*

9 Circuit designed to receive signals in small fraction of principal time interval in radar or control system.

10 Range of fuel/air ratios through which combustion can be started.

11 Of trajectory, eg speed-record run, specified transverse apertures in space through which aircraft must pass to comply with regulations.

12 Of space mission, transverse aperture(s) defined in width and height at particular time or distance from liftoff or related to other body in space, through which vehicle must pass if mission is to accomplish objectives.

**gated** 1 EM pulse permitted to function only under control of another pulse, usually synchronized.

2 Limited by gate (3).

**gate guardian** Aircraft publicly displayed at entrance to major establishment, esp. air force base.

**gate hold** Departure held at gate, common if delay exceeds 5 min.

**gate position** Particular gate (1) numerically assigned to flight (7).

**gate reader** Rapid checker of ticket and boarding pass located at gate (1).

**gate time** 1 Agreed time at which flight enters new sector of controlled airspace.

2 Time at which aircraft passes particular point on track.

**gate-to-gate** ATC is usually considered to be effective between gates (2).

**gate valve** Valve controlling fluid flow by flat plate having linear motion across flow channel.

**gateway** Customs airport, through which pax/cargo can enter country.

**gathered parasheet** Parasheet whose periphery is constrained by hem cord.

**gathering** Process of bringing guided missile into narrow pencil beam for subsequent guidance.

**gating** 1 Process of selecting portions of EM wave which exist during one or more selected time intervals or which have magnitudes between selected limits.

2 Use of Q-switching or other control to permit laser to emit only during exact specified time intervals, esp. when used in rangefinding mode.

**3** Imposing mechanical stop on piston engine throttle below selected pressure altitude.

**Gatip** Global air-traffic interoperability project (FAA / Eurocontrol).

**gatling** Originally (1861) Gatling, automatic rapid-fire gun having a rotating assembly of several parallel barrels brought in succession in front of a single breech.

**GATM** Global air-traffic management.

**Gator** **1** GPS ability to overcome resistance.  
**2** Ground/air task-oriented radar.

**Gotorizing** Isothermal forging process for high-nickel turbine rotor blades and other super-alloys.

**GATR** Ground/air transmit/receive.

**GATS** GPS-aided targeting system; /GAM adds GPS-aided munition[s].

**GATSS** Global air-transportation systems and services (R, CIS).

**GATT** **1** Gate-assisted turnoff thyristor.  
**2** General agreement on tariffs and trade.

**GAU** Gun, aircraft unit.

**GAUC** GA Users Committee (LGK, LHR).

**gauge (US gage)** **1** Any pressure-measuring instrument.  
**2** Hand comparator for GO/NO GO check on an exact dimension or screwthread.  
**3** Standard measures of sheet and wire thickness.

**gauged fuel** Sum of fuel-gauge readings; fuel state, including unusable.

**gauge pressure** Indicator reading showing amount by which system pressure exceeds atmospheric.

**gauss** Non-SI unit of magnetic induction (flux density), =  $10^{-4}$ T.

**GAvA** Guild of Aviation Artists [office, Farmborough GU14 6TF] (UK).

**GAVC** Ground/air visual code (FAA).

**GAVRS** Gyrocompassing attitude and velocity reference system.

**GAWG** General Aviation Working Group (Natmac).

**GAZ** State aviation factory [almost 1,000] (USSR).

**GB** **1** Gain/bandwidth.  
**2** Groupe de Bombardement (F).  
**3** Aircraft category, glide bomb (USAAF 1942–47).  
**4** Lethal nerve gas first produced as Sarin (G 1938) and later by US.

**Gb** Gigabyte[s].

**Gb** In flight-control augmentation, a bending-mode filter.

**g.b.** Grid bias.

**GBA** Groupe de Bombardement d'Assaut (F).

**GBAD** Ground-based air defence; BC adds bridging capability, WS adds weapon system[s].

**GBAS** Ground-based augmentation system, for precision approach.

**GBCS** Ground-based common sensors.

**GBD** Greener by design (UK).

**GBDM** Ground-based data management; S adds system.

**GBI** Ground-based interceptor[s].

**GBIB** Ground-based integrity broadcast.

**Gbits/s** Gigabits ( $10^9$ ) per second, not to be confused with Gb.

**GBL** **1** Ground-based laboratory.  
**2** Ground-based laser.  
**3** Government bill of lading.

**GBMD** Global ballistic-missile defence.

**G/BMI** Graphite/bismaleimide composite.

**GBM levels** Gough, Beard and McEvoy pioneered investigation of upper limits of force a pilot could be expected to exert on particular flight-control inputs (NACA).

**GBP** Great Britain pound[s] Sterling.

**GBR** Ground-based radar; P adds prototype (US NMD).

**GBRAS** Ground-based regional augmentation system.

**GBS** **1** Global broadcast service.  
**2** Ground-based software; T adds tool.  
**3** Ground-based sensor[s].

**GBTa** Guild of Business Travel Agents [1967–, office, London] (UK).

**GBTs** Ground-based training system.

**Gbyte** Gb.

**GBU** Glide-bomb unit.

**GC** **1** Groupe de Chasse (fighter wing, F).  
**2** Great circle.  
**3** Goggles-compatible (NVG).  
**4** Gyrocompass.  
**5** Ground control.

**GCA** **1** Ground-controlled approach.  
**2** General controlled airspace, from 1990 called Class E (FAA).

**GCAA** General Civil Aviation Authority (UAE).

**GCAM** Ground collision-avoidance module.

**GCAS, G-cas** Ground collision-avoidance system.

**GCB** **1** Generator circuit-breaker, or control breaker.  
**2** Gun-control box (helicopter).  
**3** See next.

**GC brg** Great-circle bearing.

**GCC** **1** Graduated combat capability.  
**2** Goggles- (ie, NVG) compatible cockpit.  
**3** Gulf Cooperation Council (Inmarsat).  
**4** Global climate change; I adds initiative[s].  
**5** Ground-cluster controller (Agars).

**GCCS** Global command and control system (DoD).

**GCF** Ground-conditioning fan.

**GCHQ** Government Communications HQ (Cheltenham, UK).

**GCI** Ground-controlled interception.

**GC/IMS** Gas chromatography/ion mobility spectrometry.

**gcm<sup>3</sup>** SI unit of density.

**GCMS** Gas-chromatograph mass spectrometer.

**GCOS** Global climate observing system.

**GCP** General conditions of purchase.

**GCR** **1** Generator-control relay.  
**2** Ground-clutter reduction.

**CGS** **1** Ground-control station[s].  
**2** Ground-clutter suppression.

**Gels** Gigacycles = GHz.

**GCSC** Great-circle steering cue.

**GCSS** Global combat-support system (USAF).

**GCT** **1** Government competitive test.  
**2** Greenwich Civil Time.

**GCU** **1** Generator control [and protection] unit.  
**2** Ground control unit [UAV].  
**3** Guidance control unit.

**GCV** Ground check vehicle [navajds].

**GD** **1** Lethal nerve gas first produced (G, 1940) as Sarin (also GB).

- 2** General Duties branch, which includes aircrew (RAF).
- 3** Geometric dimensioning, & T adds and tolerancing.
- GDB** Ground data-bus.
- GDC** Gyro display coupler.
- GDE** 1 Gas-discharge element, light source.
- 2** Graphics differential engine.
- 3** Ground demonstrator engine.
- GDI** Get-down-it's, dangerous desperation to land for whatever reason.
- GDL** 1 Gas-dynamics laboratory, pioneer rocket research centre (USSR).
- 2** Gas dynamic laser.
- 3** Ground data-link; P adds processor.
- GDM** Generalized development model.
- GDOP** Geometric[al] *dilution of precision*, also expressed as geometrical degradation of performance.
- GDP** 1 See GDOP.
- 2** Graphics drawing processor.
- 3** Ground delay program.
- GDPA** Ground distributed processing station.
- GDS** 1 Ground debriefing station.
- 2** Global decision support, controls worldwide airlift; S adds system (USAF).
- 3** Global, or general, distribution system (Sita).
- 4** Goldstone.
- GDT** Ground data terminal.
- GE** 1 Groupe d'entraînement (F).
- 2** Gigabit ethernet.
- G/E** Graphite/epoxy.
- Ge** Germanium.
- Ge** Gain, especially of radar jammer system.
- GEANS** Gimbaled electrostatic aircraft navigation system; GEAINS adds inertial.
- gear** Landing gear (colloq.).
- gear change** In powered flight-control system, traditionally effected [automatically, with manual standby] by moving fulcrum or radius of an operating rod according to IAS or Mach.
- geared engine** Piston engine with reduction gear to turn propeller more slowly than crankshaft, to enable power to be increased whilst not overspeeding propeller.
- geared fan** Fan (2) driven through reduction gear.
- geared propeller** See *geared engine*.
- geared supercharger** Piston engine supercharger driven through friction clutch and step-up (speed-increasing) gears.
- geared tab** Balance tab mechanically linked to control surface so that its angular movement is determined by that of main surface.
- gear-type pump** Two intermeshing gears in close-fitting casing which pump fluid round outside of each gear in spaces between successive teeth and outer casing.
- GEASA** Group of experts on aviation safety and assistance.
- Gebecoma** Groupement Belge des Constructeurs de Matériel Aérospatiale [office, Brussels B-1130] (Belgium).
- GEC** Graphite epoxy composite.
- GeCu** Germanium/copper (IR detector).
- GEE** Ground exploitation, or evaluation, equipment.
- Gee** Pioneer precision navaid, using interrelated VHF pulses transmitted from ground stations; position of aircraft determined by observing intervals between pulses from pairs of stations and plotting on hyperbolic map.

- Gee-H** Secondary-radar navaid which enabled aircraft to determine position with precision by simultaneously measuring distances from two beacons.
- GEEIA** Ground Electronics Engineering Installation Agency (USAF).
- GEF** General Engineering Flight (RAF).
- Gefra** Group of experts on the future regulatory arrangements [for international air transport].
- gegenschein** Faint light area of sky opposite Sun and celestial sphere; believed to be reflection of sunlight from particles beyond Earth's orbit.
- GEH** Graphite-epoxy honeycomb.
- GEI** Groupement d'Economique Interêt (see *GIE*, which is more common).
- Geiger counter** Geiger-Müller gas-filled tube containing electrodes; ionising radiation releases short pulse of current from negative to positive electrode, frequency of pulses indicating intensity of radiation.
- GEJ** Group of Experts on Jurisprudence (ICAO).
- GEL** Graphite-epoxy laminate.
- GELIS**, **Gelis** Ground-emitter location and identification system.
- GEM** 1 Ground-effect machine (ACV).
- 2** Generic electronics module.
- 3** Graphite epoxy (solid rocket) motor.
- 4** Ground-environment material.
- 5** Generalized emulation of microcircuits.
- 6** Guided, or guidance, enhanced missile.
- 7** Graphic [piston-] engine monitor, typically pictures CHT and EGT.
- 8** GPS-embedded module.
- GEMS**, **Gems** 1 Grouped engine monitoring systems.
- 2** Global environment management system (noise).
- 3** Global expeditionary medical system (USAF).
- 4** Generic Earth-station management system.
- GEN** 1 Generator.
- 2** General [not the rank].
- 3** General information (AIP).
- Gen, gen** 1 Information, latest knowledge (colloq. RAF WW2).
- 2** Generation, a complete phase of development.
- Gen2, Gen 3** New 'generations' of helicopter visionics.
- genav** General aviation.
- GENE, Gene** GPS – enhanced navigation equipment.
- general air traffic** All traffic excluding OAT (3), special military (eg lo-level training) and local pleasure flights not notified for ATC purposes.
- general-arrangement drawing** Usually three-view (front, side, plan) outline, in some cases with addition of dimensions, ground line, and broken lines giving additional information.
- general aviation** All civil aviation except air transport for hire or reward; largest sectors are private (including company transport), agricultural and aerial work. Term introduced in US by CAA in 1951.
- General Belgrano** Head office of the CAA [colloq.] (UK).
- general cargo** Loose items, excluding large unit loads, not containerized or palletized. Head office of the CAA [colloq.] (UK).
- general inference** General meteorological situation and future forecast.
- General Flying Test** Taken at different levels by candidates for PPL, BCPL and CPL.

**general-purpose aircraft** Military aircraft intended to fill multiplicity of roles; nearest modern equivalent is armed utility.

**generate** To get a combat aircraft airborne and thus \* a sortie.

**generation** Family of all examples of particular hardware species designed at same time to meet similar requirements; after first \* hard to define, and word generally used to impress audience of prior experience of particular manufacturer in field concerned.

**generator** 1 Machine for generating direct current. Invariably used incorrectly to mean alternator.

2 Device for producing clearly visible smoke, e.g. for aerobatics or for wind-tunnel.

**generator line contactor** Main circuit-breaker between generator (ie, alternator) and AC bus.

**generic** A particular meaning; using same region of EM spectrum for land, sea and air stations.

**Genova** General overall validation for ATM (7) (Euret).

**gentle turn** Primary flight manoeuvre in which bank angle does not exceed 25°.

**Gen-X** Generic expendable[s].

**GEO** Geostationary Earth orbit.

**GEOAP** Ground equivalent onboard attitude processor.

**geocentric** Related to centre of Earth.

**geodesic line** Shortest line between two points on mathematically derived surface; \*\* on Earth called geodetic line.

**geodesic radome** Spherical enclosure for large surface or ship radar whose structural members are geodetics and whose panels are perpendicular to transmissions.

**geodesy** Science which deals mathematically with size and shape of Earth and its gravitational field, esp. with surveys of such precision that these measures must be taken into consideration.

**geodetic construction** Methods of making curved space frames in which members follow geodesics along surface, each experiencing either tension or compression; resulting basketlike framework does not need stress-bearing covering.

**geodetic height** Height above the surface of the Earth (represented as an oblate spheroid) measured along a normal to the surface, symbol  $h$ .

**geodetic latitude** The angle between the geodetic equatorial plane and the normal to the surface, positive in N hemisphere, negative in S, symbol  $\phi$ .

**geodetic position** Location of a point on the surface of the geosphere, defined by geodetic latitude, longitude and height.

**GEODSS** Ground-based electro-optical deep-space surveillance system.

**geographical envelope protection** Database which prevents the aircraft in which it is installed from entering a defined keep-out zone, eg overriding pilot's attempt to steer into a building.

**geographical mile** One minute of arc at Equator, defined as 6,087.08 ft.

**geographical position** Where line from centre of Earth to a heavenly body cuts Earth's surface (astronav).

**geographic information system** Inputs land use in Gems (2), and other studies of airport noise.

**geographic poles** North or south points of intersection of

Earth's surface with axis of rotation, where all meridians meet.

**geoid** Earth as defined by that geopotential surface which most nearly coincides with MSL.

**geolocation** Finding where fixed targets are on the land surface, if possible near-instantaneously.

**geomagnetic cavity** Volume moving through solar wind occupied by Earth and surrounding magnetic field (magnetosphere).

**geomagnetic co-ordinates** System of spherical co-ordinates based on best fit of centred dipole to actual terrestrial magnetic field.

**geomagnetic dipole** Hypothetical magnetic dipole (bar magnet) located within Earth in such position as to give rise to actual terrestrial field.

**geomagnetic equator** Terrestrial great circle everywhere 90° from geomagnetic poles (should not be confused with magnetic equator).

**geomagnetic poles** North and south antipodal points marking intersection of Earth's surface with extended axis of geomagnetic dipole; north \*\* is 78½°N, 69°W, and south \*\* is 78½°S, 111°E. Should not be confused with magnetic pole.

**geomagnetism** 1 Magnetic phenomena exhibited by Earth and surrounding interplanetary space.

2 Study of magnetic field of Earth.

**geometric dilution of precision** See *dilution of precision*.

**geometric pitch** Distance propeller-blade element would advance in one revolution when moving along helix to which line defining blade angle of that element is tangential; \*\* of fixed-pitch propeller at standard radius is pitch of that propeller, and is marked on it.

**geometric transition absorber** Family of RAM (2) structures, most common being pyramidal type. Others include cones and sine waves.

**geometric twist** Variation along span of aerofoil of angle between chord and a fixed datum (see *aerodynamic twist*).

**geometry-limited** Restriction placed on aircraft attitude or configuration by geometric considerations; eg scraping tail on take-off or (variable-geometry aircraft) underwing stores fouling tailplane at max sweep.

**geophones** 1 Sensitive acoustic sensors for detecting sound transmitted through Earth's crust.

2 Seismic sensors buried along edge of runway to measure point of touchdown, severity of impact and bounces on landing (see *ALMS*).

**geopotential altitude**  $Z = \frac{R_e H}{R_e + H}$  where  $R_e$  = Earth radius and  $H$  is geometric altitude [ $Z$  can be ignored at low altitude].

**geopotential height** Height above Earth in units proportional to potential energy of unit mass (geopotential) relative to sea level. For most meteorological purposes same as geometric height, but geopotential metre = 0.98 metre; \*\* used under WMO convention for all aerological reports.

**Georef** World Geographic Reference System.

**George** Automatic pilot (colloq., arch.).

**GEOS** Geodynamic experimental ocean satellite[s] (NASA).

**GeoSAR** Geographic synthetic-aperture radar (NIMA).

**geosphere** Solid and liquid portions of Earth's lithos-

sphere plus hydrosphere. Above \* lies atmosphere, and at interface is found almost all biosphere zone of life.

**GEOSS** Global Earth Observation System of Systems [2005–] (U.N., int.).

**geostationary altitude** That at which body is in geostationary orbit. Accepted value is c35,880 km, 22,300 miles.

**geostationary orbit** Orbit in which satellite remains over same point on surface of Earth. Thus, period = 24 h; V is 3.07 kms<sup>-1</sup>, 1.91 miles/s.

**geostationary satellite** Satellite in geostationary orbit; also called synchronous satellite.

**geostrophic wind** Wind the direction of which is determined by deflective force due to Earth's rotation.

**geostrophic wind speed** Calculated from pressure gradient, air density, rotational velocity of Earth and latitude, but neglecting curvature of wind's path.

**geosynchronous** Revolving at same angular speed as Earth, generally synonymous with geostationary.

**GEP** 1 Glassfibre/epoxy/PVC foam sandwich.

2 Geographical envelope protection.

**GEPA, Gepa** Groupement d'Etudes de Phenomenes Aériens (N adds 'Non-identifies') (F).

**Gepna, GEPNA** Groupe Européen de Planification de la Navigation Aérienne (Int.).

**Gepta, GEPTA** Group of experts on air-transport policy (Int.).

**GERB** Geostat Earth radiation budget.

**germanium** Silver-white, hard, brittle element possessing properties of both metals and non-metals; used in transistors, LEDs and IR windows (8–14 microns), but being superseded. Symbol Ge.

**gerotor** Generator-rotor.

**gerotor pump** Gear pump in which spur gear having n teeth rotates inside internal ring gear having n + 1 teeth.

**GES** 1 Ground Earth station.

2 Ground exploitation station [S adds subsystem].

3 Global exploration strategy [2007–] (Int.).

**Geschwader** Luftwaffe formation equivalent to RAF group or US wing; also naval squadron (G).

**GET** 1 Ground elapsed time.

2 Ground entry terminal [Elint].

**get** To remove gas from vacuum system by sorption.

**GETA** Graphite-epoxy/titanium/aluminium.

**get-away speed** Airspeed at which seaplane or flying boat becomes entirely airborne.

**GETI** Ground elapsed time of ignition.

**Gets** GPS-enhanced theater support (US).

**getter** Material or device for removing gas by sorption.

**GEU** Guidance electronics unit.

**GEV** Ground-effect vehicle (usually = ACV).

**GEW** Ground-effect wing.

**GEWP** Generic electronic-warfare platform [pilotless aircraft for testing missile countermeasures].

**GF** 1 Gold film.

2 Ground fog.

3 Geospace Force (US).

**Gf** In flight control, noise filtering.

**gf** Gram[me] force, =  $9.80665 \times 10^{-3}$  N.

**GFA** Gliding Federation of Australia [Essendon, Vic.].

**GFAC** 1 Ground forward air controller, ie not airborne.

2 Government furnished active countermeasures.

**GFAE** Government-furnished avionic (or aeronautical or aerospace) equipment (US).

**GFDEP, GFDep** Depth [thickness] of fog, estimated in feet.

**GFE** Government-furnished equipment; supplied by DoD to industrial contractor for incorporation in aircraft or other large product.

**GFET, G-fet** G-force environmental training.

**GFH** Groupe Francaise de l'Helicoptere [office, F-75016 Paris] (F).

**GFI** 1 Government-furnished information (US).

2 Ground fault interrupter.

3 General format identifier.

**GFK, GfK** Glass-reinforced plastics (G).

**GFL** 1 Gesellschaft zur Förderung der Luftschiffahrt (G).

2 Gravity feed line.

**G-Flops** Billions of Flops.

**GFM** Government-furnished materiel (US).

**GFMC** Global Fire Monitoring Centre, an agency of ISDR [Freiburg, Germany] (Int.).

**GFP** Ground fine pitch.

**GPFT** Geospacial Force planning tool (US).

**GFRP** Glass-fibre reinforced plastic[s].

**GFS** 1 Gesellschaft zur Förderung der Segelflugforschung (G).

2 Global fire-support system (Litton).

**GFSK** Gaussian frequency-shift keying.

**GFT** 1 General flight (or flying) test.

2 Generalized fast transform.

**GFW** Gesellschaft für Weltraumforschung (German national space society).

**GF-X** Global Freight Exchange (London office).

**GG** 1 Gravity gradient.

2 Gas generator.

3 Gyro-angling gain.

4 Graphics generator.

5 Ground-to-ground [usually between controllers].

**GGG** Gadolinium gallium garnet.

**GGP** GPS guidance pack [age].

**GGR** Ground-to-ground router.

**GGS** 1 Gyro gunsight.

2 Gravity-gradient satellite.

3 GPS ground station.

**GGTFM** Ground/ground traffic-flow management.

**G/GV** Glove and glove vane.

**GH** General [or ground] handling.

**GH<sub>2</sub>** Gaseous hydrogen.

**GHA** Greenwich hour-angle, difference in longitude between heavenly body and 0° meridian. D adds difference, read off Godsave tables.

**GhAF** Ghanaian Air Force.

**ghost** Extra images or blips on radar, TV or other display caused by signal reflection from hills, buildings or other objects; usually to right of primary image at distance proportional to reflected and direct path lengths.

**GHQ** General headquarters.

**GHW** Ground-handling wheels.

**GHz** Gigahertz, billions of cycles per second.

**GI** 1 Gum inhibitor.

2 Government issue (US).

3 Group identifier.

**GIA** 1 Glideslope intercept altitude.

2 Ground instructional airframe.

**GIB** 1 Guy in back, ie navigator or other back-seater in tandem two-seat military aircraft.

## GIBEA, Gibeа

- 2 GNSS integrity broadcast.
- GIBEA, Gibeа** Guilde Belge des Electroniciens de l'Aviation (Belg.).
- Gibli** Hot dry wind in N Africa, similar to Sirocco.
- Gibson criteria** A series of assessments, such as attitude gain or frequency response plotted against phase angle, in an attempt to avoid PIOs.
- GIC** GNSS, or GPS, or GPS/WAAS, integrity channel.
- GICB** Ground-initiated comm-B, radio plus DME.
- GID** Government Inspection Division (CAA).
- GIDEP, Gidep** Government/industry data exchange program (DoD, US).
- GIDS, Gids** Gate information display system.
- GIE** Groupement d'Interêt Economique.
- GIEL** Groupement des Industries Electroniques [office, Paris] (F).
- GIES** Ground imagery exploitation station.
- GIF** 1 Guy in front (see GIB).  
2 Graphic[s] interchange file, or format.
- Gifas, GIFAS** Groupement des Industries Français Aéronautiques et Spatiales [aerospace industries trade association 200+ members; office F-75782 Paris] (F).
- Gift** Geosynchronous imaging Fourier transform spectrometer.
- GIG** 1 GPS integration guidelines.  
2 Global information grid (DoD).
- giga** Prefix, symbol G, =  $\times 10^9$ .
- GIG-BE** GIG(2) bandwidth expansion, links centres with 10 Gbit/s fibre optics.
- GIGO, Gigo** Garbage in, garbage out [EDP truism].
- GIHO** Ground-initiated handoff.
- GII** Global information infrastructure.
- GIITS** General imagery intelligence training system.
- GILA** Generalised integrated learning architecture (Darpa).
- Gilham Code** Gray code.
- gill** Non-SI unit of liquid measure. UK \* =  $1.42065 \times 10^{-4} \text{ m}^3$ ; US \* =  $1.18294 \times 10^{-4} \text{ m}^3$ .
- gills** Hinged flaps at rear of engine cowling or other compartment to control cooling airflow.
- Gimads** Generic integrated maintenance diagnostics (USAF).
- gimbal** 1 Mounting with at least two, and usually three, mutually perpendicular and intersecting axes of rotation.  
2 Gyro support which provides spin axis with degree of freedom.  
3 To pivot propulsion engine for TVC.  
4 To mount on \*.
- gimbal freedom** Maximum angular displacement about gyro output axis, expressed in degrees or in equivalent angular input.
- gimballed chamber** Rocket-engine thrust chamber mounted on gimbal (3) so that it can swivel about one axis (or two perpendicular axes).
- gimbal lock** Condition of two-degrees-of-freedom gyro wherein alignment of wheel spin axis with axis of freedom removes degree of freedom, rendering gyro useless.
- Gins** 1 GPS/INS.  
2 Gravimetric INS.
- GIP** 1 Ground instructor pilot.  
2 Generic interface processor.  
3 Government/industry partnership.
- GIPS** Geospatial information production system (NIMA).
- glaze finish**
- GIRA** Groupe d'Instruction des Reserves de l'Air(F).
- GIRD, Gird** Group for study of reaction (ie, rocket) engines (USSR, 1932–34).
- girt bar** Rapid-action link which in emergency transfers upper attachment of an escape slide from a door to the door sill.
- GIRTS** Generic IR training system (ASD).
- GIS** 1 Geographic[al] information system[s] (civil, US).  
2 Graphic[al] information system.
- Gismo** Globally integrated satellite mobile operating system.
- GISS** Goddard Institute for Space Studies (NASA, New York City).
- GIT** General interface terminal.
- GITC** Guns in the cockpit.
- GIUK** Greenland/Iceland UK, supposed air-defence gap.
- GIVS** Groupe Interministeriel des Vols Sensibles, charged with security of commercial flights (F).
- GW** Loop gain, plan  $\times$  compensator [many suffixes].
- GKAP** State committee on aviation industry (USSR, R).
- GKAT** State committee on aviation technology (USSR, R).
- GKO** State defence committee (USSR, R).
- GKS** Graphic[al] kernel system (WMO).
- GL** 1 Ground level.  
2 Group length.
- GLA** Gust load alleviator.
- GLAADS** Gun low-altitude air-defense system (USA).
- GLAM** Groupe de Liaisons Aériennes Ministérielles (F).
- gland** Short tube fitted to airship's envelope or gas bag through which rope may slide without leakage.
- Glare** Glass-fibre prepreg tape reinforced aluminium alloy [usually multi-ply].
- glareshield** Overhanging lip above instrument panel to protect pilot's night vision from bright reflections on windshield.
- G-Lars** Guided launch and recovery system; /PLS adds precision landing system.
- GLAS** Gust-load-alleviation system.
- glass aircraft** One with high proportion of GRP in airframe, including skin.
- glass cockpit** One featuring electronics displays in place of traditional instrument (colloq.).
- glass-fibre** Produced by melting glass and spinning on revolving drum, fibres being typically 0.025 mm diameter. Fibreglass is registered name. Produced in many forms for structural or optical properties.
- glass floor** Zero accidents or reportable incidents.
- Glasshouse** Detention centre, military prison (UK, colloq.).
- glass wool** Produced by forcing molten glass through orifices of approximately 1  $\mu$  diameter.
- Glast** Gamma-ray large-area space telescope.
- Glauert factor** Increase in lift coefficient due to fluid being compressible, =  $(1 - M^2)^{-\frac{1}{2}}$ .
- Glavkosmos** Chief Administration of Space Launch Services (R).
- Glavkoavia** Chief Administration of Aviation (USSR).
- glazed frost** Rain ice, layer of smooth ice formed by fine rain falling on sub-zero surface.
- glaze finish** Vitreous enamel coating on metal.

**glaze ice** Transparent or translucent coating with glassy surface formed by contact with rain; part freezes on impact, most flowing back and freezing over surface.

**GLC** Generator line contactor.

**GLCM** Ground-launched cruise missile.

**GLCS** Global launch control system (DoD).

**GLD** Glider (ICAO).

**glid** See *GLLD*.

**glide** 1 Controlled descent by aerodyne, esp. aeroplane, under little or no engine thrust in which forward motion is maintained by gravity and vertical descent is controlled by lift forces. Rate of descent is given by  $v_a = -(D/L)V$  where D is drag, L lift and V TAS.

2 Flightpath of \*.

3 To descend in \*.

**glide bomb** Missile without propulsion but with aerofoils to provide lift and guidance; released from aircraft.

**glide landing** No-flare landing.

**glide mode** Flight-control system mode in which aircraft is automatically held to centre of glideslope.

**glidepath** 1 Flightpath of aircraft in glide, esp. when making ILS landing.

2 Glideslope.

**glidepath angle** That between local horizontal and straight line representing mean of glideslope.

**glidepath beacon** ILS outer, middle or inner marker.

**glidepath bend** Aberration in electronic glidepath.

**glidepath indicator** ILS panel instrument.

**glidepath localizer** Contradiction in terms (see *localizer*).

**glidepath sector** Sector in vertical plane containing glideslope and extended runway centreline, limited by loci of points at which DDM is 0.175.

**glider** Fixed-wing aerodyne designed to glide, ordinarily having no internal propulsion (see *sailplane*).

**glide ratio** Ratio of horizontal distance travelled to height lost; TAS  $\div$  Vs (in same units). A common symbol is  $R_G$ .

**glider flight time** Includes time on tow.

**glider train** Two or more gliders towed in tandem behind one tug.

**glider tug** Aircraft used to tow gliders.

**glideslope** Radio beam in ILS providing vertical guidance (see *ILS*).

**gliding angle** 1 Angle between local horizontal and glidepath. Traditionally  $\gamma = \tan^{-1} D/L$  where D is drag and L lift.

2 Shallowest possible \* of sailplane.

**gliding range** Maximum distance that can be reached from given height in normal glide; also known as gliding distance.

**gliding turn** Spiral flight manoeuvre consisting of sustained turn during glide; also known as spiral glide.

**glim lamp** Source of illumination dim and local enough for use during blackout, esp. airfield lighting.

**Glint** 1 Geostationary Earth orbit light-imaging national testbed (US).

2 Gated-laser illumination for night TV.

**glint** Pulse-to-pulse change in amplitude of reflected radar signals, caused by reflection from object whose radar cross-section is rapidly changing.

**GLIT, Glit** Chief State flight-test centre, Aktyubinsk (R).

**glitch** Small voltage surge affecting sensitive device; later general colloq. for technical problem.

**GLLD** Ground laser locator-designator.

**GLM** Gear limiting speed [usually means 'extended', rather than 'cycling'].

**GLN** GPS landing and navigation; S adds system, U unit.

**GLO** Ground liaison officer.

**Global Area Network** Pioneer worldwide satcom service providing 64 kbit/s (Inmarsat 1991–).

**Global Command and Control System** Overall electronic system tracking, and to some degree controlling, combat operations worldwide (DoD).

**Global distribution system** That which apportions revenue from an air-carrier passenger ticket (Sita).

**globalization** Distribution through many carefully selected countries of the companies needed to make and support a product.

**Global positioning and com** Gives GPS/TDMA for numerous linked users, esp. for station-keeping.

**Global Positioning System** Worldwide system in which users derive their location by interrogating four satellites from total net of 24. Originally US military, which reserves to itself the greatest [centimetric] accuracy.

**Globmet** Global meteorological service.

**GLOC** See *g-loc*.

**Glonass** Global navigation-satellite system (USSR, R, India).

**glory** Aircraft in humid atmosphere viewed from above or below at centre of rings in spectral [rainbow] colours.

**glove** 1 Fixed leading portion of wing root, esp. of variable-sweep wing.

2 Additional aerofoil profile added around normal wing, usually over limited span, for flight-test purposes.

**GLOW** Gross lift-off weight (not spoken as word).

**glow-discharge anemometer** Sensitive method of measuring gas velocity, esp. at low speeds or in turbulence, using cathode discharge between two pointed electrodes about 0.1 mm apart.

**glow plug** Electric heating element, used in semi-diesel engines, which aids starting or, in one type of turboprop, provides inflight relight after flame-extinction.

**GLS** 1 GPS- or GNSS-based landing system.

2 Gunlaying system.

3 Glider launching site.

**GLTD** Ground-based laser target-designation.

**GLU** GPS landing unit.

**GLY** Galley.

**GLUAV** Gun-launched unmanned aerial vehicle.

**glycerin** Glycerol, compound of C/H/O, soluble in water/alcohol, constituent of antifreezes.

**glycol** See ethylene glycol.

**glyptal** Synthetic resin made from glycerin and phthalic acid or phthalic anhydride.

**GM** 1 Ground map mode (airborne radar).

2 Guaranteed minimum.

3 Gain [FCS feedback] margin.

4 Guided missile, usually with prefix.

5 Guidance material.

**G/M** Gun/missiles selector switch on control column.

**gm, g<sub>m</sub>** Location of c.g. as fraction of chord behind leading edge.

**GMADS** Ground-based maintenance aid and diagnostic system.

**GmbH** Gesellschaft mit beschränkter Haftung, incorporated company (G).

- GMC** Ground movement control, or controller.
- GMCS** Ground-maneuvring camera system.
- GMD** Ground-based midcourse defense; S adds segment or system; in 2002 this replaced NIM as planned national defence against ballistic missiles (US).
- GMDSS** Global maritime distress and safety system[s].
- GMES** Global monitoring for [or of] environment and security [EC + ESA] (2008-).
- GMFSC** Ground mobile forces satellite communications.
- GMI** Goddard management instruction.
- GML** Gross moving load.
- GMLA** Guided missiles and launch assemblies.
- GMLRS** Guided multi-launch rocket system.
- GMLS** Guided-missile launch system.
- GMLTS** Guided-missile launcher test set.
- GM-1** Nitrous oxide, piston-engine boost system (G, WW2).
- GMP** Ground-movement planning.
- GMR** 1 Ground-mapping radar.  
2 Giant magnetoresistance.
- GMRP** Guided-missile round pack.
- GMS** 1 Geostationary meteorological satellite.  
2 Groupement des Missiles Stratégiques (F).  
3 Ground-based midcourse system.  
4 Ground monitoring station.
- GMSP** Global multi-mission support platform.
- GMT** Greenwich mean time, or *Zulu*, now replaced by *UTC*.
- GMTI** Ground moving-target indicator (or indication).
- GMTT** Ground moving target tracking.
- GMU** GPS-based measuring, or monitoring, unit.
- GMVLS** Guided-missile vertical launch system.
- GN** See **GN<sub>2</sub>**.
- Gn** Green.
- g<sub>n</sub>** Standard value for gravitational acceleration.
- GNA** Global network architecture.
- GN&C** Guidance, navigation and control.
- G-nav** Navigation direct from A to B not on promulgated airway but crossing radials yet still using VOR/DME; name from graphic navigation, using computer-produced charts or hand-held equipment to give pilot a picture derived from VOR/DME inputs. Basic method of cross-radial navigation.
- GNC** 1 Graphic numerical control.  
2 General navigation computer.  
3 Global navigation chart.
- GNCS** Guidance navigation control system.
- GND, gnd** Ground [CK adds check, CON control, FG fog].
- GNE** 1 Gross navigational error.  
2 Global distribution system new entrants (Int.).
- GNLS** GPS navigation and landing system.
- GNLU** GPS navigation and landing unit.
- GNN** Government News Net (UK).
- gnomonic projection** Created by projecting from centre of Earth surface features on plane tangent to surface; distortion severe except near origin (point where plane touches Earth) but great circles are straight lines.
- GNR** Global navigation receiver.
- GNS** 1 Global navigation system.  
2 Global navigation satellite [P adds panel, S system, SA supervisory authority, SP system panel, SU sensor unit]; general term for all such spacecraft.
- 3** Glassfibre/Nomex sandwich.
- GNT** Gross nozzle thrust.
- GN<sub>2</sub>** Gaseous nitrogen.
- GNY** German navy [UK usage].
- GO** 1 Geared, opposed (US piston-engine designation).  
2 General Order (military).  
3 Groupe d'Observation (F).
- GO<sub>2</sub>** Gaseous oxygen.
- go-ahead** Point in government programme at which prime contractor receives written authorization to proceed with full-scale development. Not an official term.
- go-around** *Overshoot*; see *going around*.
- go-around mode** Terminates aircraft approach and commands climb; also known as auto overshoot.
- GOC** Generator over-current.
- GOCE** Gravity-field and steady-state ocean explorer.
- Goco, GOCO** Government owned, contractor-operated (US).
- GODAE** Global ocean data assimilation experiment.
- Goddard Space Flight Center** Greenbelt, Maryland, centre for NASA tracking and communications network.
- Godsave** See **GHA**.
- Goes, GOES** 1 Geostationary, or geosynchronous-orbit, or global, operational environmental satellite, suffixes East or West.  
2 Gyrostabilized opto-electronic system.
- go for broke** To fire all weapons in one pass of target.
- go gauge** Dimensional gauge which must fit close, but without being forced, on or in the part for which it is intended.
- go-home mode** Emergency RPV flight-control mode used following loss of navigation or command link.
- going around:** 1 Overshoot straight ahead (UK civil).  
2 Make another circuit (RAF).
- Gold** General on-line diagnostic.
- gold** Au, malleable metal with density 19.3, MPt 1,064°C, aerospace use mainly thermal-reflective coatings.
- goldbeaters' fabric** Layer of cloth fabric cemented to one or more layers of goldbeaters' skin, making it gastight.
- Gold C** Gliding certificate second only to Diamond C, requiring flight of  $\geq 300$  km and other achievements.
- golden arm** Supposed attribute of pilot whose ability and experience master all simulations and are acknowledged by peers.
- golden handcuffs** Large cash sum to induce military pilot to extend period of service (UK, colloq.).
- gold film** Extremely thin vapour-deposited electrically conductive film used for thermal anti-icing of transparencies.
- Goldfish Club** Club open to aircrew whose lives have been saved by dinghy made by UK company RFD Ltd. (1940-).
- goldie** Verbal code: "Aircraft automatic flight-control system and ground-control bombing system are engaged and awaiting electronic ground commands" (DoD).
- goldie lock** Verbal code: "Ground controller has electronic control of aircraft" (DoD).
- gold plating** Introduction of what (generally ignorant or partisan) politicians claim to be costly and unnecessary features in weapon systems (US).
- Goldstein** In 1929 put forward two theories to simplify propeller calculations: the trailed vortex sheet is a helix of constant pitch; and the resultant velocity is the vector sum

of the induced velocity and the velocities of rotation and forward motion.

**Goldstone** DSIF stations NE of Barstow, CA.

**golf ball** Turbulence control structure.

**GoMats** Gulf of Mexico advanced traffic surveillance.

**gondola** Car of airship.

**gong** Medal or decoration (RAF colloq.).

**gonio** VHF/DF (F).

**goniometer** 1 Instrument for measuring angles between reflecting surfaces of crystal or prism.

2 Electrical transformer used with fixed and rotating aerials for determining bearing of radio station.

3 Motor-driven instrument used with four stationary aerials to deliver rotating signal field for VOR.

**go/no-go** Step-by-step basis on which manned space-flights are flown, with flight crew and mission control jointly making positive decision whether to continue into each new phase of mission.

**go/no-go check list** Written guide for flight crews to determine go/no-go situation on any given subsystem deficiency (USAF).

**go/no-go gauge** Dimensional gauge for checking whether part is within upper and lower tolerance limits.

**Go-NoGo Line** Geographical line beyond which aircraft carrying live NW could penetrate only after receipt of Positive Release Message [in case of RAF 1953–80 this was 8°E longitude].

**go/no-go test equipment** Provides only one of two alternative answers to any question, eg whether given signal is in or out of tolerance.

**good engine** One that continues to operate after other[s] failed.

**Goodman diagrams** Various graphical plots used to determine parts life under repeated cyclic loads, most common having per cent alternating stress/endurance strength as ordinate and per cent mean stress/rupture strength as abscissa.

**good parachute** Fully and correctly deployed.

**Goodrich de-icer** Original patented pulsating rubber de-icer for leading edges, intermittently inflated with air to break up ice.

**Goodrich rivnut** See *Rivnut*.

**goofers** Audience on island of carrier.

**goolie chit** Written promise of reward if downed aircrew member is returned intact [UK Imperial, esp. North West Frontier, 1920–50].

**goon** Guard at PoW Stalag Luft (RAF WW2).

**gooseneck flare** Type of runway flare mounted on slender stem designed to bend easily if struck by aircraft.

**GOPS, Gops** Giga [ $10^9$ ] operations per second.

**GOR** 1 General Operational Requirement.

2 Guy on the right, in side-by-side military aircraft, normally navigator or electronic-warfare officer.

3 Ground occurrence report.

**Gorac** Ground collision-avoidance system operational requirements and certification (Euret).

**gore** 1 Shaped sector of parachute canopy normally bounded by two adjacent rigging lines.

2 Shaped section of airship envelope or gas bag, or balloon envelope.

3 Radial panel in airframe, esp. pressure bulkhead, hence \* panel, \* diaphragm.

**GOS** 1 General operator station.

2 Grade of Service.

3 Gate-operating system.

4 Global observing system.

**Gosat** Greenhouse-gases observing satellite.

**GOSC** General Officer Steering Committee.

**Gosip** Government open-systems interconnection profile.

**GosNII** State scientific research institute (USSR, R); -A or Aeronavgatsiya adds ATC/navigation/landing aids; -AS adds avionics; -GA adds all aspects of civil aviation; PAS adds ground test of aircraft systems.

**Gospas** State commission for space research (R).

**Gospot tube** Flexible speaking tube used in tandem open-cockpit trainers connecting instructor's mouthpiece with pupil's helmet or vice versa.

**Gost** State research institute for fuels and lubricants (USSR, R).

**Gothic-arch bearing** Becoming the preferred type of ball bearing in gas-turbine mainshafts, this runs the balls between races each formed from two radii struck from slightly different centres.

**Gothic delta** Wing whose basic triangular shape is modified to resemble Gothic window; also known as ogival delta.

**GOTS** Government off the shelf.

**Göttingen-type tunnel** Wind tunnel with return-flow circuit but open working section.

**GO<sub>2</sub>** Gaseous oxygen.

**Gouge flap** Flap whose upper surface forms part of cylindrical surface; thus as flap rotates immediate movement is rearwards to increase area.

**GOX, gox** Gaseous oxygen.

**GoXML** Universal meta-language converting almost any data format into XML and back.

**GP** 1 General purpose (bomb, or former RAF squadron role prefix).

2 Glove pylon.

3 Geographical position.

4 Glidepath.

**Gp** Group.

**GPa** Gigapascal.

**GPADIRS** Global positioning air-data inertial reference system [U adds unit or replaces system, **GPIRS** omits AD].

**GPADS** Guided-parafoil aerial [or air or airborne] delivery system.

**GPALS** Global protection against limited strikes.

**GP&C** Global positioning and communications.

**GPB** Ground-power breaker.

**GPBC** Gold-plated beryllium copper.

**GPC** Government Procurement Code (US).

**GPCDU** General-purpose control and display unit.

**GPCU** Ground-power control unit.

**GPDC** General-purpose digital computer.

**GPEP** Global-positioning experiments program.

**GPES** Ground-proximity extraction system.

**GpFL** Group flashing light.

**gph, GPH** Gallons per hour.

**GPI** 1 Ground-positioning indicator.

2 Ground point of interception.

3 Glide-path indicator.

4 Global positioning inertial; N adds navigation, RS reference system, RU reference unit, SS sensor system.

5 Gas-penetrant imaging, or inspection.

**GPIAA** Accident-investigation authority (Portugal).

**GPIB** General-purpose instrument bus, or interface board.

**GPIIA** Groupement Professionel des Industriels Importateurs de l'Aéronef (F).

**GPIN** Global positioning [laser]-inertial navigation.

**GPIO** General-purpose input/output.

**GPIRS** See *GPADIRS*.

**GPM** 1 Glass polycarbonate mix.  
2 Global precipitation measurement.  
3 General-purpose processing module.

**gpm** Gallons per minute (also gal/min).

**GPMG** General-purpose machine gun.

**GPMS** GPS performance-monitoring sys.

**GPP** 1 Graphic part-programming; technique for communicating with computer by words and diagrams, conveying pictures of shape required and operations necessary to produce it.  
2 Generative process planning, basis for implementing FMS (7).  
3 General-purpose processor.

**GPPE** General-purpose processing element.

**GPPPA, GP<sup>3</sup>A** Groupement Pour la Préparation du Patrimoine Aérien (F).

**GPR** Glider Pilot Regiment [1942–57] (UK).

**GRPA** Glider Pilot Regimental Association [1945–; Benfleet SS7 5JQ] (UK).

**GRPS** General packet radio services; see packet (3).

**GPS** Global positioning system, or satellite (Navstar); ANT adds antenna, L1/L2/L5 see these entries.

**GPSCS** General-purpose satellite communications system.

**GPS-HMU** GPS height measuring unit.

**GPSI** GPS interferometer.

**GPSS** General-purpose simulation software.

**GPSSU** GPS sensor unit.

**GPT** Glidepath tracking.

**GPTE** General-purpose test equipment.

**GPTN** General-purpose telephone network.

**GPU** 1 Ground power unit.  
2 Gun pod unit.

**GPVI** Graphic[s]-processor video interface.

**GPW** Ground-proximity warning [C adds computer, S system, SU sensor unit].

**GR, G/R** 1 Green run.  
2 Ground attack, reconnaissance (role prefix, UK current).  
3 General reconnaissance, ie Coastal Command (role prefix, UK, WW2).  
4 Ground relay, or router.  
5 Groupe de Reconnaissance (F).  
6 Hail.

**Gr** 1 Net climb gradient.  
2 Graphite.  
3 *Grashof number*.

**Gr<sub>R</sub>, G<sub>r</sub>** Rudder actuator.

**GRA** Geared rotary actuator.

**grab** Tendency of wheel brakes to increase power suddenly without pilot input.

**grabbit** Long boathook carried on large marine aircraft.

**grab line** See *handling line*.

**Grace** Gravity recovery and climate experiment (US/G).

**GRAD, Grad** Gradient.

**grad** Non-SI unit of plane angle,  $= 0.9^\circ = 1.5708 \times 10^{-2}$  rad.

**grade** 1 Of fuel, see *fuel grade*.  
2 Unit of plane angle, defined as  $0.9^\circ$ .

**Grade-A** Standard aircraft cotton fabric, long staple with 80 threads per inch across both warp and weft (US = fill).

**graded fibre** Standard form of reinforcing-fibre raw material supplied according to diameter, length or other variable.

**gradient** 1 Of net flightpath, has normal meaning, h/D%; note runway \* = slope.  
2 Space rate of decrease of function; if in three dimensions, vector normal to surfaces of constant value directed towards decreasing values. Ascendent is negative of \*.  
3 Loosely, magnitude of either \* or ascendent.  
4 Rate of change of quantity, or slope of curve when plotted graphically.

**gradient distance** Linear distance from encounter with gust to point of peak intensity.

**gradient of climb** See *climb gradient*.

**gradient wind** Along isobars with velocity exactly balancing pressure gradient; equilibrium between force directed towards region of low pressure and centrifugal forces.

**gradient wind speed** Calculated as for geostrophic but taking into account curvature of trajectory.

**grading curve** In determining propeller performance by Drzwecki theory, forces on infinitely small blade element are determined; curve of these forces (as the ordinate) against blade radius is \*\*, from spinner or root and reaching maximum between 70%–90% tip radius.

**Gradu** Gradual[ly].

**Graetz number, Gz** Heat-transfer measure =  $C_p$  (specific heat at constant pressure) times mass flow divided by thermal conductivity and a length characteristic of body concerned.

**Grafil** Registered name (Courtaulds) for carbon-fibre raw materials.

**grain** 1 Entire case or extruded charge for solid rocket motor.  
2 Particle of granular solid propellant, usually in gun ammunition.  
3 Particle of metallic silver remaining in photographic emulsion after developing and fixing; these form dark area of image.

4 Non-SI unit of weight =  $0.0648 \text{ g} = \frac{1}{7,000} \text{ lb}$ .

**grain orientation** Direction of solidification of metal.

**GRAM, Gram** GPS receiver application module.

**gramme** Fundamental SI unit of mass [gram in US], abb. g.

**gramme-molecule** Mass in grammes of substance numerically equal to its molecular weight.

**gramophone grooving** Close-pitch grooves in female part to form abradable seal round high-speed rotating member.

**Grandfather rights** Permanent certificates for their existing route networks awarded US domestic airlines by CAB on its formation in July 1940. Hence Grandfather routes. Today loosely extended to all nations on basis 'If you've had this right in the past, you'll probably succeed in a fresh application'.

**Grand Slam** RAF 22,000 lb [9,979 kg] deep penetration bomb of 1944.

**grand slam**

**grand slam** Verbal code: "All hostile aircraft sighted have been shot down" (DoD).

**Grand Tour** Planned unmanned exploration of series of outer planets with same spacecraft using planets' gravitational fields to turn spacecraft from one to another; possible only once in each 180 years.

**granularity** General measure of structure of very large EDP system based on number of processors used.

**granular snow** Precipitation from stratus clouds (frozen drizzle) of small opaque grains 1 mm or less in diameter.

**GRAP** Ground recognised air picture; -IOC adds initial operating capability.

**grape** Purple-suited refuelling crewman on carrier (USN).

**graphic part programming** Translation of three-dimensional co-ordinates of workpiece into computer program for NC machining, invariably using computer graphic displays as human interfaces.

**graphics** Visual displays of any kind, esp. electronics displays forming part of EDP (1), EW or similar system (eg on CAD), and designed written matter and symbology inside and on skin of aircraft.

**graphics differential engine** Uses DTED and algebraic/polynomial calculation to produce perspective digital landmass for DMR.

**graphics drawing processor** An ASIC using subpixel addressing and anti-aliasing algorithms – eg, giving smooth dynamics, avoiding stair-stepping – to generate complex display formats at higher than 30 Hz.

**graphic solution** Using geometric construction to solve problem; eg calculating point of no-return.

**graphic[s] user interface** A simulation of an actual, or proposed, interface between a human and an operating system. It typically includes a functioning display and software simulating fault response.

**graphite** Soft naturally occurring allotropic form of carbon, also produced artificially and recently in form of strong fibres with perfect hexagonal crystalline structure. Large family commonly called carbon fibres includes many which in fact are graphite.

**graphite bomb** Filled with filaments which short-out hostile electronics.

**Grapioc** Ground recognised air picture initial operating capability (UK Army/RAF).

**GRAS** Ground-based regional augmentation system, for en-route navigation and precision approach.

**Grashof number, Gr** Heat-transfer parameter =  $\frac{l^3 g}{\nu^2 T_0} (T_2 - T_0)$  where l is a length, g is gravitational acceleration,  $T_1$  and  $T_0$  are temperatures, and  $\nu$  is kinematic viscosity.

**grass** Random spikes projecting from timebase of CRT, radar or other electronic display caused by noise or deliberate jamming.

**grasshopper** Safety-pin type of clip used to fasten cowl and other panels to perforated stud or similar anchor.

**graticule** Any array of lines used as a reference for aiming, measurement or determining spatial relationships, esp. one of straight lines crossing at right angles on chart, map, CRT or other display, HUD or other human interface.

**grating lobes** Undesirable radar-emissions caused by overlarge spacing between array elements which could reveal fighter's position.

**grating spectrum** Produced by diffraction grating.

**GRAU** State rocket and artillery directorate (USSR, R).

**graunch** To damage aircraft or vehicle (UK, colloq.).

**graveyard dive** One entered too close to the ground.

**graveyard spiral** Without blind-flying instruments most simple aircraft, on entering cloud, can enter increasingly steep spiral, pilot under 1g and wings apparently level.

**Graviner** Maker of fire extinguishers, became term for an extinguisher (RAF WW2).

**gravipause** Point between two bodies where their gravity fields are equal and opposite.

**gravireceptors** All sensors in human body for attitude, gravity and acceleration.

**gravitation** Assumed universal property of all masses of attracting all other masses with force  $GMm/r^2$  where G is universal \* constant, M and m are two masses and r is mutual distance apart.

**gravitational constant, G** Also called Newtonian constant,  $= 6.6732 \times 10^{-11} \text{ Nm}^2 \text{kg}^{-2}$ ; other published values include 6.664, 6.669, 6.670 and 6.6705, in each case  $\times 10^{-11}$ .

**graviton** Hypothetical elementary unit of gravitation.

**gravity** Attraction experienced in vicinity of a mass, especially Earth. Standard value for terrestrial acceleration  $g = 9.80665 \text{ ms}^{-2} = 32.1740 \text{ ft/s}$ .

**gravity drop** Departure of inert projectile from initial trajectory.

**gravity drop angle** Angle in vertical plane between gun line at moment of firing and straight line to a future projectile position.

**gravity feed** Relying on fact liquids tend to flow down-hill, unassisted by pump.

**gravity seat** Simulator seat giving sensation of 'pulling-g', see next.

**gravity suit** Aircrew suit, closely related to g-suit, with elements inflated/deflated by external system to give sensation of flight manoeuvres.

**gravity tank** Container relying on gravity for feed, hence may be inoperable when inverted.

**gray** 1 Grey (US spelling).

2 Derived SI unit of absorbed dose of ionising radiation, equal to 1J/kg.

**gray Code** Binary code used to transmit altitude data interleaved between transponder framing pulses, changing one digit at a time in Mode C.

**gray scale** Grey scale.

**grazing** Almost tangent to a curved surface, eg Sun-limb sensor or target-ranging system in low-level attack.

**grazing angle** That between aircraft axis or sensor LOS and local Earth's surface.

**GRB** Gamma-ray burst; CN adds co-ordinates network.

**GRBL** Green-raster brightness level.

**GRBM** Gamma-ray burst monitor.

**GRC** 1 Glenn Research Center (NASA, Cleveland, Ohio).

2 Glass-reinforced concrete.

**GRCA** Ground radar coverage area (MR-Tip).

**GRCS** Guardrail common sensor.

**GRDC** Gulf Range drone control; US adds update system.

**GRDS** 1 Ground-roll director system, based on PVD.

2 Generic radar display system.

**GRE** 1 Ground readout equipment.

2 Ground runup enclosure.

## grease

**grease** 1 Lubricants based on hydrocarbon soaps emulsified in petroleum oils.

2 To make a greaser.

**greaser** Landing so smooth touchdown is imperceptible.  
**great circle** 1 Circle (usually small portion) on surface of sphere whose plane passes through sphere's centre.

2 Intersection of Earth's surface and plane passing through Earth's centre.

**great-circle chart** One on which all GCs are straight lines.

**great-circle course** See next.

**great-circle route** Shorter of two great circles linking all pairs of points on Earth's surface, giving minimum distance to fly; GC course is a misnomer because except along Equator or meridians course (hdg) is constantly changing.

**great-circle track** See *great-circle route*.

**Greatrex nozzle** Pioneer noise-reducing jet nozzle having several (typically six to eight) radial petal-like segments to increase length of periphery.

**green** 1 Signal to proceed given by Aldis or similar lamp aimed at aircraft.

2 Friendly.

3 Coloured light[s] on instrument panel, esp. 3 \* = landing gear down and locked.

**green aircraft** Flyable but still lacking interior furnishing and customer avionics, and still in \* protective surface coat, awaiting painting.

**green airway** One running essentially E-W.

**Green channel** Airport route for arriving 'nothing to declare' passengers without dutiable possessions.

**green density** That of compacted powder prior to sintering.

**green endorsement** Written in logbook of aircrew member in green ink, showing exceptional ability, esp. for landing crippled or dangerous aircraft.

**greenfield site** Site considered for new airport or other facility where no structures exist at present.

**Green Flag** Tac-air war exercises strongly emphasising EW (USAF).

**green flag** In signals area = right-hand circuit.

**greenhouse** Long glazed canopy over tandem cockpits (colloq.).

**greenhouse effect** Filtering and reflective effect of Earth's atmosphere on solar and other radiation akin to that of glass panes; part of incoming spectrum penetrates to Earth, where it heats surface and causes reradiation of longer wavelengths, some of which are absorbed by atmospheric water vapour and again reradiated.

**Greenie[s]** Technical air groundcrew (RN).

**greenlight** To authorise start of expenditure on a programme (US).

**green, red, blue** A common landing check, meaning gear [undercarriage], mixture, propeller[s].

**green run** First run of new or overhauled engine or other item.

**green suit[er]** Soldier (USA).

**green tube** Unfurnished passenger aircraft.

**Greenwich** Earth's prime ( $0^\circ$ ) meridian, hence \* apparent time (GAT), \* hour angle (GHA), \* mean time (GMT) and \* sidereal time (GST).

**green zone** Traditionally, intersection between green and crossing airway at which it is traffic on crossing route that has responsibility for ensuring height separation.

## grid north

**Gregale** Strong wind from NE in central Mediterranean [pronounced gregally].

**Gremlin** Family of mischevious imps responsible for faults (RAF, WW2).

**Gretel** Gramma-ray Eureca telescope.

**grey body** Unknown hypothetical body absorbing constant fraction of all wavelengths of incident EM radiation.

**grey code** Gray Code.

**grey literature** Technical documents produced by universities, laboratories and professional and government bodies, not normally available to public.

**greyout** Blurred vision under high positive acceleration less than that producing blackout.

**grey scale, grey shades** Standard series of achromatic tones linking black to white, typically 64 on modern display.

**grey water** Waste from handbasin; this can be fed to drain mast, unlike waste water.

**grey wedge** Standard filter whose opacity increases in known fashion across width, usually L to R; used in determining pulse distribution and other variables on CRT and other displays.

**grf, g.r.f.** Group repetition frequency.

**GRG** Ground-roll guidance.

**GRI** Group repetition interval.

**Grib** Gridded-binary data [chart of forecast weather].

**grid** 1 Perforated electrode between cathode and anode of thermionic valve controlling flow of electrons into fine beam.

2 Metal cylinder at negative potential in CRT designed to concentrate electrons.

3 System of two sets of parallel lines crossing at  $90^\circ$  to form pattern of squares each identified by number and/or letters in margins; superimposed on maps, charts, photographs and multi-sensor outputs so that any point can be located by letter/number code. Usually also permits accurate measures of distance and direction. Often called military \*, though most are civil.

**grid bearing** Direction of one point from another measured clockwise from grid (3) north.

**grid bias** Constant potential in series with input circuit between grid (1) and cathode to hold operation to one part of characteristic curve.

**grid convergence** Angle between true north and grid (3) north.

**grid co-ordinates** Rectilinear measures about two axes in flat plane of grid (3) facilitating conversion of lat/long and other Earth measures on to flat sheet by routine plane surveying.

**grid heading** Aircraft heading measured relative to grid (3) north.

**grid leak** Resistor allowing grid (1) charge to drain to cathode.

**Grid Lock** Automatic precise geo-registration of imagery from airborne sensors to create target co-ordinates within minutes, later within seconds (USAF).

**grid magnetic angle** Angle between magnetic north and grid (3) north, measured E/W from latter; also known as grivation (= grid variation).

**grid modulation** AM achieved by applying modulating signal to grid (1).

**grid north** Zero datum of grid (3), close to true north.

## grid ring

**grid ring** Round top of traditional magnetic compass, rotated by hand when setting course.

**grid ticks** Small marks on neatline or along grid (3) lines showing alternative grid system(s).

**grid variation** See *grid magnetic angle*.

**griff** Reliable news or information.

**Griffith crack** Supposedly ideal crack in structure, where minor axis = 0.

**Griffith wing** Subsonic wing of very deep section with powerful suction slit on upper surface at about 70% chord to induce airflow to follow discontinuity between upper surface ahead of slit and thin trailing edge. Never successfully used.

**Grip** Global reach improvement program.

**grip range** Range of thickness of material joinable by particular blind rivet or other fastener.

**GRIS** Global reconnaissance information system.

**GRM** Ground-roll monitor.

**GRMS** Ground reference and monitor station (DGPS).

**GRND** Ground.

**GRO** Gamma-ray observatory.

**grommet** 1 Rigid or reinforcing eyelet closed on to flexible surface.

2 Flexible ring set into rigid surface, often by peripheral groove matched with sheet thickness, providing bearing surface for pipe, cable or other line (1, 2) or control cable.

**grooved runway** One whose surface is traversed by one of four standards of shallow grooves tailored to climate, crossfall and other factors, along which water can escape even in heavy rain and strong wind to make critical aquaplaning depth extremely unusual.

**groover** Machine with large wheel, usually diamond-dressed saw, for cutting runway grooves.

**GROS, Gros** Civil Experimental Aeroplane Construction Organization (USSR).

**gross altitude scale** Presentation of total altimeter operating range on one fixed scale (ASCC).

**gross area** Area of projected surface of aerofoil, edges being assumed continuous through nacelles, fuselages, pods or other protuberances. Where tapered wing meets fuselage, edges projected in to meet at centreline, except in case where angle is extreme (eg, with glove, Lerx, strake), where end of root is taken across at 90°.

**gross ceiling** Altitude at which gross climb gradient (see *gross performance*) is zero.

**gross dry weight** Traditional measures of powerplant weight which included propeller hub (metal hub on which wooden propeller was mounted), all starters, primers, exhaust systems, fluid filters, air inlets and accessories, but excluding cooling system, fluid tanks and supply systems and instruments.

**gross flightpath** Gross profile in climb-out segment.

**gross flight performance** See *gross performance*.

**gross height** Height of any point on gross flightpath.

**gross lift** Buoyancy in ISA (1) of aerostat under standard conditions of inflation and with allowance for humidity.

**gross liftoff weight** Actual mass of spacecraft at moment of liftoff.

**gross moving load** Total moving mass of simulator, including upper baseplate and actuators.

**gross performance** That actually measured on one aircraft of type, adjusted by small factor to reflect guaranteed rating and fleet minimum performance.

## ground cushion

**gross profile** Side elevation of aircraft trajectory, esp. following takeoff, corresponding to gross performance.

**gross thrust** That developed by propulsion system in ideal conditions, not allowing for inlet momentum drag, inlet shock losses, duct losses, tailpipe losses, cooling drag, propeller slipstream drag, torque effects or any other effects.

**gross upset** Major uncommanded departure in AOA/V/altitude/attitude.

**gross weight** Traditional measure usually defined as maximum flying weight permitted; today MTOW.

**gross wing area** *Gross area*.

**ground** 1 US = earth.

2 To declare object or person unfit for flight.

3 Personnel on apron connected to aircraft by interphone cord.

**ground-adjustable propeller** One whose pitch can be changed only by ground crew.

**ground air vehicle** One designed for ground mobility but which can fly for short periods (ASCC).

**ground alert** Status of aircraft fuelled and armed and crews able to take off within specified period, usually 15 minutes.

**ground angle** 1 That between local horizontal and major axis of parked fuselage.

2 Maximum usable nose-up angle on landing, limited by tail scrape.

**ground board** Flat surface representing the ground in wind tunnel.

**ground clearance** 1 Vertical distance between airfield or deck and tips of helicopter main rotor blades in no-lift position.

2 Vertical distance between airfield or deck and specified part of aircraft or external stores.

**ground clutter** Unwanted returns on radar display caused by direct reflection from ground.

**ground collision avoidance system** To prevent airborne aircraft from flying into the ground, not for preventing taxiing accidents.

**ground contact** Glimpse of Earth sufficient to assist navigation.

**ground control** Control tower position or other authority assigned to control all vehicles, including taxiing aircraft, on airfield movement area.

**ground-controlled approach, GCA** Ground radar installation able to watch approaching aircraft and direct them to safe landing by radio (so-called talkdown) in bad visibility; and landing thus directed.

**ground-controlled interception, GCI** Interception (1) controlled by ground radar and radio (usually voice-plain-language) advice.

**ground crew** 1 Personnel assigned to cleaning, replenishment, servicing or maintenance of aircraft at turnaround, between missions or in other routine situation.

2 Personnel assigned to manoeuvre aerostat on ground (see *landing crew*).

**ground cushion** 1 Region of increased pressure beneath landing aeroplane caused by forward motion, proximity of ground and trapping of air ahead of flaps and under fuselage (can affect flow over tail and, for this and other reasons, cause pronounced pitching moment).

2 Region of increased lift under helicopter or jet V/STOL in low-altitude hovering mode caused by reflec-

## ground delay program

tion of downwash, jets, entrained air and possibly entrained solids or liquids from ground.

**ground delay program** Implemented to control traffic to airport where acceptance rate is reduced [expected to last a significant time, e.g. because of severe weather or an accident] by prohibiting flights to that airport to depart until a delayed EDCT.

**ground Earth station** Aeronautical ground station.

**grounded** Legally prohibited from flying.

**ground effect** 1 Increased wing lift when flying in close proximity to ground, especially with low-wing aircraft.

2 Increased lift caused by interaction of powered lift system and ground, as with ground cushion (2), used in ACV (GEM).

3 All effects, invariably unwanted, caused by interference of ground on radars, radio navaids and other EM systems.

**ground elapsed time, GET** Time measured from liftoff of major space mission, beginning with countup and continuing to provide one index of elapsed time unvarying with Earth time zone.

**ground engineer** Skilled member of armed force or employee of MRO with power to certify work.

**ground environment** 1 Environment experienced by ground equipment (no definition except to meet particular specifications which are variable).

2 Electronic environment created by ground stations, esp. for air-defence purposes.

**ground equipment** 1 All non-flying portions of aerial weapon system.

2 All hardware retained on ground needed to support flight operations. Appears to be no clear definition; most authorities agree every item intimately associated with flight operations but exclude those concerned with training, design/development, marketing or other peripheral areas, and never include consumables.

**ground fine pitch** Special ultra-fine pitch available after landing to increase drag on non-reversing installation; use of \*\*\* known as discing (pronounced disking).

**ground-fine-pitch stop** Mechanical lock on hub released by compression of landing gear or other signal.

**ground fire** Gunfire from ground directed against aircraft (most authorities exclude all but small-arms fire).

**ground/flight switch** Isolates batteries on ground.

**ground fog** Shallow fog caused by radiation chilling of surface at night.

**ground half-coupling** That part attached to GSE affording direct connection with mating half in aircraft.

**ground handling equipment** Ground equipment for lifting or moving large items, such as wings, missiles, spacecraft etc.

**ground hold** Hold (1) for ATC purposes taken on ground before starting engines.

**ground horizon** 1 Theoretical distance of horizon from sea level (see *horizon*).

2 Actual horizon seen from particular location.

**ground idle** Governed running speed for engine with throttle fully closed; lower rpm than flight idle.

**ground-imagery exploitation station** Each GIES comprises an IIW, an MD/RWW and an RRW (RAF reconnaissance).

**ground lag** See *lag*.

**ground liaison** Officer specially trained in offensive air support (DoD) and/or air reconnaissance (NATO,

## ground resonance

CENTO, IADB); organized as member of team under ground commander for liaison with air and/or navy.

**ground line** A notional airfield surface used in design [in theory, the same as the actual surface at any time].

**ground loiter** Helicopter saving fuel by resting on ground between particular military tasks, in friendly or hostile territory.

**ground loop** Involuntary uncontrolled turn while moving on ground, esp. during takeoff or landing, common on tailwheel aeroplanes with large ground angle, caused by directional instability; if at high speed, landing gear would normally collapse before turn had reached 180°.

**ground marks** ICAN and other bodies decreed what information should be written [usually in letters/numbers 6.09m (20ft) high] on the ground or on buildings to aid pilots.

**ground movement control** Military unit assigned to control of transport by land, esp. of air forces.

**ground moving target indication** Separation of ground moving targets from clutter background by using their different Doppler shift, especially when looking ahead at small angles from track.

**ground nadir** Point on ground vertically beneath perspective centre of camera lens when exposure was made; coincides with principal point in vertical photo.

**ground observer** Trained person forming part of organization providing (DoD) visual and aural information on aircraft movements over defended area, (UK) information on fallout after nuclear attack.

**ground occurrence report** Monitors failures [ground or inflight] traced to lapses by engineers.

**ground-performance aircraft** One able to move itself on ground without using flight propulsion system (ASCC).

**ground plane** Earthed system of conductors forming horizontal layer (mesh, sheet, radial rods etc) surrounding ground navaid.

**ground plot** A calculated ground position.

**ground position** Point on Earth vertically below aircraft.

**ground-position indicator** Device fed with data from compass, ASI etc and giving continuous readout of DR position (obs.).

**ground power unit** Source of power, usually electric and possibly pneumatic/hydraulic/shaft, supplied to parked aircraft.

**ground-proximity extraction system** Standard technique for low-level airdrop of palletized cargo using shock-absorbing ground coupling which engages with hook suspended from pallet.

**ground-proximity warning system** Uses forward-looking radar and sensitive altimeter[s] to give aural and/or visual warning, and in most systems, if ignored, to command violent pull-up to [typically] 30° climb. See *EGPWS*.

**ground radar aerial delivery** Method of air-dropping cargo, usually in A-22 (US) containers, from high altitude to avoid hostile fire, mountains or other hazards, with full parachute deployment delayed to increase accuracy.

**ground readiness** Status of aircraft serviceable and crews standing by so that arming, briefing etc can be completed within any specified period (longer than 15 min of ground alert).

**ground resonance** Dangerous natural vibration of helicopter on ground caused by stiffness and frequency of landing-gear legs amplifying primary frequency of main

**ground return**

rotor; potentially catastrophic unless designed out, and even with certificated helicopter can occur as a result of severe landing shock.

**ground return** See *ground clutter*.

**ground roll** Distance travelled from point of touchdown to runway turnoff, stopping or other point marking end of landing.

**ground run** Distance from brake-release to unstick, not same at TOR (see *takeoff*).

**ground safety lock** Retraction lock.

**groundschool** This is increasingly being spelt as one word. It usually refers to classroom instruction for GA pilots, especially on executive aircraft.

**ground sheet** Radial-wall flow of hot gas along ground beneath VTO [esp. jet-lift] hovering in ground effect.

**ground signals** Bold visual symbols displayed in signal area.

**groundspeed, G/S** Aircraft speed relative to local Earth.

**groundspeed mode** Flight-system mode holding constant G/S.

**ground spoiler** Spoiler available only after landing, usually as lift dumper.

**ground start** Supply of propellants to large rocket vehicle from ground during ignition and hold-down so that at liftoff main-stage tanks are still full.

**ground stop** Holds flight [usually scheduled, but in any case already cleared] at departure. Reasons might be closure of destination or to allow for implementation of longer-term solution to a destination problem, such as a *GDP*.

**ground strafing** Attack by aircraft on tactical surface target, esp. by gunfire.

**ground support** 1 Air power deployed for immediate assistance of friendly army, ie close air support; hence designation \* aircraft.

2 Hardware needed to facilitate operation of aircraft, eg ladders, chocks, refuelling, replenishing and rearming equipment, loaders, tie-downs, blanks (4) and ground conditioning and power supplies; and use thereof.

**ground support equipment, GSE** Ground equipment required for operation of aircraft [especially military], RPV or missile.

**ground swing envelope** Plot of ground where obstructions would foul nose or tail of longest aircraft in most extreme positions on curves of taxiways or apron.

**ground test** Test on ground of equipment or system normally used in air.

**ground test coupling** Connections enabling airborne system to be tested on ground for fluid pressure and functioning, supply voltage or any other variable.

**ground trace** Ground track of satellite.

**ground track** Path on Earth's surface vertically below aircraft or satellite.

**ground upset** Accident caused to light aircraft or other vehicle by jet blast or large propeller slipstream.

**ground visibility** Prevailing visibility along Earth's surface as reported by accredited observer or measured by RVR.

**groundwash** Outward flow of wake turbulence from engines or wingtips of large aircraft on ground.

**ground wave** Radio or other EM waves taking direct path from ground transmitter to ground receiver (in practice mix of ground, ground-reflected and surface waves); subject to refraction in ducts in troposphere.

**ground wire** 1 US term for earthing wire.

2 Winched cable emerging from top of mooring mast and connected to airship mooring cable; US = mast line.

**ground zero, GZ** Point on Earth nearest to centre of nuclear detonation (which may be below, at or above GZ).

**group** 1 Military air formation consisting of two or more squadrons (DoD), or two or more wings (RAF).

2 Several sub-carrier oscillators in telemetry system.

3 Major portion of aircraft (eg. wing\*) assigned to \* (4).

4 Team of engineers assigned to design, stress, develop and possibly cost major portion of aircraft, often remaining intact to work on same part on successive programmes; common in US, where \* titles are wing, fuselage, tail/controls, weight, electrical, hydraulic, armament and often others.

**group flashing light, GpFL** Ground light with regular emission of two or more flashes or Morse letter(s).

**group technology** General term for philosophy that links CAD with CAM to give CIM, based on recognising similarities between discrete parts.

**group velocity** Symbol U, that of entire disturbance of waves, equal to phase speed c minus wavelength 1 times dc/dl.

**growl** Missile tone heard in pilot headset indicating IR head locked on to target.

**growler** 1 Test equipment for short circuits in electrical machines (colloq.).

2 ECM aircraft, or a member of its crew.

**growth** Development to increase performance, hence \* engine; this may or may not be physically larger.

**GRP** 1 Glass-reinforced plastics.

2 Geographic reference point.

**GRR** Glycol recovery and recycling.

**GRS** 1 Government rubber synthetic, Buna-S type.

2 Global reconnaissance strike (US).

3 Gamma-ray spectrometer.

**GRSF** Ground Radio Servicing Flight (RAF).

**GRT** Gross registered tonnage, measure of capacity of ship,  $= 100 \text{ ft}^3 = 2.832 \text{ m}^3$ .

**GRU** Main intelligence directorate of General Staff (USSR).

**grunt manoeuvre** One involving high g (colloq.).

**Gruppe** Group (G), equivalent to RAF wing.

**GRV** Glycol recovery vehicle.

**GRVD** Grooved runway.

**GRVL** Gravel runway or surface.

**Gr wt** Gross weight.

**Gryphon** FBMS/shore communications system.

**GS** 1 Ground speed.

2 Glideslope.

3 Ground plus station (costs).

4 Ground supply (usually electrical).

5 General schedule.

6 Galley service vehicle.

7 Ground stop.

8 Gliding School.

**G/S** 1 Ground speed.

2 Glideslope.

**Gs** Small hail or snow pellets.

**GSA** Gunsight, surface-to-air.

**GSARS** Ground-surveillance airborne radar system.

**GSC** 1 Ground switching centre.

2 Ground-station controller.

- GSD** 1 Graphics system design.  
 2 Grey-[gray-] scale definition.  
 3 Ground sample distance.
- GSDI** Ground speed and drift indicator.
- GSE** 1 Ground support equipment.  
 2 Ground swing envelope.  
 3 Global sensitivity equation[s].
- GSF** Gross square feet [undesirable].
- GSFC** Goddard Space Flight Center, Greenbelt, MD (NASA).
- GSFG** Group of Soviet Forces in Germany (NATO name).
- GSGA** State service of civil aviation (R).
- GSGG** Gadolinium scandium gallium garnet.
- GSI** 1 Grand-scale integration (microelec.).  
 2 Government source inspection.  
 3 Glideslope indicator.  
 4 Grid security infrastructure.
- GSIF** Ground-station information frame.
- GSLV** Geostationary [or geosynchronous] satellite launch vehicle (India).
- GSM** 1 Ground-station module, or mobile.  
 2 Global-station module.  
 3 GPS sensor module.  
 4 Global-systems mobile, or global system for mobile communications.
- GSMC** Global system for mobile communications.
- GSMS** Ground-station management system.
- GSN** Guidance unit (R).
- GSO** Geostationary orbit.
- GSOC** German Space Operations Centre, Oberpfaffenhofen.
- GSP** 1 Ground service plug (= socket).  
 2 Glareshield panel.
- GSQA** Government source quality assurance (US).
- GSR** 1 Ground surveillance radar.  
 2 General Staff requirement (UK, Army).
- GSS** Ground (or group) support system.
- GSSS** Gyrostabilized sight system.
- GST** 1 Greenwich sidereal time.  
 2 General Staff Target.  
 3 General skills test (proposed for NPPL).
- GSTF** Global Strike Task Force (USAF).
- GSTP** General support technology programme (ESA).
- GSTRS** Ground safety tracking and reporting system.
- GSTS** Ground-based surveillance and tracking system (SDI).
- GSU** 1 Group Support Unit.  
 2 Group Standardisation Unit (RAF).
- GSV** Gray-scale voltage[s].
- G-switch** Activated by severe acceleration or impact.
- GT** 1 Group technology.  
 2 Rate, eg kg/h, of fuel consumption (USSR).  
 3 Gas temperature.  
 4 Greater than.  
 5 Gain/thermal noise ratio, also G/T.  
 6 Aircraft category, glider torpedo (USAAF 1942–47).
- G<sub>t</sub>** Gain of radar aerial (dB).
- GTA** General terms agreement.
- GTACS** 1 Ground-target attack control system.  
 2 Ground-theater air control system (JFACC).
- GTAW** Gas tungsten-arc welding.
- GTC** 1 In IFF, group time cycle.  
 2 Gyro time constant.
- 3 Ground terminal computer of data-link.
- GTDS** Ground tracking data station.
- GTE** Grupo de Transporte Especial [government air carrier] (Brazil).
- GTF** 1 Ground test facility.  
 2 Geared turbofan.
- GTL** Gas to liquid [fuel].
- GTM** Ground targeting mode.
- GTN** Global Transportation Network [web-based control system, to be upgraded to \* 21] (US DoD).
- GTO** Geosynchronous (or geostationary) transfer orbit.
- GTOW** 1 Ground take-off weight.  
 2 Confusinlgly, gross take-off weight.
- GTPE** Gun time per engagement.
- GTR** 1 Gulf Test Range.  
 2 General technical requirements.  
 3 Greater.
- GTRE** Gas Turbine Research Establishment (India).
- GTRI** Georgia Tech. Research Institute.
- GTS** 1 Gas-turbine starter.  
 2 Glider Training School.
- GTSIO** Geared, turbocharged, direct injection, opposed.
- GTSS** Ground-target sensor surveillance.
- GTT** Ground test time.
- GTV** 1 Ground-test vehicle (helicopter).  
 2 Guidance test vehicle (missile).  
 3 Glide test vehicle.  
 4 Ground test valve (hydraulic system).
- g.u.** Gravity unit, standard unit for geophysical and MAD calculations, =  $10^{-6} \text{ ms}^{-2}$ .
- GUAP, Guap** Chief Administration of Aviation Industry (USSR).
- guaranteed rating** Minimum power or thrust which manufacturer guarantees every engine of type will reach.
- Guard** Category of aircraft of secret type, or containing secret equipment, requiring armed guard when parked (UK, WW2).
- guard** Emergency VHF channel usually monitored as a secondary frequency by all air and ground stations in geographical area.
- guarded switch** One protected against inadvertent operation by hinged cover or shroud.
- guard frequency** Guard.
- guardroom** Police post at entrance to RAF airfield or other military establishment (UK).
- guardship** 1 Armed escort helicopter.  
 2 Planeguard helicopter.
- gudgeon pin** Links piston to connecting rod (US, wrist pin).
- GUDN** Guarnylurea-dinitramide.
- GUGVF** Chief Administration of Civil Air Fleet, of which Aeroflot is operating branch (USSR, R).
- GUH** Get-U-Home.
- GUI, G/UI** Graphics, or graphic[al], user interface.
- guidance** Control of vehicle trajectory, esp. that of unmanned, or of manned but according to external inputs (see *active homing*, *beam-rider*, *command* \*, *electro-optical* \*, *inertial* \*, *IR* \*, *laser* \*, *midcourse* \*, *passive homing*, *radar command* \*, *semi-active homing*, *wire* \*).
- guidance radar** One dedicated to providing pencil beam for beam-rider or radar command guidance or illumination beam for semi-active homing.

## guidance system

**guidance system** Complete system providing guidance signals to flight-control system which steers vehicle.

**guide ailerons** Small wing-tip ailerons providing normal feel on aircraft with plug-type spoiler ailerons.

**guided bomb** Free-fall missile with guidance, esp. modified bomb.

**guided missile** Vehicle able to deliver warhead to target; normally not including those travelling over land surface or entirely through water (torpedo) but including all with some form of aerial trajectory.

**guided weapon** Guided missile (UK).

**guide rope** See *drag rope*.

**guide-surface canopy** Any of several families of parachute deployed from pack but able to be steered through air with translational motion.

**guide vane** 1 See *stator blade*.

2 Radial aerofoil struts at gas-turbine inlet designed to add or reduce swirl to airflow.

**Guidonia** Large aeronautical research centre formerly (pre-1944) run by Italian defence ministry.

**Guinea Pig Club** Members of Allied air forces in WW2 who had been critically burnt or injured and operated on semi-experimentally.

**GULF, Gulf** Graphical user interface load-control facility.

**gull wing** One having pronounced dihedral from root to c15–20% semi-span, then little dihedral or even anhedral to tip.

**gull-wing canopy** In left/right halves, opened along centreline.

**gull-wing door** One having pronounced curvature, concave on outer face, hinged parallel to aircraft longitudinal axis.

**gully** Deep axial channel, eg. between two separated engines in fuselage of twin-jet aircraft.

**gulp** Irreversible consumption of lubricating oil.

**gum** General term for viscous residues formed in gasolines (petrols) and to lesser extent other hydrocarbon fuels, mainly by slow oxidation.

**gun inhibitor** Now called anti-oxidant additive.

**Gumo, GUMO** Main and central directorates, each with a number (R, MoD).

**Gump** Gas, undercarriage, mixture, propeller(s) (US arch.).

**gun** 1 Good general term for airborne rifled weapons of all calibres, including recoilless installations; no clear definition at what low muzzle velocity \* becomes projector.

2 Piston engine throttle; hence to cut \* = to close throttle, and to \* engine = to apply full power (colloq., suggest arch.).

**gunbore line** Projected axis of bore.

**gun cross** HUD symbol indicating gun is armed, ready to fire.

**gun gas** Emitted from muzzle, mix of initially incandescent gases from propellant deficient in unburned oxygen which if ingested by engine suddenly alters operating conditions.

**gun jump** Angle between gunbore line at firing and projectile trajectory as it leaves muzzle.

**Gunk** Registered commercial solvent for oils and greases.

**gunlaying radar** Early AI radar with mode for assisting attack with fixed guns on target seen only on display.

## gustiness factor

**Gunn oscillator** Major family of GaAs diodes generating microwave outputs on application of small bias voltage.

**gun pack** Quickly replaceable unit comprising one or more fixed guns (sometimes with barrels remaining installed in aircraft), feed systems and ammunition tanks, either in streamlined pod or contained within aircraft.

**gun perfection coefficient**  $\frac{T-m}{60-M}$  where  $m$  is mass of projectile,  $M$  mass of gun and  $T$  shots per minute.

**gunship** 1 Specially designed helicopter with slim two-seat fuselage, extensive protection and wide range of armament for roles in land warfare.

2 Large transport aircraft equipped with night sensors and guns for use against poorly defended ground targets.

**gunsight line** LOS to aiming point through gunsight fixed optics.

**gun time per engagement** Usually firing duration in seconds, aggregate of separate bursts, against one aerial target.

**gun-type weapon** Nuclear weapon triggered by firing together at maximum velocity two or more subcritical fissile masses.

**gunwales** Pronounced gunnels, the upper edge of the sides of a marine-aircraft hull or float [with a rounded top, hardly applicable].

**Guppy** Aircraft with grossly swollen or bulged fuselage, eg, for conveyance of space-launcher stages and wide-body components (colloq.).

**Gusem** Generic unified systems engineering metamodel.

**gusset** Small flat member used to reinforce joints and angles.

**gust** 1 Sudden increase in velocity of horizontal wind (see *gustiness factor*).

2 Suddenly encountered region of rising or falling air, causing moving aerodyne to experience sudden increase or decrease in angle of attack, = gust velocity  $u \div$  airspeed  $v$ . Vertical gust can theoretically be sharp-edged (instantaneous change from zero to maximum  $u$ ) but normal design/airworthiness based on l-cosine (gradual) gust curve to which gust-alleviation factor applied.

**gust alleviation** Dynamic system for reducing effect of vertical gust on aeroplane (rarely, other aircraft) (see *active ailerons, Softride*).

**gust-alleviation factor** As aeroplane encounters gust it pitches (depending on wing/tail or foreplane geometry) and wing does not generate full extra lift until it has travelled several chord lengths into gust, both of which reduce sudden structure load below instantaneous encounter, BCAR assumes \*\*\* 0.61, ie assumptions are based on 61% of true sharp-edged gust.

**gust curve** Assumed plot of gust (invariably 2) velocity relative to surrounding air mass against horizontal distance from undisturbed air to position of peak  $u$ .

**gust envelope** Basic aircraft design plot, vertical axis being structural load factor (1) and horizontal axis airspeed; normal boundaries are positive-stall curve, peak positive gust (normal non-SI = 50 ft/s) to  $V_c$ , line to meet gust of half this strength  $\pm 25$  ft/s at  $V_d$ , then vertical  $V_d$  to negative half-strength gust, line to  $-50$  ft/s gust at  $V_c$ , and straight line at this negative gust value to meet positive stall at point less than 1 g. Recently new boundaries have been established at  $V_B$  at  $\pm 66$  ft/s. Increasingly now called flight envelope.

**gustiness factor** Measure of gust (1), = difference

## **gust loading**

between maximum gust and lull expressed as percentage of mean wind.

**gust loading** Increased structural loads caused by gust (1, 2).

**gust locks** Particular *control locks* preventing movement of flight controls of parked aircraft.

**gust response** Aircraft encountering gust (1, 2) experiences vertical acceleration made more severe by high speed, low wing loading (esp. large span, discounting flexure effect of wing) and some other factors. Normal measure of \*\* is number of 0.5 g vertical accelerations experienced by pilot's seat per minute under specified conditions at high (Mach 0.9) speed at low level.

**Guti** Rare clag in Zimbabwe.

**gutter** Afterburner flameholder having cross-section generally in form of V, open side to rear, to create strong turbulence sufficient to keep flame attached; see *vapour* \*.

**Guttman** Original scaling technique used to assess community noise response assuming that any positive answer implies positive answer to all questions of lower order; final Guttman scale is normally: no action; sign petition; attend meeting; contact officials; visit officials; help organize action group.

**GUVVF** Chief Administration of Air Fleet (USSR).

**GV** Grivation.

**GVC** Girls Venture Corps: -AC or (AC) adds Air Cadets [1939–, incorporates WJAC; office Sheffield S9 1UD] (UK).

**GVE** Graphics vector engine.

**GVF** Civil Air Fleet (USSR, R).

**GVI** General visual inspection.

**G/VLLD** Ground/vehicle laser locator designator.

**GVLS** Ground vortex length scale.

**GVPF** Geared variable-pitch fan.

**GVR** Gross vehicle weight [airport vehicle].

**GVRC** GPS volume receiver card.

**GVS** 1 Ground velocity subsystem.

2 Global voice service.

**GVSC** Generic VHSIC spaceborne computer (USAF).

**GVT** Ground vibration test(s).

**GVW** Gross vehicle weight.

**GW** 1 Guided weapon.

2 Groundwave.

3 Gateway.

**G<sub>w</sub>** In a flight-control system [for example] a washout filter.

**GWAI** George Washington Aviation Institute [Ashburn, VA] (US).

**GWAC** Government-wide acquisition contract [2007–] (US).

**GWIB** Guy way in back [GIB1 more common].

**GWIS** Generic weapon interface system.

**GWEN, Gwen** Groundwave emergency network.

**GWJ** Garnet water jet for high-rate cutting of hard metals.

**GWM** Guam missile/space station.

**G-WOE** Global war on error.

**GWOT, G-WOT** Global war on terrorism.

**GWS** 1 Guided weapon system (RN).

2 Graphical weather service.

**GWT** Gross weight.

**GVVSS** Ground wind vortex sensing system.

**G<sub>x</sub>** Gain of transponder RF amplifier.

**G<sub>xyz</sub>** Shear modulus of a composite panel with fibres crossing at 45°.

**gyro** Gyroscope.

**gyro angling gain** CG = H/c, H sense (7).

**gyrocompass** Compass based upon space-rigidity of gyroscope; no true long-term instrument exists but see *directional gyro* and *Gyrosyn*, and sensing element of fluxgate compass is gyro-stabilized.

**gyrocopter** Autogyro (US).

**gyrodyne** Aerodyne having engine power transmitted to lifting rotor(s) and propeller(s) used for thrust; convertiplane has wing in addition.

**gyrograph** Graphical plot of gyro drift against time.

**gyro gunsight** Sight for fixed guns using one or more gyros (and RAE-developed Hooke's joint with two degrees of freedom) to provide automatic lead computation by measuring rates of sightline spin while remaining insensitive to rotation about sight axis itself caused by roll of host aircraft.

**gyrohorizon** See *artificial horizon*.

**gyro log** Form used to calculate and record gyro drift and drift rate (ASCC).

**gyromagnetic compass** Directional gyro whose azimuth datum is maintained aligned with magnetic meridian by precession torquing from magnetic detector.

**gyropilot** See *autopilot*.

**gyroplane** Becoming a common US term for an *autogyro*.

**gyroscopic manoeuvre** Flight manoeuvre by aerodyne in which the aircraft tumbles, rotating about all three axes but capable of controlled recovery.

**gyrostabilized** Held in fixed attitude relative to space, subject to precession and wander.

**gyrostat** Hughes-developed technique for satellites of great length spinning about minor axis.

**Gyrosyn** Registered name for gyrosynchronized compass comprising DI (2) slaved to magnetic meridian by fluxgate.

**gyro time constant** GTC = J/c.

**gyro vertical** Local vertical indicated by vertical gyro.

**GZ** Ground zero.

# H

- H**
- 1 Henry.
  - 2 Total pressure.
  - 3 Enthalpy.
  - 4 High (synoptic chart).
  - 5 High-altitude-class Vortac/Tacan or Route Chart.
  - 6 NDB 50-1,999 W.
  - 7 Angular momentum.
  - 8 Helicopter mission category, USAF since 1948, USN since 1962, or helicopter qualification [PPL].
  - 9 US military aircraft modified mission prefix, search/rescue and aerial recovery (DoD).
  - 10 Magnetizing force; horizontal component of Earth's field, See  $\vec{H}$  below.
  - 11 Stored in silo but raised to surface for launch (DoD, ICBM).
  - 12 Hard temper (light-alloy suffix).
  - 13 G/S home from CP.
  - 14 Airway or map prefix, helicopter route.
  - 15 Ambulance [hospital]category (USN 1929-31, 1942-44).
  - 16 Transfer function.
  - 17 Health (facility or RAF).
  - 18 Piston engine with two crankshafts and parallel opposed cylinders.
  - 19 Hard surface [airfield].
  - 20 Haze.
  - 21 Homing [beacon].
  - 22 Hold, followed by direction.
  - 23 Heavy.
  - 24 Hazard.
  - 25 Heliport.
  - 26 Geometric altitude, or height of aircraft c.g. when on ground.
  - 27 Hydrogen [see  $H_2$ ].
  - 28 Maximum section height (tyre).
  - 29 Propeller pitch [P more common].
  - 30 Aircraft category. VTOL aircraft [but see category M] (FAI).
  - 31 Hankel function.
  - 32 High-intensity [airfield lighting].
- h**
- 1 Hour[s].
  - 2 Prefix hecto =  $10^2$ .
  - 3 Hexode, heptode (ambiguous).
  - 4 Hangarage available.
  - 5 High (synoptic chart).
  - 6 Heater (electronics).
  - 7 Height above MSL, or height difference in flight trajectory.
  - 8 Specific enthalpy.
  - 9 Planck constant,  $= 6.62559 \times 10^{-34} \text{ Js}$ .
  - 10 Height of blade CP above flapping axis.
  - 11 Operator,  $120^\circ$  (electrical).
  - 12 CC blowing jet slit height (also  $h_j$ ).
  - 13 Distance measured across chord from leading edge divided by MAC.
  - 14 Subscript, hover.
  - H+**, **H-** Hours plus or minus minutes, eg related to H-hour.
  - H** Magnetic field,  $\text{Am}^{-1}$ .
- h<sup>1</sup>, h** Vertical velocity. Suffixes for glide-slope (GS), flare trajectory (FL) and reference trajectory (REF).
- H<sub>2</sub>** Gaseous hydrogen.
- H<sub>24</sub>, H<sub>24</sub>** Continuous-service airfield or facility.
- H<sub>2S</sub>** Original PPI mapping radar (UK, WW2).
- H<sub>2X</sub>** Development of  $H_3S$  at shorter wavelength in US (see *mickey*, *BTO*).
- H-83282** Highly stable non-inflammable synthetic hydraulic fluid (USN).
- H-bomb** *Hydrogen bomb*.
- H-display** B-display with elevation angle indicated; target appears as bright line with slope proportional to sin elevation.
- h-dot** See  $h^1, h$
- H-engine** Piston engine with left and right rows of vertical opposed cylinders, two crankshafts geared to central output.
- H-force** Helicopter main-rotor drag.
- H-hour** Start of war, esp. time first landing aircraft reaches LZ, or similar clearly defined action.
- H-film** Kapton hi-temperature polyimide.
- H-plane** Plane of antenna's magnetic field, normal to E-plane.
- H-Pres** Pressure altitude.
- H-tail** One having twin fins on tips of tailplane.
- HA**
- 1 Height of apogee.
  - 2 Hour angle.
  - 3 High altitude.
  - 4 Housing allowance.
- ha** Hectare[s],  $= 10^4 \text{ m}^2$ .
- HAA**
- 1 Helicopter Association of America [office Washington DC].
  - 2 Height above airport.
  - 3 Historic Aircraft Association [1978-; office Leamington CV32 6NQ] (UK).
  - 4 Heavy anti-aircraft [gun, or fire].
  - 5 High-altitude airship.
  - 6 Helicopter Association of Australia.
- HAAP** Helicopter approach aiming point.
- haar** Wet sea fog (UK, North Sea).
- HAARP** Hf active auroral research program (ONR).
- HAARS** High-altitude airdrop resupply system.
- HAATR** Highly accurate autonomous target recognition [C adds capability].
- HAB** Heliport acquisition beacon.
- HABM** Hypervelocity air-breathing missile.
- hadoop** Line squall causing severe dust storm.
- HABV** Hypersonic air-breathing vehicle.
- HAC**
- 1 House Appropriations Committee (US Congress).
  - 2 Hover/approach coupler.
  - 3 High-acceleration cockpit.
  - 4 Hélicoptère anti-char (F).
  - 5 Helicopter aircraft controller.
  - 6 Helicopter active control.
  - 7 Heading alignment cone.
  - 8 Helicopter Association of Canada.
- Hacienda** Office of Aerospace Research (USAF, colloq.).

**hack** 1 Aircraft informally used as general transport and utility vehicle by military unit (often captured from enemy or retired from combat duty).

2 To be able to accomplish (military/RAF, transitive, colloq.).

3 To penetrate private network, especially a secure LAN.

**HACP** High-altitude communications platform [unmanned airships].

**HACS** Helicopter armoured crashworthy seat.

**HACT** Helicopter active-control technology.

**HAD** 1 Hybride analog/digital.

2 Hélicoptère d'Appui-Destruction (F).

3 Hardware architecture document.

**Hadas** Helmet airborne display and sight.

**Hadec** Highly-adaptive digital engine control.

**HADF** High-accuracy direction finder.

**HADS** 1 High-accuracy digital sensor.

2 Helicopter air-data system.

**HAE** High-altitude endurance.

**HAF** Hellenic air force [UK usage].

**HAFFS** Heliborne aerial firefighting system.

**Hafnium** Hf, corrosion-resistant silver metal, density 13.3, MPt 2,230°C, \* carbide and \* nitride MPts are well beyond 3,000°C.

**HAGB** Helicopter Association of Great Britain.

**Hagen-Poiseuille** Law for velocity or pressure drop per unit length for pure streamline (laminar) flow in constant-section pipe. Equal to  $u = \frac{P}{4\mu} (a^2 - r^2)$

where u is local velocity, P pressure drop per unit length,  $\mu$  coefficient of viscosity, a radius of tube, and r radius at point concerned. Equation denotes parabolic velocity distribution.

**HAGR** High-gain advanced GPS receiver.

**HAH** Hot and high.

**HAHO, Haho** High-altitude high-opening.

**HAHS** Hibernian Aviation Historical Society [office Dublin].

**HAHST** High-altitude high-speed target.

**HAHV, HaHV** Haute altitude, haute vitesse.

**HAI** Helicopter Association International [office, Alexandria, VA22314–2818] (US, Int.).

**HAIL** Highlands and Islands Airports plc (UK).

**hail** Precipitation in form of hard or soft ice pellets, varying size; maximum for certification test is usually 1 in (25.4 mm) sphere.

**HAILSS** Helicopter aircrew integrated lift-support system.

**HAINS, Hains** High-accuracy INS.

**Hair** High-altitude IR.

**hair absorber** Family of RAM (2) coatings consisting of dense mats of hair with conductive coatings, eg carbon-black in neoprene.

**hairline crack** One in which the two sides are in close contact, hence inconspicuous to eye.

**HAISS** High-altitude IR sensor system.

**HAL** 1 Height above landing [on helicopter pad].

2 Host accessory logic.

**Hale, HALE** High-altitude, long-endurance.

**half-brightness life** Used in several senses, eg time from cutoff of stimulating radiation of phosphor to luminescence falling to half peak, time of cutoff of current to LED

to same reduction in brightness, and various characteristics of storage tubes and displays.

**half chat** Vaguely, any partial power setting [colloq.].

**half-Cuban** Aerobatic manoeuvre consisting of up-45 line, half-roll followed by remainder of loop [many variations and additions].

**half glidepath** ILS glidepath within points at which DDM is 0.0875.

**half-life** Time required for decomposition of half original mass or number of atoms of radio-active material.

**half-million** Aeronautical chart series on scale 1:500,000 (ICAO).

**half-period zone** See *Fresnel zone*.

**half-power points, rings** Points, whose locus is normally closed ring, where radiated power from antenna is half lobe maximum.

**half-power width** Total angle at antenna between two opposite half-power points measured in plane containing lobe peak.

**half-residence time** Time for quantity of delayed fallout (weapon debris) deposited in particular part of atmosphere to decrease to half original value.

**half-reverse Cuban** Aerobatic manoeuvre: two left rolls up up-45 line, two flick rolls to right, increase trajectory to vertical to zero airspeed, tailslide followed by other manoeuvres on down-45.

**half-roll** Rotation of aircraft sensibly about longitudinal axis through 180°, usually from upright to inverted attitude or vice versa; can be half of barrel roll or of slow roll.

**half-thickness** Thickness of absorbing medium which transmits half intensity of radiation incident upon it.

**halftone screen** Fine opaque grating usually scribed on glass to break up photographic image into halftone dot pattern, for printing or digitising purposes.

**halftone tube** CRT containing conventional gun for writing separated from screen by fine-mesh electrode and storage plate.

**half-view** Drawing showing half a symmetrical object.

**half-wave rectification** Use of single-phase rectifier which passes only half of each alternate wave from input.

**Hall effect** When current-carrying material is subjected to magnetic field (or when conductor is moved through magnetic field) potential difference is set up perpendicular to both current (or motion) and field; small in metals but important in semiconductor systems and in study of electricity in ionosphere. Since 1990 the operating principle of some space thrusters.

**Halo** 1 High-altitude, low-opening (paradrop system).

2 High-altitude large optics.

3 High altitude [or agility], low observable.

4 Hypersonic air-launched option.

5 High altitude, long operation.

**halo** 1 Any of several species of part-circular phenomena caused by ice crystals in upper atmosphere, chief of which is 22° radius around Sun or Moon.

2 Coloured ring or disc seen on cloud in direction away from Sun, ie with aircraft shadow at centre; also called pilot's \*.

3 Reflection of cockpit instrument seen in canopy at night.

**halo effect** Ability of SST service to generate or attract additional first-class subsonic traffic to same carrier on same route(s).

**Halon** Family of halogen-based fluids, mainly BCF,

stored as liquid under pressure and used as fire extinguishants and for inerting space above fuel in tanks.

**Halsol** High-altitude solar [-powered aircraft].

**HALT, Halt** Highly, or hardware, accelerated life test[s].

**halteres** Twin vibrating prongs used in certain time-keeping systems.

**hammer** Sudden violent excursions in pressure caused by reflected shockwaves in closed fluid (esp. hydraulic) system.

**hammerhead** 1 Large circular paved area at end of runway to facilitate turning.

2 See next.

**hammer stall** Extreme stall turn in which aircraft rotates within c 5° of vertical plane; depending on aircraft, power retained until point of stall at apex. Also called hammer-head stall.

**Hamots** High-altitude multiple-object tracking system.

**HAMS** Hot-air management system.

**han** Hydroxyl ammonium nitrate.

**handbook problem** One requiring in-flight consultation of flight manual for numerical answer.

**hand bumping** Use of hand tools and backing dollies to shape sheet metal.

**hand controller** Human interface to automatic or semi-automatic system, eg to HUD, multi-mode radar or large display; usually incorporates stick, rolling ball or triggers.

**hand-crafted** Still used to mean IC (4) is custom-designed for particular application, even though design is entirely via computer graphics.

**hand cranking** Direct mechanical connection between crank and piston engine or small gas turbine (in latter case via step-up gears) for starting.

**handed** Items on left of aircraft are mirror-image of those on right; see next.

**handed propellers** Left and right \*\* rotate in opposite directions.

**hand flying** Piloting autopilot-equipped aircraft in fully manual mode.

**hand forging** Forging by hand tools.

**hand forming** Shaping ductile sheet with hand tools and accurate form blocks tailored to flanging, beading etc.

**hand geometry** Basis of one branch of biometrics concerned with linear and rotary measures, but not forces.

**hand-held microphone** Self-powered (battery) microphone for use in light aircraft following total electrical failure, usually connected to external antenna at 121.5 MHz.

**hand inertia starter** Hand crank spins flywheel which, when at full speed, is suddenly clutched to start piston engine.

**handlebar moustache** Wide with upturned ends (RAF fashion, WW2).

**handler** Apron loader of cargo.

**Handley Page slat, slot** See *slat*.

**handline** Firefighting hosepipe stowed on CFR vehicle, unreeled and deployed manually.

**handling** 1 Subjective impressions of response to controls of particular aircraft; hence \* *squadron*.

2 Manoeuvring of aerostat by ground crew or landing party.

3 Providing full service for operator at airport where that operator has no staff. Customer is usually an air-carrier.

4 Response of [usually gas-turbine] engine to varying power demand; see next.

**handling bleed** Air bleed, usually from compressor, to avoid surge caused by varying power demand.

**handling line** 1 Primary line used by ground crew for handling aerostat.

2 Single or twin cables attached above c.g. of seaplane for use when hoisting by crane into or out of water.

**handling pilot** Pilot actually flying the aircraft.

**handling squadron** Assigned assessment of new aircraft, and compilation of Pilot's Notes.

**handoff** Transfer of control or surveillance from one ground radar controller to another.

**handover** Handoff (military).

**hand priming** Manually squirting a spray of fuel into the engine inlet manifold [if fitted, by a cockpit inceptor].

**hands-off** 1 Condition in which non-autopilot aircraft, usually aeroplane, flies by itself in perfect trim with pilot(s) not touching controls.

2 Flight on autopilot.

3 Ground party release balloon basket, permitting ascent.

**hands-on** 1 With human(s) interfacing with system, which can be EDP (1) or aircraft in flight; appropriate only to complex autopilot aircraft in which \* is rare in cruising flight. Hence, \* training = practice in hand flying, or interfacing manually with military sensors and weapon systems.

2 Ground party hold down balloon basket.

**hand starter** Arrangement for starting engine by hand other than by swinging propeller.

**hand-starter magneto** Separate hand-controlled auxiliary magneto carried to aircraft and used to supply powerful spark when starting piston engine.

**hand-turning gear** Connection for a hand-crank, eg on same shaft as centrifugal breather to give maximum mechanical advantage. In piston engine can be same as manual or hand starter.

**hangar** Shelter for housing aircraft on ground.

**hangarette** 1 Hangar tailored to single aircraft, esp. hard shelter [*HAS* 1 now almost universal].

2 Weatherproof cover over missile launcher or similar installation.

3 Pre-fabricated hangar flown to FOL and rapidly erected.

**hangar flying** Social chat about flying by those involved in it, esp. pilots.

**hangar queen** Particular aircraft notoriously prone to unserviceability requiring major maintenance.

**hangar rat** Young enthusiast [self-explanatory].

**hangfire** Fault condition in which rocket missile fails to fire; vehicle or missile thus affected.

**hang glider** Large class of simple ultra-light aerodynes, broadly divided into those with flexible wings (most of Rogallo type) and those having wings with preformed aerofoil section (called rigid); majority have no controls and manoeuvre by translation of pilot mass to shift c.g. Can be monoplane or biplane, and may have rear tail, canard or auxiliary engine. Demarcation line with glider or ultra-light aeroplane becoming blurred.

**hang up** 1 Externally or internally carried store which fails to release when thus commanded.

2 Gas-turbine engine which starts but fails to spool-up; also called hung start.

- h<sub>ant</sub>** Height of ILS or MLS antenna above ground plane.
- HANZ** Helicopter Association of New Zealand.
- HAP** Hélicoptère d'appui et de protection (F).
- Hapdar** Hardpoint demonstration array radar.
- HAPI, Hapi** Helicopter approach-path indicator.
- Happ** High-altitude powered platform, lightweight, solar-powered, unmanned aircraft able to hold station for months to years.
- Haps** 1 Helmet-angle position sensor.  
2 Helicopter acoustic processing system.
- HAR** 1 Helicopter, air rescue (role prefix, UK).  
2 Helicopter alternative route.
- harass** 1 Air attack on any target in area of land battle not connected with CAS or interdiction, with objective of reducing enemy's combat effectiveness.  
2 To interfere with progress of another aircraft by making repeated close passes against it.
- Harc jet** Hall-effect arc jet, using magnetic field on hydrogen plasma jet (see *Hall*).
- Harco** Hyperbolic area-coverage.
- HARD** Helicopter and aeroplane radar detection.
- hard copy** Immediately readable output, eg printed pages, as distinct from tape, microfilm or software.
- hard data** Remains in memory when power switched off.
- hard deck** The ground, especially in air combat at low altitude.
- hardened** 1 Protected against blast, ground shock, over-pressure, EMP, radiation and possibly other effects of nuclear explosion, and (DoD only) likely to be protected against chemical, biological or radiological attack (see *hardness*).  
2 More recently, protected against terrorist attack, eg cockpit or LD3 container.  
3 Of avionics, protected against EMP and any other powerful external EM effects which in particular would normally degrade or destroy most memory cores.  
4 Of metal, physically \* by precipitation, quenching or cold working.
- hard flutter** Normally well damped but extremely violent over one narrow range of conditions.
- hard intervals** Precisely scheduled service/overhaul periods, as distinct from on-condition.
- hard intervals** Precisely scheduled service/overhaul periods, as distinct from on-condition.
- hard-iron magnetism** That induced into all magnetic parts of aircraft during manufacture, esp. by hammering or riveting, orientation and polarity depending on assembly heading and terrestrial latitude.
- hard lander** Spacecraft designed to free-fall to surface of heavenly body.
- hard landing** 1 Conventional aircraft landing with excessive rate of descent, esp. that results in damage or overstressing.  
2 Arrival of hard lander on lunar/planetary surface.
- hardness** 1 Various measures of physical \* such as Moh's scale for non-engineering (eg geological) materials, and Rockwell, Vickers, Brinell and many other standard tests for precise quantified readings.  
2 Any of five measures of nuclear hardening; eg resistance to overpressure, which varies from c 2 lb/sq in (c 14 kPa) for aircraft parked in open to over 11,000 lb/sq in (c 75 MPa) for hardest concrete silo.
- hardover runaway** Sudden unwanted operation of

system, esp. flight-control channel, to extreme limit of travel.

**hardover signal** Fault condition resulting in full demand for unidirectional system operation unrestrained by normal feedback.

**hardpoint** Anchorage built into aircraft structure for heavy external load, usually via intermediate pylon, MER or launcher.

**hard radiation** High penetrating power from very short-wavelength; usual definition is ability to pass through 100 mm of lead.

**hard recovery** Landing under difficulties, eg barrier crash into net in bad weather with tower out of action (probably colloq.).

**hardstanding** Paved parking area (US, often hardstand).

**hard target** 1 One that is hardened (1).

2 In air-to-air or surface-to-air firing practice, a rigid drone, as distinct from a sleeve or banner.

**hard-target functional defeat** Use of air/ground weapons to disable deeply buried installations without necessarily killing humans.

**hard temper** Modification of light-alloy properties, eg by cold working, denoted by scale such as 3/4H (= 75% fully hard); increased tensile strength is usually accompanied by reduced ductility, which in airframes tends to be equated with shorter fatigue life.

**hard time** Period, usually an inspection interval, precisely written into service/overhaul documentation and mandatory. Today increasingly replaced by flexible routines such as OCM.

**hardtop** Paved with permanent all-weather surface.

**hard turn** Planned turn in air combat at rate governed by angle-off and range.

**hard vacuum** High vacuum, pressure below  $10^{-9}$  Nm<sup>-2</sup> ( $10^{-7}$  torr).

**hardwall hose** Does not collapse under atmospheric pressure when used for suction; not necessarily armoured.

**hardware** 1 Originally introduced to distinguish mechanical parts of EDP(1) systems from software, today useful to imply manufactured items of any kind that exist, as distinct from software, system concepts, paper designs and proposals, simulations, capabilities and functions.

2 In narrow sense, small fasteners and similar small parts.

**hardware in the loop** Flight-motion simulation system incorporating portions of actual aircraft dynamics.

**hard wing** 1 One with simplified leading edge compared with particular previous wings, eg no slat.

2 Any wing with fixed-geometry leading edge.

3 In combat mission, wing man locked-in to follow leader in (almost) all circumstances.

**Harm, HARM** High-speed anti-radiation missile.

**Harmattan** Dry, dust-filled NE wind (W Africa).

**harmonic** Component of sinusoidal or complex waveform or tone whose frequency is integer multiple of fundamental frequency.

**harmonic analyser** Device, typically variable-frequency filter, which can resolve waveform into harmonic constituents.

**harmonization** 1 Boresighting of all guns fixed to fire in same basic direction (eg ahead) so that all are correctly aligned with respect to aircraft axes, usually so that all gun axes converge at specified distance from aircraft.

2 Adjustment of flight-control system so that effect of

**harness**

controls about each axis matches that about others at all airspeeds; in particular so that handling about each axis in terms of rate of pitch, roll or yaw, and load (real or synthetic) experienced by pilot appear to be in harmony.

**harness 1** Assembly of straps with which member of flight crew can be secured to seat.

**2** Assembly of straps with which parachutist can be attached to parachute, which may or may not be permanently attached to \*.

**3** System of straps and other restraining members with which cargo pallet or container is secured to cargo floor in cases where there is no inbuilt anchorage. Not restraint net.

**4** Weatherproof, screened assembly of HT leads connecting ignition source to piston engine plugs or gas-turbine igniters.

**harness secure** The mandatory procedure of assembling and pinning the harness in an empty pilot seat when a dual aircraft is being flown solo [to prevent it fouling the control column].

**HARP, Harp** 1 Helicopter Airworthiness Review Panel.

2 Helicopter advanced rotor program.

3 High-altitude research program.

**Harper rivet** Extremely shallow convex head.

**harpoon system** Any helicopter hold-down system based on firing barbed anchor into grid or other fixed base on ship platform.

**Harris program** Numerical factors used in designing aircraft to the area rule for minimum wave drag (NASA).

**Harry Clampers** Clamp (colloq.).

**HARS, Hars** 1 Heading/attitude reference system.

2 High-altitude route system.

**harsh environment recorder** Tape recorder with up to 28 tracks meeting most severe specification for temperature, vibration/shock and sustained acceleration.

**hartley** Standard unit of information content generally taken as equal to  $\log_2 10 = 3.219$  bits or 1 decimal digit.

**Hartmann generator** Common electrically powered source of intense noise, usually with variable spectrum.

**Hartridge smoke unit, HSU** One of most popular measures of smoke blackness; smoke is fed through chamber of known length and light meter measures light received from calibrated source at other end. Accurate for combustion engineers but for subjective assessment against sky jet diameter must be taken into account. PSU is similar (see *smoke*).

**HARVe** Pronounced harvey, high-altitude reconnaissance vehicle (JHU/APL).

**HAS** 1 Hardened aircraft shelter.

2 Hover-augmentation system (reduced pilot workload by using sensitive accelerometers in hover).

3 Hood, aircrew survival.

4 Helicopter anti-submarine (UK).

5 Heading and attitude (reference) system (or heading/attitude sensors).

6 Hazard awareness system.

7 Helicopter air and surface [targets].

**HASA** Helicopter Association of Southern Africa.

**HASC** House Armed Services Committee (US).

**Hasell check** Height, airframe, security, engine(s), location, lookout; prior to spin or other harsh manoeuvre.

**HASG** Helicopter Airworthiness Study Group (CAA).

**HASI** Huygens atmospheric-structure instrument.

**Hasp** High-altitude sampling program.

**Hass, HASS** Highly accelerated stress screening.

**HAST** High-altitude supersonic target.

**Haste** Helicopter ambulance service to emergencies (US).

**Hastelloy** Family of US Ni-Cr-Mo-Fe alloys combining strength at high temperatures with resistance to oxidation or corrosion.

**HAT 1** Height above touchdown (or threshold) (FAA).

2 Harbour acceptance trial(s) (Missile).

3 Hierarchical axis, or axes, technique.

4 High-power amplifier transmitter.

**Hat** On a navex, or en route, noting heading / altitude / time at each turning point (GA1).

**hat** 1 Section commonly used for stiffeners and other structural members, formerly called top-hat and resembling latter's outline.

2 Coolie \*, flat cone multiway thumb switch on top of stick, usually controlling trim and radar elevation angle.

**hatchback** Transport whose rear cabin area is Combi.

**HATM** Hypervelocity anti-tank missile.

**HATOD** Hill airtasking order defragger.

**hatol** Horizontal-attitude takeoff and landing.

**HATR** 1 High-temperature attenuated total reflectance.

2 Hazardous air traffic report(ing).

**HATS** 1 Helicopter automatic targeting system.

2 Heavy Aircraft Test Squadron (UK, WW2).

**hatted** Appointed as a military commander (US colloq.).

**Have** Permanent first word in code names of AFSC projects (USAF).

**have numbers** Radio code: "I have received and understood wind and runway information for my inbound flight".

**HAW** 1 Hypersonic aerodynamic weapon.

2 Hawaii space tracking station.

**HAWC** Homing and warning computer.

**Hawfcar** Helicopter adverse-weather fire-control acquisition radar.

**Hawk** Homing all the way killer.

**hawking the deck** To fly closely past carrier on right (starboard) side to check deck state before landing on.

**Hawtads** Helicopter all-weather target-acquisition and destruction system.

**Haybox** Helicopter jetpipe incorporating IRCM (colloq.).

**hazard alert** Broadcast to all affected operators of existing or impending failure in hardware of nature likely to imperil safety of flight, usually as result of fault discovered on inspection; fault can be structural or in system operation, but invariably affects part of aircraft.

**hazard beacon** Warns of permanent danger to air navigation.

**hazard levels** Aircraft manuals identify three: Note, a mere reminder of possible hazard; Caution, advice of possible damage to human or hardware; Warning, ignoring which could be lethal (FAA).

**hazardous** A particular aerospace meaning is: likely to threaten the continuation of safe flight.

**Hazcam** Hazard [on planetary surface] camera.

**haze** Mist caused by water borne by particulate matter in unsaturated air.

**hazmat** Hazardous material[s].

**HB** 1 Brinell hardness.

<b>2</b> Aircraft category, heavy bombardment (USAAC 1925–27).	2 Distilled mustard gas code (USA).
<b>3</b> Height of burst.	3 Hydrogen decrepitated powder, for sintered and polymer-bonded magnets.
<b>h<sub>b</sub></b> Height of bump on runway.	4 High-drag [bomb].
<b>HBA</b> Hybrid buoyant aircraft.	5 Hourly difference.
<b>HBAW</b> Handbook bulletin for airworthiness (FAA).	6 Home Defence [i.e., of UK, WW2, esp. civilian].
<b>HBB</b> Hollow-bladed blisk.	7 High-definition [TV].
<b>HBC</b> 1 Hot-bonding controller.	8 Decision height (F).
2 Heave by cable.	<b>HDA</b> High-density acid (usually nitric).
<b>HBD</b> Hollow-bladed disk.	<b>HDAC</b> House [of Representatives] Defense Appropriations Committee (US).
<b>HBK</b> Handbook.	<b>HDAS</b> Hypersonic deep attack system.
<b>HBN</b> Hazard beacon.	<b>HDB</b> High-density bombing, rebuild of bomber designed for nuclear warfare to carry heavier loads of conventional bombs.
<b>HBP</b> High-band prototype.	<b>HDBK</b> Handbook.
<b>HBPR</b> High bypass ratio.	<b>HDBT</b> Hard [and] deeply buried target [DC adds defeat capability].
<b>HBR</b> 1 Human-behaviour representation.	<b>HDD</b> Head-down display, ie a display inside cockpit, usually CRT raster plus symbology and TV overlay.
2 High bit-rate.	<b>HDR</b> Head-down display radar, or recorder.
<b>HBS</b> 1 Hot ball and socket.	<b>HDEP</b> Haze depth.
2 High-band subsystem [DU adds demonstration unit].	<b>HDF</b> 1 Hot-drape forming.
3 Hold-baggage screening.	2 High-frequency direction-finding (facility).
<b>HBT</b> Heterojunction bipolar transistor.	<b>HDFPA</b> High-density focal-plane array.
<b>HC</b> 1 Hexachloroethane, ECM aerosol also usually containing ZnO and Al powder.	<b>Hdg</b> Heading.
2 Hand controller.	<b>Hdg C</b> Compass heading.
3 Helicopter, cargo (UK) and USA (1959–62, became CH).	<b>Hdg Sel</b> Heading select.
4 Critical height [ch preferred].	<b>HDI</b> Homeland defense interceptor.
5 High-capacity [bombs, WW2].	<b>HDIP</b> Hazardous-duty incentive pay (US).
6 Hydrocarbon[s].	<b>HDK</b> Hard disk.
7 Crane helicopter (USN 1952–55).	<b>HDL</b> Hybrid datalink.
<b>Hc</b> Height change.	<b>HDLC</b> High-level datalink control; –B adds balanced..
<b>hc</b> , <b>h<sub>c</sub></b> Distance from leading edge at MAC (1) to c.g.	<b>HDLMS</b> Hybrid datalink management system.
<b>HCA</b> 1 High-cycle aircraft, specimen which has completed more flights than any other of same type.	<b>HDMR</b> High-density multitrack recording.
2 Hot compressed air (airfield snow clearance).	<b>HDOC</b> Hourly direct operating cost.
3 Historic cost accounting.	<b>HDOP</b> Horizontal dilution of precision.
4 Helicopter Club of America.	<b>HDP</b> Hardware development plan.
5 Hypersonic-cruise aircraft.	<b>HDPE</b> High-density polyethylene.
<b>HCC</b> High-thermal conductivity composite.	<b>HDR</b> 1 High data rate.
<b>HCCS</b> Human-centred control system[s].	2 High-density rule [busy airports].
<b>HCDC</b> House of Commons Defence Committee (UK).	<b>HDS</b> 1 Helicopter delivery service.
<b>HCDR</b> High channel density receiver.	2 Hard-disk subsystem.
<b>HCF</b> 1 High-cycle fatigue.	3 Horizontal driveshaft.
2 Hollow carbon fibre.	<b>HDT</b> High damage tolerance.
<b>HCGB</b> Helicopter Club of Great Britain [office, Aynho, Banbury OX17 3AT] (UK).	<b>HDTA</b> High-density traffic airport (FAR 93).
<b>HCHE</b> High-capacity HE (ammunition).	<b>HDTS</b> Helmet-display tracking system.
<b>HCI</b> 1 Human/computer interface.	<b>HDTV</b> High-definition TV.
2 Helicopter Club of Ireland.	<b>HDU</b> 1 Hose-drum unit for in-flight refuelling.
<b>h<sub>cm</sub></b> US usage for chordwise location of centre of mass.	2 Horizontal display unit.
<b>HCMM</b> Heat-capacity mapping mission (spacecraft).	<b>HDV</b> Hydrant dispenser vehicle.
<b>HCN</b> Hydrogen cyanide.	<b>HE</b> 1 High explosive [43 suffix acronyms].
<b>HCMOS</b> High-density CMOS.	2 High-energy [ignition].
<b>HCP</b> 1 Head-up control panel.	3 Handling equipment.
2 Hélicoptère de combat polyvalent [= multirole] (F).	<b>He</b> Helium.
<b>HCS</b> Host computer system.	<b>He</b> , <b>H<sub>e</sub></b> Altitude error.
<b>HCT</b> Helicopter control trainer.	<b>h<sub>e</sub></b> Energy height, $h + v^2/2g$ .
<b>HCTS</b> Helicopter collective training system (British Army).	<b>HEA</b> Head equipment assembly [HUD].
<b>HCU</b> 1 Heavy Conversion Unit (RAF, WW2).	<b>HEACE</b> Health effects in aircraft cabin environment [2001–] (EU).
2 Hydraulic control unit.	<b>head</b> 1 Complete hub of helicopter rotor (main or tail) including flight-control linkage and all auxiliaries (nitrogen pressure signal, anti-icing connection, lights etc.).
<b>HCV</b> Hypervelocity, or hypersonic, cruise vehicle.	
<b>HCW</b> Heavily cold-worked [seamless tube].	
<b>HD</b> 1 Height difference, usually in attack mission between IP and target.	

## head-down

2 Cutter and positioning system in most machine tools, esp. those in which workpiece is stationary.

3 Loosely, downwind end of runway.

**head-down** Looking into cockpit as distinct from outside aircraft.

**head-down display** See *HDD*.

**header tank** Inserted at highest point of coolant circuit of liquid-cooled piston engine, receiving hot coolant from engine and passing it to radiator[s].

**heading** Angle between horizontal reference datum and longitudinal axis of aircraft expressed as three-figure group 000°-360°; in UK also called course. Datum can be compass north, magnetic north or true north. Not to be confused with track [one dictionary actually calls \*‘the direction of an aircraft path’, precisely what it is not].

**heading alignment cone** Imaginary cone of 18,000-ft upper diameter serving to guide Orbiter or STA(6) to runway.

**heading hold** Flight-control mode which maintains selected heading.

**heading-oriented map** One held in hand so that heading is towards top of sheet.

**heading select** Flight-control mode in which aircraft automatically turns to and holds any inserted \*.

**head-level display** Immediately below HUD.

**head moment** Total turning moment transmitted through head(1) in helicopter manoeuvre.

**head-on** Flying directly towards other aircraft on reciprocal track.

**head resistance** Drag.

**heads down** Control of RPV or UAV without having it in view.

**headset** Receive/transmit interface with radio communications or other system (eg aural warning or missile launch tone), either worn separately or built into helmet. Normally includes earpieces or earshells, noise-cancelling microphone on boom and binaural cable.

**heads up** 1 Airborne intercept code: “Hostile force, whole or in part, got through defences” or “I am not in position to engage” (DoD).

2 Occasionally used to mean head-up [only one human head can use a HUD at any one time].

**head-up display** See *HUD*.

**health** Generally everyday meaning but applied to hardware; thus \* monitoring, can be equated with inspection, AIDS output etc.

**HEAO** High-energy astronomical observatory.

**heap cloud** Cloud with pronounced vertical development, e.g., cumulus family.

**Heart** Health evaluation and risk tabulation.

**heart-cut distillate** Particular family of kerosene fuels, in particular JP-6.

**HEAT** 1 High-enthalpy ablation test.

2 High-explosive anti-tank, shaped-charge warhead.

3 Helicopter electric-actuation technology.

4 High-energy advanced trainer.

**Heat** Armament panel switch selection for IR AAMs.

**heat** Measure of atomic/molecular kinetic energy, but not to be confused with temperature. Symbol Q, unit joule,  $J = 0.238846 \text{ cal} \text{J}$ .

**heat barrier** Supposed barrier to increasing flight Mach number due to kinetic heating.

**heat capacity** 1 Of a solid [usually metal] object, its mass multiplied by the specific heat of the material. See next.

## heavy alloy

2 Quality of high-power lasers which permits sustained firing followed by brief cooling period.

**heat-engine** Prime mover in which energy is extracted from thermodynamic system in which gas passes through cycle from which closed PV or T-entropy diagram can be plotted. Perfect \*\* has reversible (Carnot) cycle; all practical \*\* have lower-efficiency irreversible cycle. Nearly all aviation \*\* are constant-pressure gas turbines or Otto-cycle piston engine.

**heater** Afterburner (colloq.).

**heat-exchanger** Radiator in which two fluids are brought into close contact (eg, cold air and hot oil) so that one can reject heat to other.

**heat flow rate** Synonymous with *power*. SI unit is watt,  $W = 3.41214 \text{ Btu/h} = 0.85985 \text{ kcal/h}; \text{Btu/h} = 0.293071 \text{ W}$ .

**heat load** Rate of heat transfer, = *heat flow rate*.

**heat of ablation** Measure of value of ablating material, rate of heat input divided by rate of mass loss.

**heat pipe** Contains fluid which is alternately evaporated and condensed, transferring heat [in spacecraft, to space].

**heat pulse** Total heat to be absorbed, dissipated, radiated or otherwise transferred from original kinetic energy of body on re-entry.

**heat-seeker** Sensitive IR detector and homing guidance system.

**heat shield** Usually non-structural layer protecting primary structure from high-temperature environment which would degrade strength, such as around aeroplane afterburners, at base of large rocket vehicle and, esp., over upstream face of body on re-entry (later is invariably ablative).

**heat sink** 1 Any location to which heat may be removed from thermodynamic system.

2 Specifically, mass of metal, fuel, oil or other material which can accept unwanted heat.

**heat treatment** Heating metals above specific temperatures followed by slow or rapid cooling to improve mechanical properties (see *carburising*, *case hardening*, *nitriding*, *precipitation* \*\*, *solution* \*\*).

**heave** 1 Vertical movement without rotation (simulator).

2 Motion of taxiing aircraft [esp. marine] in vertical plane, fuselage [hull] remaining level.

**heavier than air** Having density much greater than that of air, thus aerostatic buoyancy ignored in calculating lift, which is assumed generated wholly by aerodynamic or propulsive forces; aerodyne.

**Heaviside layer** D, E, F, and F<sub>1</sub>, layers in upper atmosphere (ionosphere) where UV solar radiation ionises gas molecules, allowing conduction of electricity.

**heavy** 1 Flight control; difficult to move.

2 Maintenance, major and prolonged.

3 Warning to ATC of wake turbulence, aircraft MTO  $\geq 300,000 \text{ lb}$  (136,080 kg).

4 US [becoming universal] civil radio traffic, any large transport, esp. large jet.

5 AA gun, >40-mm calibre (WW2); also, of course, can mean intense fire from many guns of all calibres.

6 Propeller aircraft,  $\geq 5,700 \text{ kg}$  [12,566 lb] MTOW.

7 Air in balloon envelope close to density of local atmosphere.

8 Large firefighting tanker, as distinct from Seat.

**heavy alloy** One tailored to have exceptionally high

## heavy bomber

density; most consist chiefly of tungsten, but osmium, iridium and depleted uranium are important.

**heavy bomber** Aircraft designed to deliver heavy load of conventional ordnance to targets in enemy heartlands (arch.).

**heavy dropping** Delivery by system of parachutes of exceptionally bulky or heavy load, suitably packaged and cushioned.

**Heavy Fuel** In US usage, all DFs (diesel fuels) plus JP-5 and JP-8.

**heavy landing** See *hard landing* (1).

**heavy maintenance** Maintenance taking 30 days or longer.

**heavy metal** Classic warbird, esp. large and powerful (colloq.).

**Heavyside** E-layer.

**Heavy Wagon** Designated routes for lo military flights within Conus; 300 series for various nav/electronic systems evaluation and 400 Series for nav. training and weather evaluation at 500 ft (152 m) down to MOCA, normally not over 500 kt (USAF, USN).

**HECS** High-performance engine control system.

**hectare** Non-SI unit of large areas = 100 are =  $10^4 \text{m}^2$ .

**hecto** Prefix, multiplied by  $10^2$ , symbol h.

**hectopascal** Pressure of  $100 \text{ Nm}^{-2}$  = 1 mb, symbol hPa.

**hedge-hopping** Lo(2) flight by light GA aircraft (colloq.).

**hedging** Increasing one's stock of a commodity [especially fuel] in the belief price will rise.

**Hedi, HEDI** High-endatmospheric defense interceptor (SDI).

**HEDP** Ammunition, high-explosive, dual-purpose.

**HEDR** High-energy dynamic radiography.

**Heel** Helicopter emergency-egress lighting; s adds system.

**heeling** Roll due to turn while taxiing.

**HEETE, Heete** Highly efficient embedded turbofan [or turbine engine].

**HEF** High-expansion foam (anti-fire) usable at 1.5% concentration.

**HEH** Hershey, Eberhardt, Hottel, basic analysis and charts for idealised piston engine cylinder performance.

**HEI** 1 Ammunition, high-explosive incendiary.

2 Hot-end inspection.

**height** 1 In performance, Ht defined as true vertical clearance between lowest part of aircraft (assumed aeroplane) in unbanked attitude and relevant datum.

2 General common definition: h, vertical distance of level, point or object considered as point, measured from specified datum (normally associated with QFE).

3 Vertical distance from reference ground level to specified upper extremity (close to but not necessarily highest point, which may be small whip aerial, static wick or other flexible part) of aircraft at specified weight (usually MTOW) and tyre inflation pressure when parked on flat horizontal surface.

**height above airport, HAA** Height of MDA above published airfield elevation.

**height above touchdown, HAT** Height of DH or MDA above highest obstruction in touchdown zone.

**height computer** Calculator for converting barometrically indicated to true altitude by correcting for atmospheric density.

**heightfinder radar, HFR** One whose primary output is

## heliosynchronous

precise height of distant target; has nodding aerial giving multi-lobe beam.

**height lock** Function of autopilot or flight system in holding (after in some cases capturing) selected height h.

**height ring** Visible on most displays of weather/mapping/AW/cloud-collision warning and other forward-looking radars as bright ring beyond zero-range ring formed by direct reflection from Earth's surface.

**height/velocity curve** Fundamental plot of IAS against altitude included in helicopter flight manual; indicates region(s) from which safe autorotative descent is possible, normally assuming zero wind, sea level, MTOW.

**Heim joint** Universal coupling in torque tube.

**Heine mat** Flexible mat towed by support vessel on to which marine aircraft taxis before being hoisted on board.

**HEIPT** Helicopter engines integrated product team.

**HEI-SAP** High-explosive incendiary, semi-armour-piercing.

**HEI-T** Ammunition, HE incendiary, tracer.

**HEJOA** Heathrow Executive Jet Operators' Association,

**HEL** High-energy laser [A adds applications, also see HELCM, Helex, HELJTO, Hels, HELSTF and Heltads].

**Helarm** Helicopter, armed (sortie).

**HELCM** HEL countermeasures.

**HELD** Helicopter [or high-energy] laser designator.

**Helex** HEL experiment[al].

**Heli** Helicopter.

**Heliarc** Inert (helium) gas welding technique patented by Northrop 1940.

**helical compressor** Diagonal-flow compressor.

**helical gear** Spur gear with teeth arranged diagonally; contact begins at one end of tooth and proceeds diagonally across width, two teeth, normally transmit load at any time. Double \* (herringbone) gear eliminates axial load.

**helical tip speed** Actual airspeed at tip of propeller, taking account of vehicle's airspeed.

**Heli-Coil** Patented hard-steel thread inserted in soft metal or to repair stripped female thread.

**helicopter** Rotorcraft deriving both lift and control from one or more power-driven rotors rotating about substantially vertical axes. Rotors are driven as long as engines operate above certain minimum input speed, and airflow through rotor(s) is downwards except in autorotative engine-failure mode.

**helicopter approach-path indicator** Hapi, ground optical aid giving steady white for correct [0.25-0.75°] glidepath, with green and flashing green above and red and flashing red below. Signal width 24°.

**helicopter lane** Safety air corridor reserved for helicopters (DoD, NATO).

**helideck** Operating platform for helicopters, e.g. on oil rig.

**helidrop** Discharge of passengers/cargo/weapons while hovering.

**heliocentric** Centred on the Sun.

**heliopause** Frontier beyond which Sun has little or no influence.

**Helios** Helicopter instrument and operational procedures simulator.

**heliosphere** Region of solar influence.

**heliosynchronous** Satellite orbit inclined at 90° to give

complete Earth coverage, each pass having the same illumination angle.

**helipad** Prepared area designated as take-off/landing area for helicopters; need have no facilities other than painted markings.

**heliport** Facility for operating, basing, housing and maintaining helicopters; if civil, includes passenger facilities and usually mail/cargo channels.

**heliport acquisition beacon** Marks landing pad[s] by white flashing Morse H.

**helistat** Aerostat with added helicopter rotor(s).

**helitop** Helipad served by civil helicopter.

**helitanker** Large firefighting helicopter.

**helitow** Towing by helicopter, normally applies to minesweeping.

**helium** Inert gaseous element, He, density 0.0001785 (0.1785  $\text{g l}^{-1}$ ), 0.01114 lb/ft<sup>3</sup>, BPt 3.2°, 4.2° K (two isotopes), helium 3 (three atomic nuclei) being important as lunar-source material for fusion power.

**helix angle** 1 Of gear, measured between line tangent to tooth helix at PCD and shaft axis.

2 Of propeller, see *effective\**.

3 Of wingtip in steady roll,  $P_b$  [roll rate  $\times$  span]  $\div$  2V [TAS].

**HELJTO** High-energy laser joint technology office.

**Hellads** High-energy liquid laser area-defense system [airborne].

**Hellas** Helicopter laser [radar].

**helmet** Individual fairing over piston-engine cylinder, hence helmeted cowl.

**helmet sight** Any of several systems which attempt to interface between human aircrew looking at surface (or other) target and aiming of armament system; usually wearer's head is in some way accurately aligned with rigid flight helmet whose orientation is then automatically monitored to give output signals fed to weapon-aiming system.

**Helmholtz resonator** Hollow volume connecting with outside via small orifice, single-frequency output.

**Helmore light** Powerful air-to-air searchlight [RAF, not adopted, 1940].

**Helms** Helicopter malfunction system.

**helio** Helicopter (colloq.).

**HELP, Help** Hybrid electronic lightweight packaging.

**Helps** Helicopter protection and support.

**Helraps** Heliborne long-range active [acoustic-path] sonar.

**Helras** Helicopter long-range sonar.

**HELS, Hels** High-energy-laser system [TF adds test facility] (USA).

**HELSTF** High-energy-laser system test facility, at WSMR (USA).

**Heltads** High-energy-laser tactical air-defense system (USA).

**Heltas** Helicopter towed-array support.

**Helweps** High-energy laser weapon system (TRW/USN).

**HEMA** Heavy maintenance.

**Hem-bird** Helicopter electromagnetic probe, suspended magnetometer for measuring thickness and other parameters of surface layers.

**HEMC** High-explosive medium-capacity.

**Hemes** Helicopter Hospital Emergency Medical Evacuation Service (USAF, USA).

**hemispherical engine** Piston engine whose combustion spaces at TDC are hemispherical.

**hemispherical radar** Mounted at nose and tail of aerial platform to provide complete 360° ( $2 \times 180^\circ$ ) azimuth coverage.

**hemispherical resonator gyro** Senses changes in vibration patterns in thin-wall glass shell when subject to acceleration.

**hemispheric rule** For IFR, and VFR between FL30-290, altitude assignments are determined by magnetic bearing.

**Hemloc** Helicopter emitter/locator countermeasures.

**Hemp** Name of khaki-ochre colour [BS.4800-10B-21] of large patrol and tanker aircraft (RAF).

**Hems** Helicopter emergency medical service.

**HEMT** High electron mobility transition.

**HEND** High-energy-neutron detector.

**He-Ne** Helium/neon laser.

**henry, H** SI unit of inductance, that of closed circuit in which 1 V is generated when current varies at steady 1 A/s; in other units  $H = \text{kg.m}^2\text{s}^{-2}\text{A}^{-2}$ ; plural henrys.

**HEOB** Hostile electronic order of battle.

**HEO** Highly elliptical [Earth] orbit; P adds payload.

**HEP** High-explosive plastic.

**HEPA** High-efficiency particulate air, or arrester.

**HEPL** High-energy-pulse laser.

**heptane** Basic member of straight-chain (alkane) hydrocarbons (see *paraffin series*) with seven carbon atoms and thus 16 of hydrogen; zero-octane reference fuel.

**HER** 1 Harsh [or high] environment recorder.

2 Helicopter experimental radar.

**Herald** Helicopter equipment for radar and laser detection.

**Herbst manoeuvre** Post-stall [ $70^\circ$  AOA]  $180^\circ$  turn using vectored thrust (X-31).

**Hercules** Large range of fibre-reinforced materials [US company name].

**Herid** High-energy railgun integration demo, (USAF).

**Hermes** Helicopter energy/rotor management system; automatically computes limiting payload.

**Hermit** Harsh-environment robust micromechanical technology.

**HERO, Hero** Historical evaluation and research organization.

**herringbone gear** Double-helical (see *helical*).

**HERT** Headquarters emergency relocation team.

**Hertz, Hz** SI unit of frequency, = cycles per second; hence kHz, mHz, GHz etc.; in the US, increasingly hertz.

**Hertz pressure** Contact pressure between mating gear teeth.

**Hesh** High-explosive squash-head.

**hesitation roll** Aerobatic rolling manoeuvre, normally based on slow roll, in form of succession of quick aileron applications between which rate of roll is suddenly arrested; positions of arrest called points, and common \*\* are 4-point, 8-point or 16-point, 16 being difficult and rare.

**HESSI, Hessi** High-energy solar spectroscopic imager.

**HeSTOR** Helicopter simulator for technology operations and research.

**HET** 1 Helicopter environmental technique, to increase safety and reduce disturbance by avoiding dwellings, and certainly urban areas.

2 Hall-effect thruster.

**HETE** High-energy transient Explorer.

<b>Hete</b>	High-energy transient experiment.
<b>Heterodyne</b>	Mixing of two alternating currents (eg radio signals) to generate third equal to sum or difference of their frequencies; verb or adjective.
<b>heterojunction II logic</b>	Microcircuits with inverted gates in which transistor is embedded (integrated injection) in epitaxial GaAs layer.
<b>heterosphere</b>	Earth atmosphere above c100km (62 miles).
<b>HEU</b>	1 Highly enriched uranium; MF adds Materials Facility.
	2 HUD electronics unit.
<b>heuristic</b>	Leading towards solution by trial and error (see <i>algorithm</i> ).
<b>HEUS</b>	High(er)-energy upper stage.
<b>HEW</b>	1 Heliborne, or helicopter, early warning. 2 Health, Education and Welfare (US).
<b>HEWS</b>	Helicopter electronic-warfare suite, or system.
<b>H<sub>ex</sub></b>	Heat exchanger.
<b>Hexal</b>	Hexogen/aluminium bomb filling.
<b>Hexapod</b>	Usual mounting for cabin of flight simulator: two superimposed triangles (both horizontal when at rest) displaced spatially by 60° with corners joined by six actuating jacks to give 6-DoF motion.
<b>Hexcel</b>	Range of proprietary honeycombs, and honeycomb sandwiches, most with 24ST skins bonded by epoxy resin to glassfibre core [US company].
<b>Hexogen</b>	RDX.
<b>Hexotonal</b>	Mix of RDX, TNT and powdered aluminium.
<b>HF</b>	1 Human factors; see HFE, HFM, HFR(2), HFRT, HFSG. 2 Hydrogen fluoride; C adds cleaning. 3 High-altitude fighter (UK role prefix, WW2). 4 Hybrid fan. 5 Heavy fuel, includes all DFs plus other blends. 6 High-frequency, see <i>Appendix 2</i> . 7 Height to a fix.
<b>H<sub>f</sub>, H<sub>F</sub></b>	Wheel height at flare initiation.
<b>Hf</b>	Hafnium.
<b>h.f., HF</b>	High-frequency, see <i>Appendix 2</i> .
<b>h<sub>f</sub></b>	Height above longitudinal axis of resultant force on deflected rudder.
<b>h<sub>f</sub></b>	Per-cent-chord location of wing flexural axis.
<b>HFAC</b>	Helicopter flight-advisory computer.
<b>HFAJ</b>	High-frequency anti-jam[mer].
<b>HfB<sub>2</sub></b>	Hafnium boride.
<b>HFCS</b>	Helicopter flight-, or fire-, control system.
<b>HFD</b>	1 Head-up flight display, S adds system. 2 High-frequency data; CR adds communications radio, L link, R radio, RS radio system, U unit.
<b>HFDF</b>	1 High-frequency direction-finding. 2 Hydrogen fluoride/deuterium fluoride.
<b>HFDL</b>	HF datalink.
<b>HFDM</b>	HF data modem.
<b>HFDP</b>	High-frequency differential protection.
<b>HFDR</b>	HF data radio.
<b>HFDS</b>	Head-up flight display system.
<b>HFE</b>	1 Human-factors engineering. 2 Heavy-fuel engine.
<b>HFG</b>	High-flotation [landing] gear.
<b>HF-GWR</b>	H.f. ground-wave [OTH] radar.
<b>HFI</b>	Helicopter Foundation International.
<b>HFIP</b>	H.f. improvement programme (NATO).
<b>HFISA</b>	Helicopter flight into Service Area.
<b>HK</b>	Hochgeschwindigkeits Flugkörper, high-speed vehicle (G).
<b>HFM</b>	Human factors in maintenance.
<b>HFL</b>	Hydrogen fluoride laser.
<b>HFNPDU</b>	HF network protocol data unit.
<b>HFOL</b>	Hydrogen fluoride overtone laser.
<b>HFOR</b>	Human-factors open reporting.
<b>HFP</b>	1 High-fragmentation projectile. 2 High flash point.
<b>HFPD</b>	High-frequency pulse detonation.
<b>HFR</b>	1 Height-finder, or -finding, radar. 2 Human-factors reporting.
<b>HFRT</b>	Human Factors Research and Technology Division (NASA).
<b>HFS</b>	High-frequency system[s].
<b>HFSG</b>	Human-factors steering, or study, group.
<b>HFSNL</b>	HF sub-network layer.
<b>HFSWR</b>	High-frequency surface-wave radar.
<b>HFVT</b>	Hybrid-fan vectored thrust.
<b>HG</b>	Head-up guidance; D adds display, S system from LOC/GS capture to touchdown.
<b>Hg</b>	1 Mercury. 2 Barometric, or boost, pressure in inches of (1).
<b>HGA</b>	High-gain antenna; S adds system.
<b>HGAA</b>	High-gain active antenna.
<b>HGC</b>	Head-up guidance computer.
<b>HgCdTe</b>	Mercury cadmium telluride, IR detector for 8-14μ.
<b>H-GDS</b>	Helicopter gunfire detection system.
<b>HGI</b>	Hot gas ingestion (ejector lift).
<b>HGL</b>	Hot gas leak.
<b>HGM</b>	Hot-gas manifold.
<b>HGOPA</b>	High-gain open planar array.
<b>HGPADS, HGPads</b>	High-glide precision air-delivery system (USA).
<b>HGR</b>	1 Hot-gas recirculation [or reingestion]. 2 Hypervelocity guided rocket.
<b>Hgr</b>	Hangar.
<b>HGRI</b>	Hot-gas reingestion.
<b>HGS</b>	1 Holographic guidance system. 2 Head-up guidance system. 3 Heading guidance system.
<b>Hgs</b>	Height of glide-slope referenced to depressed surface.
<b>HGSI</b>	Hot-gas secondary injection TVC.
<b>Hgt</b>	Height.
<b>HGU</b>	Horizon gyro unit.
<b>HGW</b>	Higher gross weight.
<b>HH</b>	NDB class, over 2 kW.
<b>HHC</b>	Higher harmonic control.
<b>HHLD</b>	Heading hold.
<b>HHMD</b>	Hand-held metal detector.
<b>HHS</b>	Helicopter [shipboard] handling system.
<b>HHSI</b>	Horizontal hover situation indicator.
<b>HHT</b>	Hand-held terminal [readout unit].
<b>HHTI</b>	Hand-held thermal imager.
<b>HHTR</b>	Hand-held tactical radar.
<b>HHV</b>	Higher heating value.
<b>HHUD</b>	Holographic HUD.
<b>HHX</b>	Hydrogen heat exchanger.
<b>HI</b>	1 High-intensity light. 2 Heading indicator [direction indicator]. 3 High, high-altitude, high-intensity, high band.

**hi** Flight at tropopause or above, adopted by gas-turbine combat aircraft flying for range outside hostile environments.

**HIA** Held in abeyance.

**HIADC** High-integration air-data computer.

**HIAL** 1 High-intensity approach lighting; S adds system.

2 Highlands & Islands Airports Ltd [Inverness IV2 7JB] (UK).

**HIAPER, Hiaper** High-performance instrumented [or instruments] airborne platform for environmental research (NCAR).

**HIB** Helicopter identification by [AT adds acoustic techniques *Hibat*, IRD adds IR detection *Hibird*, RAD adds radar detection *Hibrad*].

**hibernate** To remain on station in space or in orbit with as many subsystems as possible switched off until reactivated by Earth command.

**Hibird** Helicopter identification by IR detection.

**Hibrad** Helicopter identification by radar detection.

**HIC** Head impact criteria.

**Hi-camp** Highly calibrated aircraft measurements program (Darpa).

**Hicar** Acrylonitrile to DTD.5509.

**Hi-CAT** CAT above 55,000 ft (16.8 km).

**HICT** Hand-held imaging communications terminal.

**HICU** HIPSS interface control unit.

**Hidar** High instantaneous dynamic acoustic range.

**Hidas** Helicopter integrated defensive-aids system, or suite.

**hide** Locally constructed aircraft shelter of posts, net and camouflage.

**Hidec** Highly integrated digital engine [or electronic] control.

**HIDL** High-integrity data-link (UAV).

**HIDSS** Helmet integrated display sighting [or and sight] system.

**Hiduminium** Family of duralumin-type alloys, including RR (Rolls-Royce) formulations, often also containing nickel and iron; developed for piston engine pistons and similar applications, also used in supersonic airframes (in Concorde also known by French designations such as AU2GN).

**Hidyne** See *Hydyne*.

**HIE** Helicopter-installed equipment.

**Hi-Ex** High-expansion [typically volume factor of 1,000] firefighting foam.

**HIF** Horizontal integration facility (space launchers).

**Hifast** High-frequency active suppression technology.

**HIFR** Helicopter in-flight refuelling from ship, also rendered hover in-flight refuelling.

**HIG, Hig** Hermetic integrating gyroscope.

**HIGE** Hover[ing] in ground effect.

**Higger** High-integrity GPS guidance enhanced receiver (blind STOVL).

**high** Region of high atmospheric pressure, anticyclone.

**high altitude** 1 Above 10 km (32,800 ft) (NATO).

2 Between 25,000 and 50,000 ft (7.6–15.2 km) (DoD).

**High-altitude airship** To remain geostationary at 70,000 ft (21.34 km) for six months (US).

**high-altitude bombing** Level bombing with release at over 15,000 ft (4.57 km) (DoD).

**high-altitude burst** Nuclear weapon explosion at over 100,000 ft (30.5 km).

**high blower** See *high supercharger*.

**high boost** Piston engine operated at high inlet-manifold pressure, esp. one well above SL atmospheric pressure for takeoff.

**high boss** Variable stator vane outer bearing.

**high BPR** Bypass ratio exceeding 5.

**high-capacity bomb** Large thin-case bomb for demolition of major soft target.

**high cloud** Extremely loose classification, typical band being 6–8 km (20,000–60,000 ft) in tropics, 5–13 km (16,000–43,000 ft) in temperate, 3–8 km (10,000–26,000 ft) polar. Always mainly ice crystals, Ci, Ce, Cs.

**high compressor** HP compressor (US).

**high-cycle fatigue** That due to high-frequency vibrations, flexure or rotation of machinery, typically at rate many times per second.

**high-density focal-plane array** EO sensor with thousands of 2-D IR elements integral in substrate with CCD readout and processing circuitry.

**high-density rule** Applied at four busy US airports to limit arrival rates [from 1 Non. 04] (FAA).

**high-density seating** Normally, that giving greatest practical number of passengers, more even than all-economy, tourist or other classifications.

**high-density tunnel** One having closed circuit filled with air or other gas under pressure, power required for given Mach/Reynolds combination being inversely proportional to density.

**high-energy laser** No lasting definition; varies with family, whether continuous, pulse or gated, and with rapid progress, which by 1980 had made GW output not uncommon.

**higher harmonic control** Reduction of helicopter stress, noise and vibration by using dynamic absorption methods.

**high-flash fuel** See *Avcat*.

**higher heating value** Gross calorific value of fuel.

**high-flotation gear** Landing gear having geometry and other characteristics suitable for operation from soft soils, sand and similar surfaces.

**high-flotation tyre** One of low inflation pressure and very large contact area; not necessarily used on high-flotation gear.

**high frequency** See *Appendix 2*.

**high-frequency pulse detonation** Proposed propulsion systems based on pulse detonation at frequencies not less than 2 kHz, pioneered by Moscow State University.

**high-gain aerial** Usually means strongly directional, designed to transmit or receive along single axis.

**high gate** Different meaning in different programmes (lunar landing, air speed record runs, etc) but always a specified rectangle in exact relation to surface of Earth or other body through which vehicle must pass, often at precise time, for mission to be successful (see *gate* [10, 11]).

**high gear** High supercharger gear.

**high-incidence stall** Unaccelerated symmetric stall at highest angle of attack, normally with high-lift configuration.

**high-inclination mission** Usually means satellite inclination from about 63° to 99° to Equator.

**high-lift** System, device, configuration or mode giving lift greater than in clean or cruise configuration. Normal \* devices include leading-edge flaps, droops, slats,

Krügers, trailing-edge flaps, flap blowing and variable-sweep; other forms include BLC, EBF, USB, Jet Flap, vectored thrust and tilt-wing.

**highly blown engine** Piston engine in which supercharger is used to achieve high inlet manifold pressure at low altitudes. Terminology can be ambiguous; high and low-blown can mean high and low rated altitudes (critical heights).

**highly supersonic** Mach 4 to Mach 6.

**high-Mach buffet** Experienced when critical Mach number is exceeded on aircraft not designed for transonic flight; can affect control surfaces and primary structure, and cause trim changes which automatically either remove or intensify condition.

**high-Mach flight** Flight at high subsonic Mach number.

**high-Mach trimmer** See *Mach trimmer*.

**high oblique** Oblique reconnaissance or other aerial photograph in which portion of apparent horizon is visible.

**high-octane** Fuel grade. Not defined, but typically over 100.

**high pitch** Coarse-pitch.

**high-pressure area** Region of atmosphere where pressure significantly exceeds that of surroundings, esp. one bounded by enclosed isobar rings; anticyclone.

**high-pressure compressor** Applicable only to an engine with two or more compressors on separate shafts. High-pressure turbine likewise.

**high-pressure fuel pump** The HP pump is normally that mounted on the engine.

**high-pressure shut-off valve** See *pressure-raising shut-off valve*.

**high-ratio engine** Engine having high BPR.

**high route** Area-navigation route extending from 18,000 ft AMSL to FL450 (FAR. 1.).

**high rudder** See *top rudder*.

**High-Shear rivet** Patented close-tolerance steel threadless bolt held by swaged ring closed around groove.

**high-speed alloys** Brasses, steels, light alloys and other metals which can either be machined easily at high linear speed, or which retain strength at high temperature and can edge cutting tools (two almost opposite meanings for same term).

**high-speed exit** *High-speed turnoff*.

**high-speed stall** Accelerated stall in which stalling angle of attack is reached at relatively high airspeed; height well below aircraft ceiling is implied.

**high-speed tunnel** Traditionally, one in which effects of compressibility can be observed.

**high-speed turnoff** Taxiway forming transition curve from landing runway enabling aircraft to leave runway at earliest possible moment.

**high-speed warning** ADC-triggered subsystem giving aural and visual indication (usually duplicated) of inadvertent speed excursion beyond threshold usually set at just above MMO; can be overridden to demonstrate MDF/VDF but aircraft thus equipped is not airworthy without it.

**high-subsonic** In the range of Mach numbers where sonic speed is locally exceeded at peak suction, and compressibility effects, if any, are manifest; in older aircraft can be Mach 0.8, today higher values can be reached with no significant change in handling or trim (beyond 0.9 there may be major trim changes auto-

matically countered by Mach trimmer). Hence \* aircraft, general category of jet aircraft other than those designed for supersonic performance.

**high supercharger gear** In older high-power piston engine with mechanically driven supercharger it was common to have two drive ratios, high gear being automatically clutched in by aneroid at preselected height, thus giving power/altitude curve with two major discontinuities; high gear unavailable at lower levels.

**high-tailed aircraft** Aeroplane with horizontal tail on top of fin; T-tail.

**high-test peroxide, HTP** Not aqueous solution but almost pure hydrogen peroxide, used in MEPUs, rocket engines and other applications as monofuel rapidly decomposed by silver-plated nickel into superheated steam and free oxygen in which kerosene or other fuel is also often burned.

**high-time item** That particular engine, aircraft or other hardware item that has flown more hours or completed more operating cycles than any other of same design.

**high tow** Towing a glider, especially over a long distance, at an altitude higher than the tug.

**high turbine** HP turbine (US).

**high vacuum** Pressure less than  $10^{-9}$  Nm<sup>-2</sup>( $10^{-7}$  torr).

**high-velocity drop** Airdrop in which conventional parachute system is not used, and speed of descent lies between 30 ft/s (low-velocity) and free-fall; requires retarding means plus stabilization to ensure impact on cushioned face.

**highway** Generalised term for channel for data in EDP (1) or other dynamic system.

**high wing** One attached at top of fuselage; see parasol, shoulder.

**HIL** Heterojunction integrated injection logic.

**HIK** Heading index knob.

**hikodan** Wing (= UK group) (J).

**hilite plane** That across the face of an externally mounted jet engine nacelle; hl forms suffix to R [radius] or D [diameter].

**The Hill** The seat of government, esp. The Capitol (US).

**HIL** Horizontal integrity limit.

**Hill's mirror** Instrument for measuring wind-speed by observing smoke or other particulate matter.

**Hilo 2** Hilo No 2, one of two worldwide programs for microcircuit design.

**HILS** Hardware-in-the-loop simulator.

**HIM** High-inclination mission.

**Himad** High to medium (altitude) air defence [s adds system].

**Himat, HiMAT** Highly manoeuvrable aircraft technology (research programme).

**Himes, HIMES** Highly manoeuvrable experimental space [vehicle] (J).

**hinged wing** General term for wing not always rigidly fixed but able to fold, vary sweep or incidence, slew or rotate in any other way relative to fuselage.

**hinge moment** Force required to rotate aerodynamic surface or resist incident air load on it,  $C_H$  = total aerodynamic load on surface (varies as square of airspeed) multiplied by distance from hinge axis to cp.

**HIO** Highly-inclined orbit.

**HIOC** Hourly indirect operating cost.

**Hip** Hot isostatic pressing.

**Hipar** 1 High-power acquisition radar.

**2** High-performance precision approach radar.  
**Hipas** High-performance active sonar.  
**Hicor** High-power coherent radar.  
**HİPEP, Hipep** High-power electric propulsion.  
**HIPO, Hipo** Hierarchical input process output.  
**HIPPAG, Hippag** High-pressure pure-air generator.  
**Hips** Highly interactive problem solver.  
**HIPSS** Helicopter integrated power and switching system.  
**HIR** *1* Harmful interference to radio [ICAO study].  
  *2* Higher.  
**Hiran** High-precision shoran.  
**HIRES** *1* High resolution, pronounced hi-rez.  
  *2* High-resolution Earth station.  
**HIRF** High-intensity radiated field, or radio frequency.  
**HiRise** High-resolution imaging science instrument [Mars orbiter].  
**HIRL** High-intensity runway light/lights/lighting.  
**HIRM** High-incidence research model.  
**HIRNS, Hirs** Helicopter IR navigation system.  
**HIRS** *1* Helicopter IR system.  
  *2* High IR sounder.  
**HIRSS** Hover IR suppressor, or suppression, system.  
**Hirt** High-Reynolds-number tunnel.  
**Hirta, HIRTA** High-intensity radio transmission area.  
**Hirth coupling** A method of precisely locating the mating faces of two rotating assemblies, such as a turbine disc and a hollow driveshaft, by high-precision radial grooves which maintain perfect centering at all rotational speeds.  
**HIS** Hyperspectral imaging system.  
**Hisar** Hughes integrated surveillance and reconnaissance.  
**Hisat, HISAT** High-speed air-to-air target.  
**HISL** High-intensity strobe light.  
**Hisos** Helicopter integrated sonar system.  
**hi-spec** Commonly means luxuriously appointed.  
**Hi-Spot** High-altitude surveillance platform for over-the-horizon targeting (airship, Lockheed).  
**Hiss** ASW helo. (USN colloq.).  
**HiSTED, Histed** High-speed turbine-engine development, or demonstration.  
**historical** Based on past values.  
**HISU** Hybrid inertial sensor unit.  
**HIT, Hit** *1* Homing-intercept technology.  
  *2* Hybrid/inertial technology.  
**hit band** Plot of initial velocity against initial path angle for vehicle to make successful impact (hard/soft) on lunar or planetary surface; usually very narrow and curved.  
**hit dispersion** See *dispersion*.  
**HITL** Human in the loop.  
**Hitmore** Helicopter installed TV monitor recorder.  
**Hitron** Helicopter Interdiction Tactical Squadron (USCG).  
**HITS, Hits** Hostile identification/targeting system.  
**HITT** Holland Institute of Traffic Technology (Neth.).  
**hit the silk** Abandon aircraft by parachute in emergency (colloq.).  
**Hittile** Direct-hitting guided missile, ie one designed to explode inside target.  
**Hiwas** Hazardous in-flight weather advisory service.  
**HJ, H<sub>J</sub>** *1* Sunrise to sunset (ICAO).  
  *2* Helicopter, utility (USN, 1944–49).  
**hj** CC blowing jet slit height.

**HJV** Hot-jet velocity.  
**HKAOA** Hong Kong Aircrew Officers' Association.  
**Hkwr** Hookwire (available).  
**HL** *1* High-level airway, eg in North American VOR system, other than Jet Routes.  
  *2* Heavy lifter (airship class).  
  *3* Height loss.  
**hl** Hilite plane [suffix].  
**HLA** *1* High-level architecture.  
  *2* Helicopter Listing Association (US).  
**HLBA** High-level bus analyser.  
**HLCS** High-lift control system.  
**HLD** Head-level display.  
**HLDG** Holding.  
**HLDC** High-level data-link control.  
**HLE** Higher-layer entity.  
**HLF** *1* Hybrid laminar flow [N adds nacelle].  
  *2* Heritage Lottery Fund (UK).  
**HLH** Heavy-lift helicopter.  
**HLL** High-level language.  
**HLLV** Heavy-lift launch vehicle.  
**HLMD** Hull loss per million departures.  
**HLO** Helideck Landing Officer (oil rigs).  
**HLP** Hybrid linear potentiometer.  
**HLS** Helicopter landing site.  
**HLSI** Hybrid LSI.  
**HLSTO** Hailstones.  
**HTLC** High-level target concepts (Acare).  
**HTLF** High-level task force (MBFR treaty).  
**HLU** Hybrid linear unit.  
**HLUAV** Hand-launched UAV.  
**HLV** *1* Heavy-lift vehicle (space launch).  
  *2* In 2006 also said to mean Hybrid launch vehicle (USA).  
**HLWE** Helicopter laser warning equipment.  
**HLYR** Haze layer aloft.  
**HM** Heavy maintenance.  
**H<sub>m</sub>** Controls-fixed manoeuvre margin.  
**h<sub>m</sub>** Per-cent-chord location of H<sub>m</sub>.  
**HMA** *1* Helicopter maritime attack.  
  *2* His/Her Majesty's Aircraft (UK civil airliner individual name prefix).  
  *3* Hang-gliders Manufacturers Association [El Segundo, CA] (US).  
**HMAFV** Her Majesty's Air Force Vessel (UK).  
**HMAS** Her Majesty's Australian Ship.  
**HMC** Health-monitoring computer.  
**HMC&E** Her Majesty's Customs and Excise.  
**HMCS** *1* Helmet-mounted cueing system.  
  *2* Her Majesty's Canadian Ship.  
**HMCU** Hydraulic monitoring computer unit.  
**HMD** *1* Helmet-mounted display [D adds device, S and sight, SS and sight system].  
  *2* Helicopter mine dispenser.  
  *3* Hand-held metal detector.  
**HMDG** Hydraulic-motor-driven generator.  
**HMDS** *1* Hexamethylidisylazane.  
  *2* See HMD 1.  
**HMEP** Helmet-mounted equipment platform.  
**HMF** Health maintenance facility, monitors health of space-station human crew.  
**HMFU** Hydromechanical fuel unit.  
**HMG** *1* Her/His Majesty's Government.  
  *2* Hydromechanical governor.

- 3 Heavy machine gun.  
 4 Hydraulically motored generator.
- HMGP** Heavy machine-gun pod.
- HMH** 1 Helmet-mounted HUD.  
 2 Heavy helicopter squadron (USMC).
- HMI** Human/machine interface.
- HML** Hard mobile launcher.
- HMLA** Helicopter squadron, light attack (USMC).
- HMM** Helicopter squadron, medium (USMC).
- HMOB** Hardened main operating base.
- HMOS** High-density MOS.
- HMOSP** Helicopter multimission optronic stabilized payload.
- HMP** HMG (3) pod; -RL adds rocket launcher.
- HMR** 1 Homer.  
 2 Health-monitor[ing] recorder.  
 3 Helicopter main route.
- hmr** Homer.
- HMRS** Hotline mobile repair shop.
- HMS** 1 Health-monitoring system.  
 2 High-modulus sheet (CFRP).  
 3 Helmet-mounted sight; /D adds display, S system.  
 4 His/Her Majesty's Ship, name bestowed on ships and airfields of the Royal Navy. The latter were named after seabirds; thus, RNAS Henstridge was HMS *Dipper*.  
 5 Heat-management system.
- HMSO** Her/His Majesty's Stationery Office.
- HMSS** Helmet-mounted symbology system.
- HMST** Helmet-mounted sensory technologies [PO adds program office].
- HMT** Helicopter Training Squadron (USMC).
- HMTAS** Helmet-mounted target-acquisition sight.
- HMTDS** Helmet-mounted target designation system.
- HMTIS** Helmet-mounted targeting and indication system (R).
- HMU** 1 Hydromechanical unit.  
 2 Helmet-mounted unit.  
 3 Height-monitoring [or measuring] unit, for RVSM.
- h<sub>μ</sub>, h<sub>mu</sub>** Jet thickness or height.
- HMV** Heavy-maintenance visit.
- HMX** 1 Cyclotetramethylenetrinitramine; shock-sensitive explosive, most powerful in general use [see HNIW].  
 2 Helicopter squadron, development (USMC).
- HN, HN** Sunset to sunrise (ICAO).
- H<sub>n</sub>** C.g. margin.
- HN3** Nitrogen mustard gas (code USA).
- HNIW** Hexanitrohexazaisowurtzitane, most powerful conventional explosive.
- HNM** Helicopter noise model.
- HNMO** Host-nation management office.
- HNP** Hypersonics National Plan.
- h<sub>np</sub>** US usage for chordwise location of neutral point.
- HNS** 1 Host-nation support.  
 2 Hybrid navigation system.
- HNSC** House [of Representatives] National Security Committee (US).
- HNVS** Helicopter night-vision system.
- HO** 1 Service available to meet operational requirements (ICAO).  
 2 Hardover.  
 3 Helicopter, observation (USA, USN, 1948–62).  
 4 Handoff.
- HoA** 1 Heads of agreement.
- 2 Head[s] of Agency.
- hoar frost** White semi-crystalline coating deposited in clear air on surface colder than frost point (see *frost*).
- HOB** Height of burst.
- Hobbs meter** Logs engine operating time.
- Hobo, HOBO** Homing bomb [S adds system].
- HOBS** High off-boresight (missile aiming).
- Hocac** Hands on cyclic and collective.
- Hocas** Hands on collective and stick.
- HOCSR** Host and oceanic computer system replacement (FAA).
- HOD** Head-out display, HUD type equipment mounted on helmet and always in wearer's LOS.
- HODF** Human-operator describing function.
- HOE** 1 Homing overlay experiment, to kill RVs above atmosphere.  
 2 Holographic optical element.
- Hoerner tip** Sailplane wingtip of curved downturned shape; popular 1950–60.
- Hofin** Hostile fire indicator; detects shockwaves caused by projectiles.
- HOG** Hermann Oberth Gesellschaft eV (G).
- HOGE** Hovering out of ground effect.
- hogging** 1 Machining from solid, esp. of large part out of heavy forging.  
 2 Deformation of airship such that both ends droop.  
 3 Stressing condition of fuselage caused by sag of overhanging nose or tail in flight or on ground.
- 4 Stressing condition of seaplane float or boat hull when weight wholly supported by large wave at mid-length.
- Hohmann** Describes minimum-energy transfer orbit between two bodies, using their gravitational attraction.
- Hohner** Sailplane wingtip (see *Hoerner tip*).
- HOJ** Homing on jamming; fundamental ECM technique.
- HOL** 1 High[er]-order language [see HOLWG].  
 2 Holiday.
- hold** 1 To stop countdown until fault has been cleared.  
 2 Period of \*(1).  
 3 To retain data in EDP (1) store after it has been copied into another.  
 4 To fly standard pattern as requested until given further clearance (see *holding fix*).  
 5 To wait on airfield at any time after arrival and before departure under tower instructions.  
 6 Underfloor cargo compartment, identified as container \* or bulk \*.  
 7 Above-floor compartment in all-cargo aircraft.  
 8 Manual adjustment for vertical/horizontal synchronization of raster display.
- holdback link** Strong link between carrier aircraft and deck, severed in accelerated takeoff; hence, any such link in launch of missile or RPV.
- hold-down test** One carried out while vehicle, rocket motor or other device is mounted on test stand.
- holding** Hold [4,5]; hence \* course, \* reciprocal, \* side, non-\* side, \* fix end, \* outer (or outbound) end, etc.
- holding area** Region of holding fix.
- holding bay** Airfield area where aircraft in motion (taxiing or towed) can be held (5) to facilitate ground movement or accommodate queue for takeoff.
- holding fix** Navaid on which holding area is based, such as VOR radial intersection, Vortac, ILS outer marker etc.

**holding off** In landing an aeroplane, the final moments of flight when the pilot keeps increasing pull on control column to postpone landing/alighting in order to do so either at lower speed or (tailwheel aircraft) in three-point attitude.

**holding pattern** Racetrack pattern of precisely known location, two parallel legs joined by turns at 3°/s or at 30° bank.

**holding point** 1 See *holding area*.

2 Designated point for holding on airfield, especially before entering active runway.

**holding room** Airport lounge.

**holding side** That side of holding course on which pattern is flown.

**hold short** Land and stop before reaching any runway intersection.

**hole** 1 Vacant space left by electron missing from crystal lattice, hence any positive charge (fixed or mobile, in latter case flow of \* cloud through p-type semiconductor).

2 Air pocket (colloq.).

**hollow charge** See *shaped charge*.

**hollow spinner** Propeller spinner in form of annular ring through which passes airflow for engine, cooling or other purpose.

**hollow-stem valve** Piston engine exhaust valve stem in form of tube filled with sodium or other material of high specific heat for conducting heat from head.

**holography** Photographic record produced by interference between two sets of coherent waves. Many unique properties, one of which is 3-D nature of image.

**Hols** Holidays.

**HOLWG** High-order language working group [1975] (DoD).

**HOM** 1 High-orbit mission.

2 Harmony order management (software).

**home** 1 To use matched-wavelength seeker and error-sensing flight-control system in order to fly automatically towards source of radiation.

2 To steer aircraft manually towards particular point navaid or other emitter.

**homebuilt** Difficult to define, but generally accepted as powered aircraft designed for construction by amateur. Majority are designed professionally, with plans approved by EAA or other authority and then duplicated and sold to homebuilders. In some cases successful \* is put into commercial manufacture for sale, removing it from category. Excluded; modifications of existing types, replicas, restorations or copies of commercial designs.

**Homeland Security** Effective October 2002, US Department exceeded in size only by Defense, with c170,000 personnel integrated from Coast Guard, federal Emergency, Customs, Immigration & Naturalization, Border Patrol and Secret Service.

**home-in** See *home* (2).

**home plate** Base airfield to which aircraft are to recover after mission.

**homeric** VHF/DF station.

**homing** 1 Procedures for bringing two radio or other EM stations, at least one airborne, together.

2 Guidance which causes a vehicle [e.g. aircraft or missile] automatically to fly towards a particular source of radiation.

**homing beacon** One on which pilot can home (2).

**homing guidance** System enabling unmanned vehicle to

home (1), typically based on use of IR, IIR, EO/TV, ARH, SARH, or SALH.

**homing receiver** Radio receiver indicating aurally/visually when heading (rather than track) is not towards transmitter.

**homodyne** Reception of DSB in which local oscillator generates output synchronized with original carrier.

**homogenous** Having uniform radar reflectivity at all points on surface (function of material substrate, coating[s] and orientation).

**homosphere** Earth atmosphere below a height of about 100 km (62 miles), composition being almost constant.

**homotron** Soft failure.

**HOMP** Helicopter operations monitoring program.

**HOMS** Homing optical missile system.

**Honcho** Big chief, hence fighter ace or high-ranking military or company officer (US, colloq.).

**honeycomb** 1 Low-density structural technique and materials based on hexagon-cell honeycomb sandwiched between two sheets too thin for stability alone; can be all-metal, or any of the three components can be of various other materials, joined by various adhesives. Can be supplied as standard sheet, or parts can be made individually with any form. Nid d'abeilles, NdA (F).

2 Grid of thin intersecting aerofoils or flat plates across tunnel or other duct intended to remove turbulence from fluid flow.

**honking** Being airsick, hence *honk bag* (cabin-staff term).

**HOO** Helicopter offshore operations.

**hood** see *canopy*.

**hoodoo** Hose-drum unit (RAF, colloq.).

**hook** 1 Procedure used by air controller to direct EDP (1) of semi-automatic command and control system to take specified action on particular blip, signal or portion of display.

2 Aerobatic manoeuvre resembling a lateral Cobra.

3 Arrester hook.

**Hooke's law** Up to elastic limit, strain set up in elastic body is proportional to applied stress.

**hookman** Member of carrier deck party charged with unhooking aircraft after recovery.

**hooks** Interfaces available for future avionics, weapons or other items not yet invented (colloquial).

**Hoops, HOOPS** Helicopter offshore operations.

**Hoover highway** Command flight-path display (colloq.).

**HOP** Hours of persistence.

**hop** 1 Very short flight; eg by aeroplane on fast taxi test or by aerodyne only marginally capable of flight.

2 Full circuit in advance of official first flight.

3 Jump from one EM frequency to another by ECCM subsystem.

**Hope** H<sub>2</sub> orbiting plane experiment [not same as next] (Japanese NAL).

**Hope - X** High-orbiting plane experiment.

**hopper** 1 Small receptacle in oil tank for hot or diluted oil to assist cold-weather start.

2 Container in ag-aircraft for dust (powdered chemical).

**Hops** Helmet optical position sensor.

**Horiz** 1 *Horizontal*.

2 Horizon.

**Horizon** Hélicoptère d'Observation Radar et d'Investigation sur Zone (F).

**horizon**

**horizon** 1 Actual boundary where sky and planetary body appear to meet: visible \*.

2 Apparent boundary as modified by atmospheric refraction, terrain, fog or other influence: apparent \*.

3 Great circle on celestial sphere at all points 90° from zenith and nadir: celestial \*.

4 Line resembling apparent \* but above or below: false \*.

5 Locus of points at which direct rays from terrestrial radio transmitter become tangent to Earth: radio \*.

6 Artificial horizon (instrument).

**horizon and pitch scale** HUD symbology comprising a horizon line, parallel lines above and below ( $\pm 2^\circ$  or  $5^\circ$ ) for pitch information, and heading marks at  $5^\circ$  intervals.

**horizon bar** Fixed horizontal reference in most types of horizon (6), HSI and attitude-displays.

**horizon sensor** Radiometer or other sensitive passive receiver used to align one axis of spacecraft or satellite with apparent horizon of Earth or other body; also called \*-seeker.

**horizontal** Used in Hatol to mean short or vertical takeoff with fuselage substantially level; used in Hotol to mean takeoff along runway (CTOL) instead of straight up in vertical attitude.

**horizontal error** Error in range, deflection or miss-radius which weapon system exceeds on half of all occasions when firing on target on horizontal plane. When trajectory at arrival is near-vertical \*\* is CEP; where trajectory slanting, giving elliptical dispersion, \*\* is probable error.

**horizontally opposed engine** Piston engine with left and right rows of horizontal cylinders and central crankshaft.

**horizontal parallax** Geocentric parallax of body on observer's horizon, = angle subtended at body by Earth radius at equator.

**horizontal plane** Usually that through longitudinal [OX] axis and perpendicular to vertical.

**horizontal project** One in which hierarchy in design/project team is minimised and each member works full-time on single project.

**horizontal scanning** Scanning in azimuth only at near- $0^\circ$  elevation; rare (see *scanning*).

**horizontal situation indicator, HSI** Standard pilot panel instrument for all except small GA aircraft; includes Hdg (T, M), angular deviation from VOR, INS or other track, Tacan/DME or INS display, and alphanumeric readout of G/S and possibly other data.

**horizontal stabilizer** Tailplane.

**horizontal tailplane** Tailplane.

**horizontal technology integration** Using common hardware, such as sensors, scanners/windows, stabilization and software shared between two or more systems, such as FLIR, IRST, LST, etc.

**Hormoconis resinae** By far the most common jet-fuel fungus.

**horn** 1 Operating arm of simple manual flight-control surface to which cable is attached.

2 Microwave aerial coupling waveguide to free air to give directional pattern; three basic forms are pyramid, sectoral and biconical, first two having rectilinear funnel appearance.

3 Acoustic emitter tube whose varying cross-section and final area control acoustic impedance and directivity.

4 Small area of control surface ahead of hinge axis, usually at tip, sometimes shielded at low deflection angles

by fixed surface upstream and usually housing mass-balance; when surface deflected provides aerodynamic force assisting deflection.

**horn aerial** See *horn* (2).

**horn balance** See *horn* (4).

**horn check** Verify correct functioning of landing-gear warning horn.

**Hornet** Hazardous-ordnance engagement toolkit, to defeat terrorist SAM (US).

**horsal** Horizontal ventral fin (originally on XF10F).

**horsepower** Non-SI unit of power; traditional hp defined as 550 ft-lb/s = 0.745700 kW; metric \* [called ch or PS] defined as 75 kg-m/s = 0.7355 kW. There is also electric \* defined exactly as 0.746 kW. Brake \* is measured at output shaft by applying known retarding torque; indicated \* calculated from area of indicator diagram and rpm; frictional \* is indicated minus brake \*; equivalent \* is turboprop bhp plus addition factored from residual jet thrust. Aircraft engines also have various \* ratings, as do some nations' pilot certificates.

**horsepower loading** See *power loading*.

**horseshoe** Revetment having this shape in plan.

**horseshoe vortex** 1 Combination of finite wing plus trailing vortex from each tip, forming circulation of approximate square-cornered U-shape in plan. The flow above and below the wing can be divided into any number of local \*.

2 Semi-toroidal flow of ground sheet ahead of VTO hovering in headwind.

**Horus** Hypersonic orbital return upper stage.

**HOS** 1 Human operator simulator.

2 Helitow observation system.

**hose** 1 Flexible conduit for fluid (liquid or gaseous).

2 Verb, to fire long burst of gunfire at or ahead of hostile or challenged aircraft.

**HOSG** Helicopter Operations Study Group (UK).

**host aircraft** That acting as carrier to test installation, or parent to UAV/drone.

**host computer** One to which remote terminals or I/O devices are connected.

**hostile** Target known or assumed to be enemy, esp. one seen on remote display.

**hostile track** One which, based upon established criteria, is determined to be enemy airborne, ballistic or orbiting threat.

**host nation** One whose territory houses infrastructure forming part of an international system or aircraft of a friendly air force.

**HOT** Higher-order term.

**Hot** High-subsonic, optically tracked, teleguided.

**hot** 1 Fast-landing (colloq.).

2 With afterburner in operation.

3 With combustion in operation (pressure-jet tip drive or HTP/hydrocarbon rocket).

4 Strongly contaminated by fallout.

5 Hazardous to vicinity (see \* *mission*).

6 Including propellant ignition (see \* *test*).

7 Ready for firing (launch or static test).

8 High-temperature parts of gas turbine (see \* *end*).

9 Thermally anti-iced, thus \* *prop*.

10 In ground refuelling, with engine(s) running.

11 Currently in use [restricted area].

12 Production line with significant number of items still to be manufactured.

## Hotac

**Hotac** Hotel accommodation to provide sleep for civil flight crews.

**hot-air balloon** Balloon rendered buoyant by heating the air contained in the envelope, thereby reducing its density.

**hot and high** Airfield or helicopter platform where high altitude above MSL is combined with high ambient temperatures. These both reduce engine power and the lift from a wing or rotor.

**Hotas** Hands on throttle and stick, design of cockpit of air-combat fighter so that pilot has every control switch, button or trigger needed in any combat on these two handholds [A adds aid]. See *Hocac*.

**hot bird** Fully functioning satellite.

**hot box** Stolen item of avionics, for intelligence or commercial profit.

**hot bucket** Turbine rotor blade (colloq., US).

**hot chaff** Pyrophoric material for IRCM dispensed in covert [not emitting at visible wavelengths] manner.

**hot day** Standard ISA condition for engine rating, aircraft performance certification and other temperature-dependent lawmaking.

**hot dimpling** Dimpling of holes pre-heated to avoid cracking.

**hotel mode** Aircraft on ground with full air-conditioning refrigeration.

**hot end** Portion of gas-turbine subjected to high temperatures from combustion, normally all parts to rear of compressor (which itself can be hot enough to require special refractory alloys in final stages but is never included in this definition); called hot section in US.

**hot fire** *Hot test.*

**hot-gas recirculation** Any mechanism by which hot gas from a propulsion or lift jet can return to engine inlet.

**hot gas system** One energized by gas bled from combustion of solid fuel, or from operating solid rocket motor.

**hot gas valve** One used to control hot gas pressure for TVC purposes.

**hot gun** Aircraft scrambled with loaded gun[s].

**hot isostatic pressing** Temperature/pressure cycle for compacting sintered ceramic or encapsulated powders close to precise net shape.

**hot leg** Presentation, or flypast, on which target simulates IR of hostile jet aircraft.

**hot mike** Microphone continuously on transmit.

**hot mission** Particular test (flight or otherwise) which involves hazards precluding other activity in same area.

**Hotol** Horizontal takeoff and landing (spacecraft launch).

**hot pit** Air refuelling in which fuel is transferred (UK colloq.).

**hot rock** Inexperienced pilot eager to show off (colloq.).

**hot rocket** One in which fuel is burned.

**hot round** Rocket vehicle equipped with operative propulsion, in test programme where many are not.

**HOTS** Hands on throttle and stick; Hotas is more usual.

**hot section** Total of all parts of gas-turbine engine subjected to high temperatures from combustion of fuel, in modular engine exactly defined and normally including associated external dressing which in fact remains relatively cool.

**hot shot** Method of igniting afterburner fuel [which

## Hovercraft

would not otherwise ignite reliably, especially at high altitude] by spraying extra dose of fuel into engine combustion chamber to create hot flame which passes through turbine to afterburner; \* lasts too short a time to damage turbine.

**hot soak** Standardized tests in which an item is baked at a selected high temperature for a specified period.

**hot spot** 1 Place much hotter than environment, showing on 3–5 micron IR.

2 Local area on radar target giving intense return.

**hot standby** Satellite (Comsat, navsat) available for instant use should operating satellite malfunction.

**hot start** 1 Attempted start of gas turbine abandoned because of overtemperature indication.

2 Start, or attempted starts, of piston engine soon after previous run, often thwarted by vapour lock.

**hot streak** Method of igniting afterburner by injecting fuel from special (normally inoperative) nozzle in main combustor, causing long flame to pass through turbine into afterburner primary zone. Can be synonymous with hot shot.

**hot-stream nozzle** That from core engine in turbofan without mixer.

**hot test** Static test of rocket engine in which actual firing takes place.

**hotwell** Tank or portion of larger tank in which hot liquid collects.

**hot winchback** Aircraft pulled into HAS with engines running.

**hot-wire ammeter** One measuring current by  $I^2R$  heating of fine wire; hence \* galvanometer, \* voltmeter.

**hot-wire anemometer** Measures airspeed or wind speed down to 10 mm/s by heating platinum wire to about 1,000°C and either measuring current I for constant T or resistance at constant I.

**hot-wire ignition** Use of suddenly heated (but not exploded) resistance wire to set off rocket engine or gun ammunition.

**hot-wire probe** Hot-wire anemometer.

**hot-wire transducer** Detects and measures sound waves by change in resistance of heated wire.

**hour** Mean solar = 3,600 s; sidereal \* = 3,590.1704 s.

**hour angle** Bearing of object on celestial sphere; angle at pole between hour circles of observer and object, abb HA (see *local* \*\*, *Greenwich* \*\*, *sidereal* \*\*).

**hour circle** Great circle of celestial sphere formed by projecting Earth meridian.

**House** House of Representatives (US).

**house aircraft** One used for research or development and property of user, normally a manufacturer.

**HOV** Autopilot mode maintaining zero lateral/longitudinal groundspeed.

**hover** 1 To fly (usually at low altitude) stationary relative to Earth, airspeed being that of local wind.

2 Exceptionally, to fly with zero airspeed, carried along at speed of wind in horizontal plane (while holding height constant).

3 Uncommon use, to be on station in geostationary orbit.

4 To operate or travel in air-cushion vehicle; obvious contradiction in terms.

**Hovercraft** The original [registered] name of pioneer air-cushion vehicles, still popularly used without initial capital.

**hovering ceiling** Greatest altitude at which helicopter under specified conditions can hover (2), normally defined as IGE (in ground effect) or OGE (out of ground effect).

**hovering point** Location where V/STOL aircraft picks up or sets down load without landing.

**hovering rig** Free-flying rig comprising open spaceframe in which are mounted jet lift engines and supporting systems planned for future aircraft to facilitate development of control systems in low hovering flight. These qualify as aircraft.

**hover pit** Test facility for jet VTO or STOVL aircraft.

**HOW** Handover word.

**HOWD** Helicopter obstacle warning device.

**howdah** Open gunner's cockpit above upper wing of large aircraft pre-1930.

**Howe truss** One having upper and lower chords joined by verticals plus diagonals inclined outwards from bottom to top on each side of mid-point.

**howgozit** Basic graphical plot of particular flight for planning purposes, always on basis of distance and with vertical scale flight level; includes weights, W/V and ambient T, and is amended as flight progresses (often arch.).

**howler alert** Warns interphone handset is not properly seated.

**Howls** Hostile-weapons location system; versatile phased-array radar.

**HOWS** Helicopter obstacle warning system.

**HP** 1 High pressure; suffix number (eg HP<sub>8</sub>) denotes stage from which bleed air is taken.

2 Horsepower (undesirable).

3 Host processor.

4 Holding position, or point, or pattern.

**hp** 1 Horsepower.

2 High-pass filter.

**h<sub>p</sub>** Pressure altitude.

**h.p.** High-pressure.

**HPA** 1 Human-powered aircraft; G adds London-based Group.

2 High-power amplifier or amplification.

**hPa** Hectopascal, previously called mb.

**HPAL** Human performance and limitations.

**H-PAPI** Helicopter PAPI.

**HPBB** High-power broadband.

**HPBW** Half-power beamwidth.

**HPC** 1 High-pressure compressor.

2 Calibrated pressure altitude.

**HPCS** High-productivity computing system (Darpa).

**HPD** 1 High-power discrimination, or discriminating.

2 High-PRF pulse-Doppler.

**HPDA** Heavy propeller-driven aircraft.

**HPEL** Hold[ing]-position edge light[s].

**HP-EMP** High-power electric-motor pump.

**HPF** High-pass filter.

**HPFL** High-power fiber/fibre laser (JTO, DoD).

**HPFOTD** High-power fiber-optic towed decoy.

**HPI** 1 High probability of intercept.

2 High-power illuminating, or illuminator (radar).

**HP/IP** The structure, containing two roller bearings, supporting adjacent ends of the IP and HP compressors. Hence, HP/LP in a two-shaft engine.

**HPIR** HPI(1) receiver.

**HPL** High-power laser (B adds blinding).

**HPM** High-power microwave[s].

**HPMG** Hydraulic permanent-magnet generator.

**HPOC** High power offload to Cass (USN).

**HPOT** High-pressure oxidiser turbopump.

**HPOX** High-pressure oxygen.

**HPPAG** High-pressure pure-air generator [missile cooling].

**HPR** 1 High-performance rescue (vehicle).

2 High-power relay.

**HPres, HPRES** Pressure altitude.

**HPRF** 1 High pulse-repetition frequency.

2 High-power radio frequency.

**HPRL** Human Performance Research Laboratory (NASA, Ames).

**HPRP** High-power reporting point (radar).

**HPS** 1 Helmet pointing system.

2 Horizon and pitch scale.

3 Hardened personnel shelter.

4 High-pressure sodium.

**HPSC** House Permanent Select Committee; I adds on Intelligence (US).

**HPSM** High-power switching mode.

**HPSOV** High-pressure shut-off valve.

**HPSS** High-pressure single-spool.

**HPSSL** High-power solid-state laser.

**HPT** 1 High-pressure turbine.

2 High-precision thermostat.

3 High-power transmission.

**HPTC** High-performance technical computing.

**HPTE** High-performance turbine engine[s], or engined.

**HPTIC** High-performance thermal-imaging committee (DERA/industry).

**HPTS** High-power transmit[ter], or transmitting, set.

**HPW** High-pressure water (snow removal).

**HPX** HP-spool shaft-horsepower extraction.

**HPZ** Helicopter protected zone.

**hpz** Hectopièze[s], non-SI unit of pressure = 10<sup>5</sup> Pa.

**HQ** Headquarters; -C<sup>2</sup> adds Command and Control, MSS mission-support system.

**HQR** Handling-qualities rating.

**Hr** Hour[s].

**HR** 1 Helicopter route.

2 Helicopter, transport (USN category 1944–62).

3 Radar altitude.

4 Hear, here or hours.

**HRA** Highlands [of Scotland] restricted area.

**H<sub>RAD</sub>** Radar altitude measured in landing phase, = wheel height.

**HRB** Horizon reference bar.

**HRC** 1 Historical-records container.

2 Helmet-release connector.

**HRD** Home-routing domain.

**HRDF** High-resolution direction-finding, or finder.

**HRE** Hypersonic ramjet engine.

**HRF** High-Response Force, since 2005 also often called High-Readiness Force (NATO).

**HRG** 1 High-resolution geometric.

2 Hemispherical resonator gyro.

**H<sub>p</sub>** Density altitude.

**HRI** High-resolution instrument.

**HRGM** High-resolution ground map.

**HRIR** High-resolution IR radiometer.

**HRL** Human Resources Laboratory (USAF).

**HRN** High-resolution navigation mode.

**HROD** High rate of descent.

<b>HRP</b>	Headset-receptacle panel.
<b>HRR</b>	1 High-resolution radar. 2 High-range resolution; GMTI adds ground MTI.
<b>HRS</b>	1 Horizon-reference system. 2 High-resolution stereoscopic. 3 Hemispheric radar system.
<b>hrs, Hrs</b>	Hours.
<b>HRSAR</b>	High-resolution SAR(2).
<b>HRSCMR</b>	High-resolution surface-composition mapping radiometer.
<b>HSRI</b>	High-temperature reusable surface, or silica, insulation; Si-fibre tiles protected by fretted borosilicate glass with pigment for desired absorption/emission ratio.
<b>HRST</b>	Hyperspectral remote-sensing technology.
<b>HRT</b>	High-resolution textured [simulator].
<b>HRTS</b>	High-resolution telescope and spectrograph.
<b>HRZ</b>	Helicopter restricted zone.
<b>HRZN</b>	Horizon.
<b>HS</b>	1 Scheduled hours only. 2 Anti-submarine helicopter designation prefix (USN 1951–62). 3 Helicopter Squadron. 4 Hold short (command). 5 High speed [1553B bus].
<b>Hs</b>	Maximum shoulder height of tyre [tire].
<b>h<sub>c</sub></b>	Total height of a stringer
<b>HSA</b>	1 Horizontal-stabilizer actuator. 2 Homeland Security Agency (US, 2002).
<b>HSAB</b>	1 Heavy-store[s] adapter beam. 2 NDB with automatic weather broadcasts.
<b>HSAC</b>	Helicopter Safety Advisory Committee/Conference [office, Houston, TX77205] (US).
<b>HSACE</b>	HSA control electronics.
<b>HSAD</b>	High-speed anti-radiation demonstration.
<b>HSARD</b>	High-speed anti-radiation demonstration.
<b>HSAS</b>	Homeland security advisory system.
<b>HSCS</b>	High-specific creep-strength; M adds material[s].
<b>HSCT</b>	High-speed commercial transport; usually = M2.2-M5.
<b>HSCU</b>	Horizontal-stabilizer control unit.
<b>HSD</b>	1 Hard surface, dry (runway). 2 Horizontal-situation display. 3 Homeland Security and Defense (US 2001), also rendered as Homeland Security Department (2005).
<b>HSDB</b>	High-speed data bus.
<b>HSDC</b>	High-speed data channel; E adds extension.
<b>HSE</b>	Health and Safety Executive (UK).
<b>HSEC</b>	High-stability engine control.
<b>HSF</b>	Half sampling frequency.
<b>HSFD</b>	High-speed flight demonstration.
<b>HSFRS</b>	High-Speed Flight Research Station (NASA Muroc, became NASA Dryden).
<b>HSF-RSAD</b>	High-speed [film] frame, relay service access device.
<b>HSI</b>	1 Horizontal-situation indicator. 2 Hot-section inspection. 3 Hours since inspection. 4 Hyperspectral imagery, or imaging.
<b>HSIN</b>	1 Homeland Security Information Network [2006–] (US). 2 High-speed impulsive noise.
<b>HSIC</b>	High-speed integrated circuit.
<b>HSIT</b>	Hardware/software integration test.
<b>HSKT</b>	Hunter standoff-killer team.
<b>HSL</b>	Heading select.
<b>HSLA</b>	High-strength low alloy steel.
<b>HSLLADS</b>	High-speed low-level air-delivery system.
<b>HSLV</b>	High-speed low-voltage (LSI).
<b>HSM</b>	1 Hard-structure munition, conventional munition intended to have maximum effect on hardened targets. 2 High-speed machining. 3 Hardware security module.
<b>HSMF</b>	High-strength modified fluoropolymer.
<b>HSMU</b>	Hydraulic system[s] monitoring unit.
<b>HSN</b>	Hot-stream nozzle.
<b>HSO</b>	Homeland Security Office (counter-terrorism, UK).
<b>HSOS</b>	Helicopter stabilized optical sight.
<b>HSP</b>	1 High-speed [1,300 m/s] penetrator, or penetration; T adds technology. 2 Head-shrinkable polyolefin. 3 Hard spark[ing] plug.
<b>HSR</b>	1 High-speed research. 2 High-stability reference. 3 High sink-rate.
<b>HSRP</b>	Hot-standby routing protocol.
<b>HSS</b>	1 Helicopter support ship. 2 Helicopter stabilized sight. 3 Homeland security sensor, or suite. 4 Hypersonic sound.
<b>HSSL</b>	Helicopter self-screening launcher.
<b>HSSM</b>	High-speed [Mach 8] strike missile.
<b>HSSS</b>	Helicopter secure-speech system.
<b>HST</b>	1 Hypersonic transport. 2 Heat-shrinkable thermoplastics. 3 High-speed tunnel, or turnoff.
<b>HSTA</b>	Horizontal-stabilizer trim actuator.
<b>HSTF</b>	High-strength toughened fluoropolymer.
<b>HSU</b>	1 Hartridge smoke unit. 2 High-speed unit (satcom).
<b>HSV</b>	Highly supersonic vehicle.
<b>HSVD</b>	Horizontal-situation video display.
<b>HSW</b>	High-speed weapon[s].
<b>HSWT</b>	High-speed wind tunnel.
<b>HT</b>	1 High turbine (US for HP turbine). 2 Hard time, thus * life. 3 Helicopter, training (USN category 1948–62, role prefix, UK). 4 History tape. 5 Horizontal tail. 6 High tension [h.t. preferred].
<b>H/T</b>	Hub-tip ratio.
<b>ht</b>	Height.
<b>h.t.</b>	High tension (electrical).
<b>HTA</b>	1 High-time aircraft of type. 2 Horizontal target attack. 3 Heavier than air. 4 Hand-entered terrain altitude. 5 Helicopter type allowance.
<b>HTAD</b>	Hard-Target Attack Division (USAF).
<b>HTADS</b>	Helmet target-acquisition and designation system.
<b>HTC</b>	1 Hard-target capability. 2 See HTCU. 3 Human to computer. 4 Highest two-way channel.
<b>HTCU</b>	Hover trim control unit.

**2 Heavy Transport Conversion Unit (RAF).**

**HTD** Hard-target defeat.

**H<sub>TD</sub>** Wheel height at touchdown referenced to depressed surface.

**HTDU** High-temperature demonstration unit.

**HTFD** Hard-target functional defeat.

**HTI** Horizontal technology integration.

**HTIC** House Transportation and Infrastructure Committee (US).

**HTIFT** Hard-target influence-fuze technology.

**HTK** Hit to kill.

**HTKP** Hard-target kill probability.

**HTL** High-threshold logic.

**HTLC** High-temperature load calibration.

**HTMPFG** One of earliest of at least 35 English-language safety acronyms = hood/harness, throttle/trim, mixture, pitch, fuel/friction-nut/flaps, gills/gyros/possibly goggles.

**HTNS** Helicopter tactical navigation system.

**HTOV** Horizontal (conventional) takeoff, vertical landing.

**HTP** 1 High-test peroxide.

2 High-tensile polyimide.

3 Horizontal tailplane.

**HTPB** Hydroxyl-terminated polybutadiene, rocket propellant.

**HTR** Heat-transfer reduction.

**HTS** 1 High-tensile sheet (CFRP).

2 Harm targeting system.

3 Hydraulic test stand.

4 High-temperature superconductor.

5 High-temperature sensor.

**HTSC** High-temperature superconductor.

**HTSF** Hard-target smart fuze.

**HTT** Head, or helmet, tracker transmitter.

**HTTB** High-technology testbed (Lockheed).

**HTU** Hand-held terminal unit.

**HTUFT** Helicopter[s] taken up from trade, ie commandeered [also Hetuft].

**HTZ** Helicopter traffic zone.

**HU** 1 Helicopter, utility (USN, USA, 1950-62).

2 Helmet unit, part of HMD(1).

**hub** 1 Strictly, those structural members required to hold together blades of propeller or rotor; in practice meaning has come to include all central portions, including pitch and other mechanisms, de-icing and instrumentation, but not spinner or other fairing.

2 Missile body section containing attachments for cruciform wings.

3 Chief airport of major city.

4 Head office or largest plant of company.

**hub and spoke** Route pattern of carrier totally centred on one city.

**hubbed, hubbing** Parked at hub (3).

**hubbed loop** An arbitrated loop in which the nodes are arranged radially around a hub.

**hub drive** Driven by shaft input rather than tip jet reaction.

**hub plane** HP, in a helicopter the plane perpendicular to the main-rotor shaft.

**hub/tip ratio, H/T** Ratio of radius at root of gas turbine fan, compressor or turbine blade, to radius at tip (usually inside tip shroud if fitted).

**Hucks starter** Device, often locally made, for starting

piston engines. On a car or truck chassis a drive is taken from the engine to a long shaft whose height and inclination can be varied. This terminates in lateral pins [dog clutch] which engage with a bayonet clutch on the end of the propeller shaft (suggest obs.).

**HUCP** Highest useful compression pressure.

**HUCR** Highest useful compression ratio.

**Hud, HUD** Head-up display; C adds camera, or computer, see next.

**Hudwac** HUD weapon-aiming computer.

**Hudwass** HUD weapon-aiming subsystem.

**Hufford** Family of large machine tools which grip ductile sheet at each end in jaws on hydraulic rams mounted on pivoting platforms and stretch it over male die itself thrust forward on rams.

**HUGS** Head-up guidance system.

**HULD** Hardened unit-load device.

**hull** 1 Fuselage of flying boat.

2 Main body of rigid airship.

3 For insurance purposes, complete aircraft as defined in policy, ignoring any load or persons on board.

**hull insurance** That covering capital value (assigned at operative time, neither original first cost nor replacement cost) of aircraft.

**hull lines** Set of plan views of LWLs of marine aircraft or float.

**hull loss** Aircraft written off.

**Hultec** Hull to emitter correlation, EW/ESM software programs.

**HUM, Hum** Health and usage monitor, or monitoring; C adds computer, S adds system or and sensing, U unit.

**human intelligence** Gained by getting people ‘in the know’ to disclose information, by whatever means.

**human-operator describing function** The transfer-function model for the use of error information to track an unpredictable target.

**humidity** Wetness of gas, esp. amount of water vapour present in air; absolute \* is mass of vapour in unit volume g/m<sup>3</sup>, specific \* is mass of vapour in unit mass of dry air g/kg, relative is percentage degree of saturation = 100 times actual vapour pressure divided by SVP.

**humidity mixing ratio** Specific humidity.

**Humint** Human intelligence, ie countermeasures against human decision-taking.

**hump** Region where, in takeoff of marine aircraft, T/W –R/W is least; T is total thrust, W weight and R total resistance. Point at which aerodynamic lift exceeds hydrodynamic lift.

**Humphrey cycle** See *constant-volume combustion*.

**hump speed** That of marine aircraft (seaplane, flying boat) or ACV at which total resistance of water is greatest; in case of aircraft this speed [in US called V<sub>H</sub>] is typically about half V<sub>us</sub>.

**Hums** Health and usage (and performance) monitoring, or management, system.

**Hun** 1 German aircraft or pilot (UK usage WW1, occasional WW2).

2 Pupil pilot (colloq, RFC).

**hundred per cent aircraft** One that exactly measures up to published performance.

**hundredweight** Non-SI unit of mass, abb. cwt = 112lb, 50.8023kg; in US [called short \*, sh.cwt.] = 100 lb, 45.3592 kg.

**hung** Hung start.

**hung round** Rocket or other missile which fails to release from aircraft.

**hung stall** After compressor stall, engine fails to recover immediately.

**hung start** Starting of main turbine engine which, for any reason, automatically or under manual control is arrested after ignition but before self-sustaining speed is reached.

**Hunter** Head-up navigation and targeting equipment for retrofit.

**hunter/killer** 1 Aircraft or other platform able to seek out and kill submarines unaided.

2 Pair of ASW aircraft, one with sensors, the other with weapons.

3 Co-ordinated task force comprising aircraft and surface forces combining in ASW mission.

**hunting** Continual steady oscillation about neutral point; governed speed, governed position, desired flight attitude or other target regime; manifest in cyclic phugoids in aircraft pitch or yaw (rare in roll), shuttling of hydraulic spool valve, ceaseless rising and falling of speed of rotating machine or visible oscillation of instrument needle.

**hunting tooth** Gear ratios which ensure that each tooth engages between a different pair of teeth on each revolution, to even out wear.

**Huntsville** Alabama location of MSFC, USSRC.

**HURCN** Hurricane.

**hurricane** One name [notably in West Indies] for tropical revolving storm, usually defined as one with winds whose mean speed exceeds 64 kt, 119 km/h.

**HURT, Hurt** Heterogenous urban reconnaissance [surveillance and target acquisition] team (Darpa).

**hush house** Noise-suppressing testbed for jet engines (colloq.).

**hushkit** Supplied by manufacturer to operator to quieten engine, invariably turbojet or turbofan already in service; often includes inlet acoustic liners, liners for tailpipe and new nozzle with longer periphery and faster mixing.

**Hutton sight** Gunsight with red/green illuminated dots for use at night, 1917 (UK).

**HV, h.v.** 1 High voltage.

2 High vacuum.

3 High volume.

**H/V** Height/velocity (plotted curve).

**HVA** 1 Horizontal viewing arc.

2 High-value asset[s].

**HVAC** Heating, ventilating and air-conditioning.

**HVAP** High-velocity armour-piercing.

**HVD** 1 Helmet visor display.

2 Helicopter video downlink.

**HVDF** Hf/vhf D/F.

**HVG** Hypervelocity gun.

**HVI** Helmet/vehicle interface.

**HVLP** High volume, low pressure [painting].

**HVM** Hypervelocity missile.

**HVML** High-volume minelayer.

**HVO** Hydrogenerated vegetable oil[s].

**HVOF** High-velocity oxygen/fuel plasma spray.

**HVOR** High-altitude VOR.

**HVPS** 1 High-voltage power supply [U adds unit].

2 High-volume precipitation sensor.

**HVT** High-value target; A adds acquisition.

**HVU** High-value unit [surface target].

**HYV** Heavy.

**HVZL** Hauptverwaltung der Zivilen Luftfahrt (DDR, East Germany).

**HW** Hardware.

**h.w.** Half-wave.

**HWA** Hot-wire anemometer, or anemometry.

**HWCI** Hardware configuration item.

**HWD** Heavy-weight deflectometer.

**HWIL** Hardware in the loop.

**HWMMT** High water mark mean tides.

**HWT** Hypersonic weapons technology.

**HWVR** However.

**HX, H<sub>x</sub>** 1 Airfield has variable working hours.

2 Heat exchanger.

3 Hold[ing] to a fix.

**Hyblum** Long-established Al-Mg-Si alloys.

**H<sub>y</sub>BOLT** Hypersonic boundary-layer transition.

**hybrid bearing** Combining bearing with rolling elements (ball, roller, needle) encased in free-rotating journal supported by fluid film. Typically Sinide elements in steel race.

**hybrid buoyant aircraft** Those built so far, or planned, are vectored-thrust airships.

**hybrid chip** Combining digital and analog functions.

**hybrid composite** Matrix reinforced by fibres of two different types.

**hybrid computer** One using digital techniques for large and precise arithmetic and logic beyond scope of analog machines, and analog wherever possible for highest computational speed; invariably a good compromise for large simulations and other specialized tasks [Ed.'s opinion].

**hybrid display** One in which alphanumerics and symbology are cursorily written on top of a raster background.

**hybrid electronics** Combination in single integrated circuit of epitaxial monolithic or thin-film with one or more discrete devices.

**hybrid fan** Refined form of tandem-fan lift/cruise engine which in lift mode blows entire fan airflow through twin vectored forward nozzles and separately induced core flow through aft vectored nozzle.

**hybrid FCS** Flight-control system with digital outer loop and analog inner loop.

**hybrid helicopter** Aerodyne with VTOL capability conferred by helicopter rotor[s] but which cruises (flies in translation mode) as an aeroplane.

**hybrid IC, hybrid package** Hybrid electronics.

**hybrid laminar flow** Combination of aerodynamic design and suction.

**hybrid navigation system** This usually means GPS, INS and IFF.

**hybrid operation** See *hybrid display*.

**hybrid propulsion** 1 Aircraft propelled by two or more dissimilar species of prime mover; eg turboprop plus jet, or turbojet plus rocket.

2 Single propulsion engine capable of operating in two distinct modes; eg turborocket or ram rocket.

**hybrid RAM** RAM(2), especially forming integral part of airframe, combining two or more techniques to give broader bandwidth in thinner layer, eg magnetic/CA, graded dielectric/CA, etc.

## hybrid RAT

**hybrid RAT** Ram-air turbine driving both electric generator and hydraulic pump.

**hybrid rocket** One using both liquid and solid propellants simultaneously; usual arrangement is solid fuel and liquid oxidant.

**hybrid solar array** Part folding, part flexible.

**hybrid trajectory** Any space trajectory intermediate between that for minimum energy or minimum time and alternatives offering greater payloads, longer launch windows or other advantages.

**hybrid wave** EM wave in waveguide having both magnetic and electric components in plane of propagation.

**Hycatrol** One of several trade names (FPT Industries) for rubber/metal bonded structures.

**Hycorder** Hyperspectral covered-lantern optical recognition device recorder.

**hyd** Hydraulic[s].

**Hydim** Hydraulic interface module.

**hydrant dispenser** Installation under apron or finger/gate area stand for refuelling aircraft without need for tanker vehicles.

**hydrant pit** Below-ground compartment, normally covered, housing connections and controls for fuel, hydraulic, lube oil or other liquid supply.

**hydraulic catapult** *Catapult.*

**hydraulic fluid** See *hydraulics*.

**hydraulicing** Abnormal resistance to movement of machine, esp. piston engine, caused by hydraulic lock in lower cylinders part-full of essentially incompressible oil; can cause serious damage.

**hydraulic lock** Use, frequently inadvertent, of essentially incompressible liquid to prevent movement of mechanical part.

**hydraulic motor** Source of mechanical power, usually rotary, driven hydraulically.

**hydraulic power unit** Source of power to energize hydraulic system, eg when main engines inoperative.

**hydraulic RAT** Ram-air turbine driving hydraulic pump.

**hydraulics** Science of liquids either in motion (hydrodynamics) or as media for transmitting forces (hydrostatics). In aerospace generally science of nearly incompressible liquids enclosed in closed-circuit pipe systems at high pressure and used both to apply forces, with little fluid motion, and supply power, with large fluid motion. Media originally mineral oils, today also engine fuel, phosphate esters, chlorinated silicones, silicate esters and (supersonic and missiles) alkyl silicate esters. There are several so-called synthetic ester-based fluids, but most aircraft still use mineral oils, notably DTD.585 [UK], MIL-H-5606 [US], H.515 [NATO], AMG-10 [Russia] and AIR.320 [France].

**hydraulic seal** Total seal between two annular spaces in engine formed by ring-fins or flanges projecting into ring of oil created by centrifugal force.

**hydraulic starting** Used in small [eg, missile and UAV] jet engines: external supply feeds pressure to hydraulic motor; once engine is started, motor functions as hydraulic pump.

**hydraulic system** Complete aircraft installation comprising closed circuits of piping, engine-driven pumps, accumulators, valves, heat exchangers, filters and, usually, emergency input such as RAT or MEPU;

## hydroglider

normally divided into at least two systems with maximum degree of independence. Each system is assigned task of driving selected items by linear actuators, motors or other output devices.

**hydrazine** Family of chemicals, mostly colourless liquids, often corrosive; basic member is \*,  $(\text{NH}_2)_2$ ; common rocket fuel is unsymmetrical dimethyl \*,  $\text{NH}_2\text{N}(\text{CH}_3)_2$ ; another is monomethyl \*,  $\text{NH}_2\text{HH}.\text{CH}_3$ .

**hydrobooster** Hydraulic power unit used in boosted (not fully powered) flight-control system (colloq.).

**hydrocarbon** Compound of hydrogen and oxygen only; some millions are known, including all derivatives of petroleum, which in product form often have other elements added for specific purposes. Many aviation fuels are alkanes (paraffins), which are open chains with carbon atoms having single-valence bonds; first six members, with one to six carbon atoms respectively, are methane, ethane, propane, butane, pentane and hexane. These are prefixed n (normal), distinguished from prefix iso of more reactive branched alkanes. Alkenes have one carbon with double bond, based on ethylene ( $\text{CH}_2$ ). Aromatic \* series are based on hexagon ring of benzene  $\text{C}_6\text{H}_6$  with three double bonds.

**hydrodynamics** Science of fluid motion, esp. of water.

**hydroflap** Water rudder on flying boat.

**hydrofoil** Lifting surface operating in water. As well as being vehicles in their own right, surface-piercing and ladder \* have been used on marine aircraft.

**hydroforming** Shaping parts by fluid pressure, esp. of thin-foil items.

**hydrogen** Symbol H, least-dense element, comprising 88 per cent of atoms in Universe,  $\text{LH}_2$  (liquid \*) has density  $77.0 \text{ g l}^{-1}$ ,  $4.806 \text{ lb ft}^3$  at  $13.8\text{K}$  (the triple point) and  $70.8 \text{ g l}^{-1}$  at  $\text{BPT}$  of  $20.28\text{K}$ ,  $-253^\circ\text{C}$ , where it becomes  $\text{GH}_2$  (gaseous \*) with density  $0.0008988$  ( $0.08988 \text{ gl}^{-1}$ ) or  $0.005611 \text{ lb ft}^3$ ; isotopes are bivalent deuterium, trivalent tritium. In air at STP  $10^3 \text{ cu ft}$  [ $28.317 \text{ m}^3$ ] of \* will lift  $32.090 \text{ kg}$  (70.746 lb).

**hydrogenation** Causing to combine with hydrogen, esp. at high pressure and in presence of catalyst such as nickel or platinum, in conversion of crude petroleum distillates into tailored fuels and other products. \* of coal also important to future aviation.

**hydrogen bomb** So-called H-bomb, or thermonuclear weapon TN or TNW; comprises NW surrounded by lithium deuteride (LiD, the lithium being isotope Li-6) and a little tritium T. Triggering the NW emits neutrons which instantly convert the Li-6 into  $\text{H+He-3+T}$ . The He-3 and T then combine with remaining D to form more He and more neutrons, which also convert the U-238 bomb case into Pu-239, causing an additional (fission) reaction.

**hydrogen bus** Airport airside buses are among the first vehicles to be powered by hydrogen, usually  $\text{GH}_2$  stored on vehicle roof.

**hydrogen economy** Hypothetical future in which Earth's limited reserves of petroleum are replaced by gaseous and liquid hydrogen. No new technology is needed, but see next.

**hydrogen fusion** Essentially limitless power could be unlocked if mankind could emulate the Sun and build a facility which continuously converted hydrogen into helium. Conversion would yield  $630,000,000,000\text{J}$  of energy per gram.

**hydroglider** Glider with marine alighting gear.

## hydrograph

**hydrograph** Hydrometer hard-copy output.

**hydrokinetics** Science of liquids in motion.

**hydrolapse** Rate of decrease of atmospheric water vapour with altitude.

**hydromagnetics** See *MHD*.

**hydromechanical logic** Performed with mechanical elements wherein information exists as hydraulic flows/pressures.

**hydromechanical metering unit** *Fuel metering unit*.

**hydrometer** Instrument for determining density of liquids.

**hydrometeor** 1 Any atmospheric water in solid or liquid form; all precipitation, fog, dew, frost etc.

2 Phenomena dependent upon (1).

**hydrophobic** Rain-repellant.

**hydrophilic** Affinity for water, so acts as dessicant (various spellings).

**hydroplane** Light boat which skims water surface on planing bottom when at high speed; erroneously misused for seaplane and/or hydrofoil.

**hydropoort** Inland airport for marine aircraft.

**hydropress** Diverse family of hydraulic presses widely used in aerospace with large-area platen on which are mounted large or multiple tools around which sheet is shaped by rubber pad or mating tools.

**hydriskis** Planing surface, usually in left/right pair and retractable, used for takeoff and landing of certain marine aircraft; have little buoyancy, so ski aircraft rests on water like flying boat when at rest.

**hydrosphere** Water resting on or within crust of Earth or other body, excluding that in atmosphere.

**hydrostatic bearing** Spinning shaft, sphere or other mass is supported (usually radially and axially) by filtered gas or liquid dynamic reaction, eliminating contact between fixed and moving solid surfaces.

**hydrostatic drive** Transmits power, usually between rotating shafts, by pumping hydraulic fluid round closed circuit; both pump and motor usually have stroke or output infinitely variable down to zero, giving perfectly flexible dynamic link from zero to maximum output power.

**hydrostatic equation** Applies when secondary effects (Earth curvature, friction, coriolis etc) ignored, leaving  $\frac{dp}{dz} = -\rho g$  where  $p$  is pressure,  $z$  geometric height and  $\rho$  density.

**hydrostatic extrusion** Advanced technique for extrusion of steels and other materials, usually at room temperature by forcing through die under extreme hydraulic pressure.

**hydrostatic fuze** Triggered by depth-dependent water pressure.

**hydrostatic test** Test of container (fuselage, solid rocket case) under high pressure using water or other liquid to minimize stored energy.

**hydovane** One meaning is a patented form of hydrofoil intended to facilitate emergency water alighting of land-plane.

**Hydrus** FBMS ship/shore communications system.

**Hydulignum** Trade name (Hordern-Richmond) for densified wood.

**Hydyne** Storable rocket fuel in various formulations based upon 60% UDMH and 40% diethylenetriamine.

**hyetograph** 1 Recording rain gauge.

2 Annual rainfall chart.

## hyperspectral

**Hyfil** Trade name for family of CFRP raw materials marketed in standard forms or used for inhouse production (Rolls-Royce).

**Hyflex** Hypersonic flight experiment.

**HyFly** Programme of Mach-6 research (Darpa/ONR).

**HYE** High-yield explosive.

**hygograph** 1 Output from a recording hygrometer.

2 Instrument for recording humidity, traditionally with pen positioned by bundle of stretched human hair.

**hygrometer** Determines atmospheric humidity (strictly, wet and dry bulb \* is psychrometer).

**hygroscopic** Eager to absorb moisture.

**Hy-Jet<sup>1,II,III,IV</sup>** Ester-based non-inflammable hydraulic fluids (Chevron).

**Hy-Lite** Hyperspectral long-wave imager for the tactical environment.

**Hylite** British titanium alloys (+ Sn, Zr, Al); creep-resistant.

**H<sub>y</sub>MIC** Hybrid micro integrated circuit.

**hyperabrupt** Device, eg diode, tailored to most rapid possible action.

**hyperacoustic zone** Region above 100 km (62 miles) where mean free path approximates to wavelengths of sound; limit of sound propagation.

**hyperbaric** 1 Having atmospheric pressure or oxygen concentration greater than normal sea-level.

2 Internal body pressures greater than ambient.

**hyperbola** Conic section obtained by plane cutting both nappes (normal right circular cone and its mirror-image inverted above); locus of points whose distances from two foci have constant difference, standard equation  $x^2/a^2 - y^2/b^2 = 1$ . Because of constant difference in distance from two foci, possible to base families of nav aids on keyed radio emissions from two fixed stations.

**hyperbolic nav aids** Based upon synchronized emissions from fixed ground stations, often called master and slave(s), which are received by aircraft at time differences which yield lines of constant time (ie range) difference in form of hyperbolic position lines. First were Gee, Loran and Decca, later developed to give instantaneous readout of position or moving-map display.

**hyperbolic error** That due to assumption that waves received at all antennas of an interferometer baseline are travelling in parallel directions.

**hyperbolic frequencies** Measured in several tens of GHz.

**hyperbolic re-entry** At hyperbolic speed.

**hyperbolic speed** Sufficient to escape from Solar System; on Earth trajectory away from Sun about 40,597 km/h, 25,226 mph.

**hypergolic** Of rocket propellants, those which ignite spontaneously when mixed.

**hypermetropia** Long-sightedness.

**hypermixing nozzle** In ejector-lift system, row of nozzles which alternately deflect jets in opposite directions to create large vortices promoting rapid mixing.

**hyperoxia** Excess oxygen in the blood.

**hypersat** Loose term for advanced small satellite[s].

**hypersonic** Having Mach number exceeding 5 [another authority, M8 to M12].

**Hypersonic National Plan** Co-ordinates DoD, NASA, industry and academia (US).

**hypersound** Frequency greater than  $10^9$  Hz.

**hyperspectral** Operating in several electromagnetic

## hypertension

HZS

bands, dividing each colour into a separate channel to give a unique signature of absorption and emission.

**hypertension** High blood pressure.

**hyperventilation** Overbreathing; specif. reduced CO<sub>2</sub> causing \* syndrome, dizziness, fainting, convulsions.

**hypobaric** Having atmospheric pressure much less than normal at sea level.

**hypocapnia** CO<sub>2</sub> deficiency in blood.

**hypoid** Bevel or helical gears transmitting power with some tooth-sliding action between shafts neither parallel nor intersecting.

**hypoventilation** Underbreathing.

**hypoxaemia** Condition resulting from hypoxia.

**hypoxia** O<sub>2</sub> deficiency in blood, from whatever cause.

**hypsometric tints** Colour gradations chosen for contrast by natural or artificial illumination (eg. for contour bands on topographic map).

**HYR** Higher.

**Hyrat** Hydraulic (pump driven by) ram-air turbine.

**HySET** Hydrocarbon-fuel scramjet engine technology.

**HySID** Hypersonic systems integrated demonstrator.

**hysteresis** 1 Generally, condition exhibited by system whose state results from previous history, specif. one whose instantaneous values lag behind prediction.

2 In ferromagnetic and some other materials, lagging of magnetic flux density T behind magnetic field strength A/m causing it (see \* *loop*).

3 Effects caused by internal friction in elastic material undergoing varying (esp. rapidly oscillating) stress.

4 Lag in instrument indication; eg that of barometric altimeter in dive or climb.

**hysteresis loop** Plot of magnetising field strength against magnetic flux density for ferromagnetic material; traditionally called B/H curve because flux density was called induction, symbol B, measured in gauss, and field strength (formerly in oersteds) was identified by symbol H; today's units are (field strength) A/m and (flux density) T.

**HYT** High year of tenure (waiver programme).

**Hytech** Hypersonic technology.

**Hythe** Ciné camera mounted on Scarff ring or similar base for gunnery instruction; full name \* camera gun.

**Hytral** Noise-absorbent panels of sandwich construction.

**Hyways** Hybrids with advanced yield for surveillance.

**HZ** Haze (ICAO).

**Hz** Hertz, SI unit of frequency, = cycles per second.

**HZ Anlage** System of using a piston-engine solely to drive supercharger feeding propulsion engines [G, WW2].

**H<sub>o</sub>, H<sub>zero</sub>** Distance from leading edge of AMC(1) to aerodynamic centre.

**HZS** Hrvatski Zrakoplovni Savez, [aeronautical sport federation, Zagreb 10-000] (Croatia).

# I

- I**
- 1 Electric current.; see ampere.
  - 2 Moment of inertia. suffixes include xx roll, yy pitch, zz yaw, R rotor [of engine or helicopter etc],  $\omega$  angular momentum, and numbers for structural webs, etc.
  - 3 Second moment of area
  - 4 Luminous intensity.
  - 5 Total heat content.
  - 6 Total impulse, usually non-dimensional.
  - 7 Intensity of turbulence.
  - 8 Immigration.
  - 9 Initial approach.
  - 10 Instrument.
  - 11 In-line.
  - 12 Interrupted.
  - 13 Prefix, direct-injection engine (US).
  - 14 Aircraft category: human-powered aircraft (FAI).
  - i**
  - 1 Intensity of rainfall.
  - 2 ‘Square root of minus 1’.
  - 3 Instantaneous current.
  - 4 Helicopter blade control-point index.
  - I-band** EM radiation, 37.5–30 mm, 8–10 GHz.
  - I-beam** One of I section.
  - I-display** When radar aerial pointed at target latter appears as circle at radius proportional to range; when aerial points away from target latter appears as segment showing magnitude/ direction of error.
  - I-local** Index of local warnings [weather].
  - I-section** Structural beam with vertical web and flat upper and lower booms.
  - I<sup>1</sup>** Image-intensifying.
  - I<sup>2</sup>F** Intelligent influence fuze.
  - I<sup>2</sup>R** The heat generated by an electric current.
  - I<sup>2</sup>S** 1 Infra-red imaging system.
  - 2 Integrated information system, cabin wireless LAN for passengers based on 802.11 and ARINC-763.
  - I<sup>t</sup>** Current squared times time, characteristic of trip switch.
  - IA**
  - 1 Initial approach (FAA).
  - 2 Inspection authorization (FAA).
  - 3 Input axis.
  - 4 Imagery analysis.
  - 5 Initial attack (firefighting).
  - Ia** Anode current.
  - IAA** 1 International Academy of Astronautics. Paris.
  - 2 International Aerospace Abstracts (AIAA).
  - 3 Irish Aviation Authority [office, Dublin 2] (Ireland).
  - 4 See *IAA (E)* and *IAA(O)*.
  - IAAA** International Airforwarder and Agents Association. [office, Alexandria, VA].
  - IAAC** 1 International Agricultural Aviation Centre (HQ in UK).
  - 2 International Association of Aircargo Consolidators.
  - 3 Information Assurance Advisory Council (UK).
  - IAAE** Institution of Automotive & Aeronautical Engineers (Australia).
  - IAA(E)** Inspector of Air Accidents (Engineering) [DETR, UK].
  - IAAF** International Agricultural Aviation Foundation [office, Walla Walk, WA99362] (Australia).

- IAAFA** Inter-American Air Forces Academy (US).
- IAAH** International Association of Aviation Historians.
- IAAI** 1 International Airports Authority of India.
- 2 Indonesian Aeronautical and Astronautical Institute.
- IAAIA** International Association of Airline Internal Auditors.
- IAA(O)** Inspector of Air Accidents (Operations) [DETR, UK]
- IAARC** International Administrative Aeronautical Radio Conference.
- IAASM** International Academy of Aviation & Space Medicine Montreal.
- IAASS** International Association for the Advancement of Space Safety.
- IAATC** International Association of Air Training Centers.
- IAB** Investment Approvals [until 2003 Appraisals] Board [senior procurement body; MoD] (UK).
- IABA** International Association of Aircraft Brokers and Agents.
- IABCS** Integrated aircraft brake control system.
- IABG** Industrieanlagen Betriebs GmbH (G).
- IAC** 1 Intelligence Analysis Center (US).
- 2 International Aerobatics Club [office Oshkosh, WI 54093–3086] (Int.).
- 3 Instrument-approach chart.
- 4 Integrated avionics computer.
- 5 See *TIACA*.
- 6 Instituto de Aviação Civil [20021–010 Rio de Janeiro] (Brazil).
- 7 Irish Aviation Council [Greystones, Co. Wicklow] (Ireland).
- 8 Irish Aviation Club Ltd [Dublin 14] (Ireland).
- IACA** International Air Carrier Association [head office, B-1930 Zaventem; UK office E Grinstead RH19 4QA] (Int.).
- IACAC** International Association of Civil Aviation Chaplains [office JFK airport, NY].
- IAC/AV** Interstate Aviation Committee/Aviation Register (R, CIS).
- IACC** Inter-agency Air Cartographic Committee (US).
- IACD** Intelligent adviser [not advisor] capability demonstrator.
- IACES** International Air Cushion Engineering Society.
- IACG** Inter-agency consultative group (US, USSR, Europe, Japan, space science).
- IACP** Independent Association of Continental Pilots.
- IACS** Integrated avionics [also air-traffic] control system.
- IACSP** International Aeronautical Communications Service Provider.
- IACS** Integrated avionics [also air-traffic] control system.
- IACZ** Inter Airline Club Zurich (Int.).
- IAD** 1 Fighter Division (R).
- 2 Integrated antenna detector.
- IADB** Inter-American Defense Board [Washington, DC].

- IADF** Isopropyl alcohol de-icing fluid.
- IADS** Integrated air-defence system.
- IAE** 1 Instituto de Aeronautica e Espaco, previously Instituto de Atividades Espaciais (Brazil).  
2 Institute for Advancement in Engineering (US).
- IAE** 3 Institute for Aviation and Environment [Cambridge CB2 1EW] (UK).
- IAEA** 1 Indian Air Engineers' Association.  
2 International Atomic Energy Agency.
- IAEM** Instituto dos Altos Estudos Militares (Port.).
- IAF** 1 International Astronautical Federation [office, F-75015 Paris] (Int.).  
2 Initial approach fix.  
3 Italian air force [UK usage].  
4 Indonesian air force (UK usage).  
5 Iranian air force [UK usage].  
6 Independent Air Force, strategic arm of RAF, formed 5 June 1918.  
7 See FAI.
- IAFA** International Airfreight Forwarders' Association (J).
- IA5** International Alphabet No. 5.
- IAFU** Improved assault fire unit (USA).
- IAGA** Israeli Association of General Aviation [46910 Kfar Shmaryahu].
- IAGC** Instantaneous automatic gain control.
- IAGS** 1 Inter-American Geodetic Survey.  
2 Integrated Arinc ground station.
- IAHA** International Air Handling Association.
- IAHFR** Improved airborne high-frequency radio: /NOE adds nap-of-the-Earth.
- IAIM** Integrated aeronautical information management.
- IAIN** International Association of Institutes of Navigation.
- IAIP** Integrated aeronautical information package (CAA).
- IAIS** Industrial Aerodynamics Information Service.
- IAL** International Airtraffic League.
- IALA** International Association of Lighthouse Authorities.
- IALCE** International Airlift Control Element (NATO).
- IALPA** Irish ALPA [office Dublin airport PA1] (Ireland).
- IAM** 1 International Association of Machinists (US). See *IAMAW*.  
2 Institute of Aviation Medicine (UK).  
3 Inertially-aided munition, free-fall device (Northrop).  
4 Instrument approach minima.  
5 Institute for Advanced Materials (Petten, Neth.).  
6 Initial approach mode.  
7 Integrated asset management [CS&S].
- IAMAW** International Association of Machinists and Aerospace Workers (US, Washington, DC, and, Canada, Ottawa).
- IAMS** 1 Integrated armament management system.  
2 Integrated airline management system (IATA).
- Iamsar** International Aeronautical and Maritime SAR Manual (ICAO).
- IANA** Internet Assigned Number Authority.
- IANC** 1 International Airlines Navigators Council.  
2 International Air Navigation Convention (from 1919).
- I&C, I&CO** Installation and checkout.
- I&E** Installations and Environement (US DoD).
- I&M** Improvement and modernization.
- I&T** Integration and tape.
- I&W** Indications and warnings.
- IANS** Institute of Air Navigation Services (Luxembourg).
- IAO** 1 In and out of cloud.  
2 Information Awareness Office (Darpa).
- IAOA** Indicated angle of attack.
- IAOPA** International Council of AOPAs [1962 –, office Frederick, MD 21701] (Int.).
- IAP** 1 Imagery architecture plan.  
2 Fighter aviation regiment (USSR, R).  
3 Instrument approach procedure (see \* chart).  
4 International airport.  
5 Integrated actuation pack[age], usually an electrically driven pump.  
6 Institution of Analysts and Programmers [office, London] (UK).
- IAPA** 1 International Airline Passenger Association (Croydon, UK).  
2 International Airline Passengers Association [office, Dallas TX] (Int.).  
3 International Aviation Photographers' Associations.  
4 Instrument-approach procedures automation.
- IAPC** 1 International Airport Planning Consortium (UK).  
2 Instrument approach procedure chart.
- IAPS** 1 Ion auxiliary propulsion system.  
2 Integrated avionics processing system.
- IA-PVO** Fighter aviation, air defence of the homeland (USSR, R).
- IAQG** International Aerospace Quality Group (Int.).
- IAR** 1 Idle area reset.  
2 Institute for Aerospace Research [part of NRC, Ottawa, K1A 0R6] (Canada).  
3 Inspection, or intersection, of air routes.
- IARO** International Air Rail Organisation (office Heathrow, UK).
- IARP** Inverse-address resolution protocol.
- IAS** 1 Institut Aéronautique et Spatial (F).  
2 Indicated airspeed (see *airspeed*).  
3 Integrated acoustic structure.  
4 Interplanetary automated shuttle.  
5 Impact attenuation system.  
6 Ideal aerofoil/airfoil shape.  
7 Integrated airport systems.  
8 Institute of the Aeronautical Sciences, changed to Aerospace, and in 1962 to AIAA.  
9 Institut Aéronautique et Spatial [office, Toulouse] (F).  
10 Institute of Aviation Safety [unrelated to ASI3, Closter, NJ] (US).
- IASA** 1 International Air Shipping Association.  
2 International aviation safety assessment (FAA).
- IASB** Institut d'Aéronomie Spatiale de Belgique.
- IASC** 1 CASI (1).  
2 International Assessment and Strategy Cemter [DC] (USA).
- IASM** Institute of Aerospace Safety and Management (U of S California 1953, became ISSM).
- IASS** 1 International air-safety seminars.  
2 Integrated airport security system.

- IAT** 1 International atomic time.  
 2 International Association of Touristic managers.  
 3 Initial approach track.
- IATA** International Air Transport Association [1945–, 280 members and growing, many national offices; head office, Montreal H4Z 1M1 (Int.)].
- IATB** International Aviation Theft Bureau [office, Frederick, MD, US] (Int.).
- Iatco** Icelandic Air Traffic Controllers' Association [office, Reykjavik] (Iceland).
- IATF** International Airline Training Fund [office, Geneva, 15] (Int.).
- IATP** 1 International Airline Technical pool.  
 2 Inter-American Training Plan 1941–46.
- IATS** Intermediate automatic test system.
- IATSC** International Aeronautical Telecommunications Switching Centre.
- IAU** 1 International Accounting Unit.  
 2 International Astronomical Union [office, Paris].  
 3 Interface adaptor unit.  
 4 Integrated avionics unit.
- IAVW** International Airways Volcano Watch.
- IAW, i.a.w.** In accordance with.
- IAWA** International Aviation Women's Association.
- IAWF** International Association of Wildland Fire.
- IAWG** Industrial Avionics Working Group (UK).
- IB** 1 Inbound.  
 2 Incendiary bomb.  
 3 Ion beam, thus \* erosion, \* engine.  
 4 Interconnecting box.
- IB<sub>b</sub>** 1 Burning-time impulse.  
 2 Helicopter blade moment of inertia about the flapping hinge.
- IBA** 1 Inbound boom avoidance.  
 2 Fighter/bomber aviation (R).  
 3 International Bureau of Aviation (Europe).
- IBAA** International Business Aircraft Association (Europe).
- IBAC** International Business Aviation Council [office, Montreal] (Int.).
- IBC** 1 Individual blade control.  
 2 Intelligent bandwidth compression.  
 3 Integrated broadband communications.
- IBCOS** In-built checkout system.
- IBCT** Interim Brigade Combat Team (USA).
- IBE** 1 Indirect battlefield effect.  
 2 Internet booking engine.
- Iberlant** Iberia–Atlantic area (NATO).
- IBF** Internally blown flap.
- IBIS, Ibis** 1 ICAO birdstrike information system.  
 2 Israeli boost-intercept system.
- IBIT** Integrated, or initiated, built-in test.
- IBKV** Integrated helicopter avionics system (R).
- IBLS** Integrity beacon landing system.
- IBN** Image-based navigation.
- IBn** Identity (or identification) beacon.
- IBOR** Innovation and business opportunity review.
- IBP** Iron-ball paint.
- IBR** 1 Integrally bladed rotor (gas turbine).  
 2 Intra-base radio.  
 3 Integrated baseline review.  
 4 Involuntary boarding refusal.
- IBRD** 1 Inflated ballute retarding device.
- 2 International Bank for Reconstruction and Development.
- Ibris** Interactive baggage reconciliation information system.
- IBS** 1 Integrated bridge system.  
 2 Integrated broadcast service, for correlating theatre intelligence for all US forces.
- IBSC** International Bird Strike Committee (Int.).
- IBU** Independent back-up unit.
- ICAOAN** ICAO Annex[e], many titles.
- IC** 1 Internal combustion.  
 2 Interceptor controller.  
 3 Indirect cycle (sometimes i.c.).  
 4 Integrated circuit.  
 5 Intelligence community.  
 6 Ice crystals.  
 7 Inter-Cabinet.  
 8 Incident commander (aerial firefighting).
- I/C, I & C** 1 Installation and checkout.  
 2 Interface and control.
- i.c.** 1 Integrated circuit.  
 2 Internal combustion (IC more common).
- i/c** 1 In charge (UK usage).  
 2 Intercom.
- ICA** 1 International Committee of Aerospace Activities. [usually ICAA]  
 2 Initial cruise altitude.  
 3 International Cartographic Association.  
 4 International Council of Airshows [office, Toronto].
- ICAA** 1 International Civil Airports Association [Paris, Orly].  
 2 International Committee of Aerospace Activities.
- ICAAS** Integrated controls and avionics for air superiority (USAF).
- ICADS, Icds** Individual combat-aircrew display system (laptop training device).
- ICAEA** International Civil Aviation English [language] Association.
- ICAF** 1 International Committee on Aeronautical Fatigue [office, D-64289 Darmstadt].  
 2 Industrial College of the Armed Forces (US).
- ICAI** Intelligent computer-assisted instruction.
- ICAM** Integrated computer-aided manufacturing.
- ICAN** International Commission on Air Navigation (rue George Bizet, Paris, from 1921).
- ICAO** International Civil Aviation Organization [1947–, 186 member states; office, Montreal H3C 5H7] (Int.).
- ICAOAN** ICAO Annex[e], many titles.
- ICAOPA** See *IAOPA*.
- Icaotam** ICAO Technical Assistance Mission.
- ICAP, I-Cap** Improved capability.
- Icarus** Complex laptop combining flight/black-box data with real-time graphics (Qinetiq).
- ICAS** 1 International Council of the Aeronautical Sciences [office, Bonn].  
 2 International Council of Air Shows [office, Milwaukee, WI, US].
- ICAT** International Center for Air Transportation (MIT).
- Icats** Integration command and telemetry system.
- ICAU** International Civil Aviation University, office Melbourne.
- ICAW** Integrated caution, advisory and warning.

**ICB** International competitive bidding.  
**ICBM** Intercontinental ballistic missile.  
**ICC** 1 International Control Commission.  
 2 International Chamber of Commerce.  
 3 International Code of Conduct (use of space).  
 4 Integrated command and control.  
 5 Initial CAOC capability.  
 6 Information coordination circular.  
 7 Interstate Commerce Commission (US 1887–1996).  
 8 Integrated cargo carrier.  
 9 IAPS(2) card cage.  
 10 Interface and configuration cartridge.  
**ICCABMP** International code of conduct against ballistic-missile proliferation.  
**ICCAIA** International Coordinating Council of Aerospace Industries Associations [office, Washington, DC].  
**ICCD** Intensified charge-coupled device.  
**ICCOPI** Integrated classified combat operations process initiative (CAOC).  
**ICCP** Integrated communications control panel (in aircraft).  
**ICCS** 1 Integrated command and control subsystem.  
 2 Integrated communications control system (on ground, unrelated to ICCP).  
**ICD** 1 Installation, or interface, control drawing.  
 2 Interface control document, or device.  
 3 Interim, or initial, capability document.  
**ICDDS** Institute of Civil Defence and Disaster Studies (UK).  
**ICDO** International Civil Defence Organization [office, CH-1213 Geneva] (Int.).  
**ICDOC** Interchangeability condition direct operating cost.  
**ICDRiA** International Center for Decision and Risk Analysis [University of Texas, Dallas] (Int.).  
**ICDS** Integrated control and display system.  
**ICDU** Intelligent control and display unit.  
**ICE** 1 Interference cancellation equipment.  
 2 Internal-combustion engine.  
 3 In-circuit emulator, simulates portions of external hardware during debugging of control software.  
 4 Improved combat efficiency [or effectiveness].  
 5 Independent cost estimate.  
 6 Institution of Civil Engineers (UK, 1818–).  
 7 Innovative control effector[s].  
 8 Integrated collaborative environment.  
 9 Immigration and Customs Enforcement (DHS2).  
 10 Internal convection enhancement turbine cooling, (GE).  
**ice** Naturally occurring forms include crystals, fog, needles and pellets, self-explanatory.  
**icebox rivet** One (eg 2024 alloy) which must be kept below 0°C until use.  
**ice frost** Forms on cryogenic tank; if on rocket, easily shaken off at launch.  
**ice guard** For piston engine, usually a mesh screen; see *gapless* \*, *gapped* \*.  
**IceHawk** Proprietary [Goodrich] ice detection based on polarized IR.  
**ice impact panel** Soocially designed structure immediately surrounding the blades of a fan or compressor.  
**ice ingestion** Class of tests to determine ability of engine to swallow various cubes of ice, ice-water slush and some-

times hailstones at specified flow rates. See *ice rod, ice slab*.  
**ice light** A light arranged to illuminate a region prone to icing, such as wing leading edges.  
**ICEM** Intergovernmental Committee for European Migrations.  
**IC engine** Internal combustion, usually means reciprocating: Otto, Diesel, Stirling, Rankine etc.  
**icephobic** “Lethal to ice”, a preventative coating.  
**ice plate** Strong plate on fuselage skin in plane of propellers.  
**ice point** NTP equilibrium temperature for ice/water mixture.  
**ice rod** Standard ingestion-test size: 1.25 in diameter × 12 in.  
**Icerun** Ice on runway.  
**ICESat** Ice, cloud and [land] elevation satellite.  
**ice slab** Standard ingestion-test size 12 in × 12 in × 0.5 in (305 × 305 × 12.7 mm). Is permitted to break before entering engine.  
**ice zapper** System for removing accreted ice by giant electrical pulses (colloq.).  
**ICF** 1 Initial contact frequency (ATC).  
 2 Inertial confinement fusion.  
**ICFAC** Inter-Caribbean Federation of Aero Clubs [office, Curaçao].  
**ICFP** Inverse-Cassegrain flat plate.  
**ICG** Icing.  
**ICGIC** Icing in cloud[s].  
**ICGIP** Icing in precipitation.  
**ICH** Interline Club Holland (Int.).  
**ICHE** Intercooler heat-exchanger.  
**ICHTHUS** Integrated and coherent technology for aircraft health and usage support systems (Smiths).  
**ICI** 1 International Commission for Illumination.  
 2 Initial capability inspection.  
**ICIAP** Inter-agency Committee on International Aviation Policy (established 1963).  
**icing** Accretion of ice or related material on aircraft. Occurs on ground in freezing fog and in flight through supercooled water droplets.  
**icing indicator** Any of four families of device quantifying presence of icing and rate of accretion.  
**icing limits** Usually upper and lower temperature limits, corresponding to one (sometimes two) flight levels.  
**icing meter** Instrument giving rate of accretion, buildup thickness and cloud liquid-water content.  
**icing tanker** Aircraft equipped to cause severe icing on another following close behind.  
**ICLECS** Integrated closed-loop ECS.  
**ICM** 1 Intercontinental missile.  
 2 Improved conventional munition.  
 3 Inter-console marker.  
 4 Integrated collection management.  
 5 Interim control module.  
 6 Interline communications manual.  
**ICMD** Improved countermeasure[s] dispenser.  
**ICMP** Internet control message protocol.  
**ICMS** 1 Integrated conventional-stores management system.  
 2 Integrated countermeasures system, or suite.  
 3 Integrated combat-management system (USN).  
**I-CMS** Index of central maintenance system fault messages.

- ICNI** Integrated com, nav, IFF.
- ICNIA** Integrated communications, navigation and identification avionics (USAF), or architecture [UK rendering].
- ICNIS** Integrated CNI set.
- ICNS** Integrated com/nav system.
- ICO** 1 Ignition cutoff.  
2 Idle cutoff.  
3 Intermediate circular orbit, 10,000–15,000 km.  
4 Instinctive cut-out.
- ICOC** International Code of Conduct (ICBMs; ABMP adds against BM proliferation).
- Icon** Integration contract.
- iconic model** A preliminary physical representation of a system, not necessarily full-scale, and not necessarily with functioning parts.
- Icons** Integrated control and operations network system.
- ICP** 1 Integrated core processor [or processing; TD adds technology demonstration].  
2 Integrated control panel.  
3 Initial conflict probe.
- ICPA** Indian Commercial Pilots' Association.
- ICR** 1 In-commission rate.  
2 Integrated cassette recorder, for voice/video to LAN/WAN.
- ICRC** International Committee of the Red Cross.
- ICS** 1 Improved composite structure.  
2 Inverse conical scan(ning) (ECM).  
3 Improved (or integrated) communications system.  
4 Intercom switch, or system, or set.  
5 Internal countermeasures system, or set.  
6 Interim contractor support.  
7 Inter-cockpit communication system.  
8 Intelligent control system.
- ICSA** International Centre for Security Analysis.
- ICSR, Icsar** Inter-agency committee on search and rescue.
- ICSC** International Communications Satellite Corporation.
- ICSM** 1 Integrated conventional-stores management; GPS can be a suffix.  
2 Integrated communication signalling and monitoring.
- ICSPA** Integrated Communications System Management Agency.
- ICSMS** See *ICMS*.
- ICSS** Integrated communications switching system.
- ICST** Imperial College of Science and Technology [London SW7 2BY] (UK).
- ICSU** International Council of Scientific Unions.
- ICT** 1 Ice-contaminated tailplane [S adds stall].  
2 In-country test[ing].
- ICU** 1 Interface computer, or converter, or control unit.  
2 Interstation control unit.  
3 Instrument comparator unit.
- ICW** 1 Independent carrier wave, or see *i.c.w.*  
2 Interpersonal communications workshop.  
3 Intermittent [or interrupted] continuous wave.
- i.c.w.** Interrupted continuous wave.
- ICWAR, Icwar** Improved continuous-wave acquisition radar.
- ICWI** Interrupted continuous-wave illumination.
- ICY** 1 Interchangeable Y-axis.
- 2 International Co-operation Year (1965).
- ICZ** Interchangeable Z-axis.
- ID** 1 Internal or inner diameter.  
2 Inadvertent disconnect (flight refuel).  
3 Identification, identity, identifier.  
4 Inverse dark (video characters).
- IDA** 1 Istituto di Diritto Aeronautico (I).  
2 Intermediate dialect of Atlas.  
3 Integrated digital avionics.  
4 Intelligence/decision/action.  
5 Initial design activity.  
6 Integrated digital audio; CS adds control system.  
7 Institute for Defense Analyses [Alexandria VA 22311–1772] (US).
- Idaflieg** Interessengemeinschaft Deutscher Akademischer Fliegergruppen eV (G).
- IDAP** Integrated defensive-avionics program.
- IDAS** 1 Integrated defensive aids system (RWR plus jammer).  
2 Integrated design automation system.
- IDC** 1 Imperial Defence College (UK).  
2 Interactive design centre.  
3 Inner dead centre [= upper in inverted engine].  
4 Indicator display control.  
5 Image-dissector camera.
- IDCAOC** Interim deployable CAOC.
- IDCSP** Initial Defense Com Sat Program (DoD).
- IDD** Interim, or instrumented, deployment device.
- IDE** Integrated development environment.
- IDEA** 1 Instituto de Experimentaciones Astronauticas (Argentina).  
2 Integrated digital electric airplane.
- ideal fluid** Perfect, inviscid fluid; forces are perpendicular to small-parcel boundaries, no kinetic energy can be degraded to heat, boundary layer absent.
- ideal profile** Flight profile and path for lowest fuel burn.
- ideal rocket** Theoretical rocket with perfect operation, eg no heat transfer, no turbulence, no friction etc.
- Ideas** International data exchange for aviation safety (ICAO).
- IDECM** Integrated defensive electronic countermeasures.
- IDEFY** Indefinitely.
- ident** 1 Special feature in ATCRBS and I/P in SIF to distinguish one displayed select code from other codes (FAA).  
2 ATC request; transponder sends extra pulse plus \* code.
- identicality** Proof that a replacement PMA part duplicates the original in design, material, fit and function (FAA certification).
- identification** 1 Proclamation of identity, eg by SSR or squawk.  
2 Visual recognition of aircraft type.
- identification cable colour** Each cable or pipeline in modern aircraft is colour coded to indicate function.
- identification feature** Characteristics built into each selected code in SSR, ATCRBS and military radars for ident purposes.
- identification friend or foe** Automatic interrogation and response, by coded transmission from transponder, to proclaim friendly status or identify flight on SSR.
- identification light** 1 Pilot-controlled white lights visible from above or below for broadcasting identity by keying.

- 2** Light on ground adjacent to beacon serving as identifier.
- identification manoeuvre** In primitive radar GCA, manoeuvre commanded by controller to establish positive identity of customer on radar.
- identifier code** Three-letter code unique to each airport.
- Index** Imagery dissemination and exploitation [system].
- IDF** *1* Intelligent data fusion, most efficient way of using large amounts of data from many sources.
- 2** Indigenous Defence Fighter.
- 3** IR decoy flare.
- 4** Instantaneous direction-finding.
- Idflieg** Inspektion der Fliegertruppen (G).
- IDG** Integrated-drive generator.
- IDGA** Institute for Defense and Government[al] Advancement (US).
- IDH** Intelligent, or intelligence, data handling; S adds system.
- IDI** Initial domain identifier.
- ID/IQ** Indefinite delivery, indefinite quantity.
- IDIS** *1* Interactive distributive information and support [on-line manuals].
- 2** Intelligent display and information system.
- IDL** Intraflight datalink.
- idle area reset** Open divergent afterburner nozzle with throttle closed [reduces temperatures].
- idle cutoff** Position of piston engine mixture control that cuts off fuel supply, thus stopping engine.
- idle descent** To bleed off height with engine[s] at flight idle.
- idler** Gearwheel or shaft whose sole function is to transmit drive between two others.
- idles** Repeated cycling of engine from idling to specified higher power.
- IDLH** Immediately dangerous to life or health.
- idling** Running at governed low speed consistent with reliable smooth operation, in most engines well above minimum sustaining rpm: usually two regimes, ground \* being lower  $N_1$  than flight \* and obtained only when oleos compressed.
- IDLS** International Data Link Society (2003–).
- IDM** *1* Improved data modem.
- 2** Inductive debris monitor.
- IDO** Initial defensive operations.
- IDP** *1* Individual development programme.
- 2** Integrated data-processing.
- 3** Imagery display processor.
- 4** Initial domain port.
- IDPA** International Deaf Pilots' Association.
- IDPM** Institute of Data Processing Management (UK).
- IDPS** Interface data-processing segment (NPOESS).
- IDPU** Incursion and display processing unit.
- IDR** Initial design review.
- IDRF** Impact-Dynamics Research Facility (crash tests, NASA Langley).
- IDRP** Inter-domain routing protocol.
- IDS** *1* Interdiction/strike.
- 2** Integrated display set [or system].
- 3** Improved data set (USAF).
- 4** Integrated dynamic system (helio).
- 5** Infra-red detection set.
- 6** Integrated diagnostic system.
- 7** Ice-detection system.
- 8** IATA distribution services.

- 9** Intrusion detection system.
- 10** Information display system.
- 11** Integrated deepwater system (USCG).
- IDSCP** Initial Defense Satellite Communications Program (US).
- IDST** Integrated decision support tool.
- IDTC** Inter-deployment training cycle (USN).
- IDU** Interactive, or integrated, display unit.
- IE** *1* Institution of Electronics (UK).
- 2** Instrument error.
- 3** Initial equipment (RAF).
- 4** Incremental ejection.
- IEA** International Ergonomics Association.
- IEAA** International EAA, UK based.
- IEB** Institut für Extraterrestrische Biologie (G).
- IEC** *1* International Electrotechnical Commission. [office, Geneva]
- 2** IAPS (2) environmental control module.
- 3** Inertial electrostatic confinement.
- IECC** International Express Carriers Conference.
- IECMS** In-flight engine-condition monitoring system.
- IED** *1* Improvised explosive device; D adds disposal.
- 2** Insertion/extraction device.
- IEDD** *IED* (1) disposal.
- IEE** The Institution of Electrical Engineers [1871–; now the IET] (UK).
- IEEE** The Institute of Electrical and Electronic Engineers [office, New York, NY08855] (US).
- IEER** Improved extended echo ranging.
- IEF** Interpretive execution facility (software).
- ITEM** Interpretive/explanatory material (JARs).
- ITEMats** Improved emergency message auto transmission system.
- IEN** Internal engineering notice.
- IEP** *1* Interim Earth penetrator.
- 2** Integrated electric propulsion [carrier].
- IEPG** Independent European Programme Group (NATO).
- IEPR** Integrated engine pressure ratio.
- IERE** Institution of Electronic and Radio Engineers (UK).
- IERW** Initial entry rotary-wing [ITS adds integrated training system].
- IES** *1* Image enhancement system.
- 2** Imagery exploitation system.
- 3** Interface editor system (ATC).
- IESI** Illuminating Engineering Society; AC adds Aviation Committee (US).
- 2** Institute of Environmental Services [office, Mt Prospect, IL] (US).
- IESI** Integrated electronic standby instrument.
- IESSG** Institute of Engineering, Surveying and Space Geodesy.
- IET** *1* Initial entry training.
- 2** Interline electronic ticket.
- 3** Institution of Engineering and Technology [London WC2R 0BL] (UK).
- IETDS** Interactive electronic training delivery system (Neth.).
- IETF** Internet engineering task force.
- IETM** Interactive electronic technical manual[s].
- IEU** Interface electronics unit.
- IEVS** IR enhanced vision system.

**IEW** 1 Integrated electronic warfare; S adds system, UAV adds unmanned air vehicle.

2 Intelligence/electronic warfare; CS adds common sensor, S adds system, UAV adds unmanned air vehicle.

**IEWS** 1 Information and electronic-warfare system.

2 See IEW.

**IF** 1 Intermediate frequency (often i.f.).

2 Instrument flight, or flying.

3 Intensive flying (UK, RN).

4 Independent Force (RAF, 1918).

5 Ice fog.

6 Intermediate, or initial, fix.

**I/F** Interface.

**I/F module** Inlet and fan module.

**IFA** International Federation of Airworthiness; 120 members in 47 countries engaged in manufacturing, operating, insuring, etc.; Secretariat, East Grinstead RH19 1BP] (Int.).

**IFAA** International Flight Attendants' Association.

**IFAC** International Forum for Air Cargo [office, Warrendale, PA] (Int.).

**I-Fact** Indirect-fire forward air control trainer.

**iFACTs** Interim future area control tools support (NATS).

**Ifalda** International Federation of AirLine Dispatchers Associations [office, Agincourt, ON, Canada] (Int.).

**Ifalpa** International Federation of Airline Pilots' Associations [95 members; admin. office, Chertsey KT16 9AP, UK; Tech.Standards, Stevensville, MD21666, US] (Int.).

**IFANS, Ifans** International Federation for the application of standards.

**Ifapa, IFAPA** International Foundation of Airline Passengers' Associations.

**IFAS** See *FISA1*.

**IFast** Integrated flexibility (or facility) for avionics system test (USAF).

**Ifatca, IFATCA** International Federation of Air Traffic Controllers' Associations [office, Montreal].

**IFATE** International Federation of Airworthiness Technology and Engineering.

**Ifatsea, IFATSEA** International Federation of Air-Traffic Safety Electronics Associations; office, London.

**IFB** Invitation for bid.

**IFBP** In-flight best procedure[s].

**IFBS** Individual flexible barrier system.

**IFC** Incentive-fee contract(ing).

**IFCA** International Flight Catering Association (office UK).

**IFCNC** Integrated flight-control and navigation computer.

**IFCS** 1 Integrated, or intelligent, flight-control system.

2 Integrated fire-control system.

**IFDAPS** Integrated flight-data processing system.

**IFDFS** In-flight duty-free shop.

**IFDL** Inter-/intra-in-flight data link.

**IFE** 1 In-flight emergency.

2 In-flight entertainment [N adds network, S system].

**IFEO** International Flight Engineers' Organization [office, Chertsey, KT16 9AP, UK] (Int.).

**IFESS** Integrated flight entertainment and services system.

**IFF** 1 Identification friend or foe.

2 International Flying Farmers Inc. [office, Wichita, KS67277-9124] (Int.).

3 Institute of Freight Forwarders, (Int. office Richmond, Surrey, (UK)).

**IFFFA** International Federation of Forwarding Agent Associations (now IFFFA).

**IFFCC** Integrated flight and fire-control computer.

**IFFCP** IFF (1) control panel.

**IF/FCS** Integrated fire/flight control system.

**IFFFA** International Federation of Freight Forwarders' Associations; office, Zurich.

**IFGR** Information for global research (USAF).

**IFHA** International Federation of Helicopter Associations (office, US).

**IFI** International Friction Index.

**IFIAT** See *FITAP*.

**Ifics** In-flight interceptor communications [or control] system.

**I-file** Intelligence (surveillance computer).

**IFIM** International Flight Information Manual (US).

**IFIS** 1 Independent flight inspection system (for ILS, Vortac, etc.).

2 Independent frequency-isolation system.

3 Integrated flight-information system[s].

**IFM** 1 Instantaneous frequency measurement.

2 In-flight monitor.

3 International Formula Midget [= Formula 1].

**IFMA** In-flight mission abort.

**IFME** In-flight medical emergency.

**IFMIS** Integrated force management info system.

**IFMP** Integrated financial management plan (NASA).

**IFMR** IFM (1) receiver.

**IFM/SHR** IFM (1) superheterodyne receiver.

**IFMU** Integrated flight-management unit (UAV).

**IFMW** Information for mobile warfare (USAF).

**IFN** Institut Français de Navigation [office, F-75007 Paris] (F).

**IFO** 1 International field office.

2 Improved first-order [approximation].

**IFOBL** In-flight-operable bomb lock.

**IFOG** Interferometric fibre-optic gyro.

**IFOP** Intensive flight-operations program.

**IFOR** Implementation Force (NATO).

**IFOSTP** International follow-on structural test programme.

**IFOV, IFOV** Instantaneous field of view.

**IFP** 1 Initial flightpath.

2 In-flight performance [computer program].

3 In-flight phone.

4 Integrated flight planner.

**IFPA** 1 International Fighter Pilots' Academy (Slovak Republic).

2 IFPS (1) area.

3 Indirect fire precision attack.

**IFPC** Integrated flight and propulsion control (STOL); S adds system.

**IFPG** 1 Intelligent flight-path guidance.

2 International Frequency Planning Group.

**IFPL** 1 In-flight power loss.

2 ICAO flight plan.

**IFPM** In-flight performance monitor.

**IFPS** 1 Integrated, or initial, flight-plan processing system.

2 Intra-formation positioning system.

**IFPTE** International Federation of Professional and Technical Engineers (Int.).  
**IFPZ** IFPS (1) zone.  
**IFR** 1 Instrument-flight rules.  
   2 In-flight repair.  
   3 In-flight refuelling.  
   4 Initial flight release (of engine).  
   5 Internationaler Förderkreis für Raumfahrt (G).  
**IFRA** In-flight refuelling area, designated airspace.  
**IFRB** International Frequency Registration Board.  
**Ifrep, IFREP** In-flight report [reconnaissance].  
**IFRS** International financial reporting standards.  
**IFRU** Interference rejection unit.  
**IFS** 1 Institut für Segelflugforschung (G).  
   2 Inspectorate, or Inspector, of Flight Safety (USAF, RAF).  
   3 Instrument flight simulator.  
   4 Inner fixed structure of reverser.  
   5 Initial Flight Screening (USAF).  
**IFSA** In-Flight Food Service Association [office, Houston, TX] (US).  
**IFSTAR, Ifsar** Interferometric SAR (2) for digital terrain [E adds elevations].  
**IFSD** In-flight shutdown [rate].  
**IFSR** In-flight shutdown rate [uncommon usage].  
**IFSS** 1 International flight service station.  
   2 Instrumentation and flight safety system.  
**IFT** 1 Intelligent flight trainer.  
   2 Integrated flight test, or training.  
   3 Intercept flight test (NMD).  
**i.f.t.** Intermediate-frequency transformer.  
**IFTE** Integrated family of test equipment.  
**IFTO** International Federation of Tour Operators [office, Lewes, BN7 1YE] (Int.).  
**IFTS** Internal, or integrated, Flir [and] targeting system.  
**IFTU** Intensive Flying Trials Unit (UK).  
**IFU** Interface unit.  
**IFURTA, Ifurta** Institut de Formation Universitaire et de Recherche du Transport Aérien [Aix-en-Provence F-13628] (F).  
**IFW** In-flight weight.  
**IG** 1 Imperial gallon (sometimes I.g.).  
   2 Inspector-General.  
   3 Image generation, or generator.  
**Ig** Grid current; hence Ig2 screen-grid current.  
**I<sub>g</sub>** Mass moment of inertia.  
**IGA** 1 Inner gimbal angle.  
   2 Informazione geotropografiche aeronautiche (I).  
   3 Irish Gliding Association.  
   4 Indium gallium arsenide.  
   5 Intermediate-gain antenna.  
**IGAA** Inspection Générale de l'Armée de l'Air (F).  
**IGAC, Igacem** Inspection Générale de l'Aviation Civile et de la Météorologique [Paris F-75006] (F).  
**Igan** Indium/gallium/arsenic/nitride.  
**IGB** Integral, or intermediate, or inlet, gearbox.  
**IGBAD** Integrated ground-based air defence.  
**IGC** 1 International Gliding Commission.  
   2 Intergovernmental Conference (US/EU).  
**IGDS** Integrated graduate development scheme.  
**IGE** 1 In ground effect.  
   2 Instrument[ation] graphics environment.  
**IGEB** Inter-agency GPS Executive Board.

**IGES** 1 International graphics exchange [file] standard.  
   2 Interim ground Earth station.  
**IGFET** Insulated-gate field-effect transistor.  
**IGI** Instrument Ground-Instructor.  
**IGIA** Interagency Group on International Aviation [from 1960].  
**igloo** 1 Air cargo container in form of rigid box sized for above-floor loading.  
   2 Small pressurized experiment container designed for use with Spacelab orbital laboratory.  
**IGN** Ignition.  
**igniter** Pyrotechnic (rocket) or high-energy discharge device for starting combustion of solid or liquid fuel.  
**igniter plug** Electric device producing intense flashover for starting combustion of gas-turbine engine. Most common types are surface discharge, shunted surface discharge, and air-gap.  
**ignition delay time** Several definitions for elapsed period between ignition signal and stable or other desired combustion in piston engine, solid rocket etc. For solid motors, the elapsed time from ignition firing voltage to chamber pressure reaching 10% of maximum value, symbol  $t_d$ .  
**ignition harness** Complete screened assembly of h.t. cables serving spark plugs of piston engine.  
**ignition interference** Disturbance to radio communication caused by faulty ignition screening.  
**ignition loop** Plot of gas-turbine combustion stability on axes air/fuel ratio and air mass flow.  
**ignition screening** Surrounding layer of conductive braid to prevent signal emission from h.t. harness.  
**ignition servo unit** Automatically controls ignition timing.  
**IGO** 1 Prefix, US piston engine, direct injection, geared, opposed.  
   2 Inter-governmental organization[s].  
**IGOR** Intercept ground optical recorder; long-focal-length tele-camera.  
**IGOS** Integrated Global Observing Strategy, or System (Int.).  
**IGPM** Imperial gallons per minute.  
**IGS** 1 Internal gun system.  
   2 Instrument guidance system.  
**IGSO** IGO plus supercharged.  
**IGT** Industrial gas turbine.  
**IGTI** International Gas Turbine Institute [ASME, office, Atlanta, GA 30328] (Int.).  
**Ig2** Screen-grid current.  
**IGV** Inlet guide vane[s].  
**IGW** Increased gross weight.  
**IGY** International Geophysical Year [1957–58].  
**IH** Inhibition height (GPWS).  
**I<sub>h</sub>** 1 Mean horizontal candlepower.  
   2 Heater current.  
**IH** Aviation Historical Association (Finland).  
**IHADSS** Integrated helmet and display sight[ing] system.  
**I-Hards** Improved high-altitude radiation-detection system.  
**IHAS** 1 Integrated helicopter attack, or avionics, system.  
   2 Integrated hazard-awareness, or avoidance, system.  
**IHC** 1 Integrated hand control.  
   2 Industry Harmonization Conference [rule making].

<b>IHDSS</b>	Integrated helmet display and sight[ing] system.
<b>IHTDV</b>	Intensified high-definition TV.
<b>IHE</b>	Insensitive, or improved, high explosive.
<b>IHEC</b>	Integrated helicopter emissions control.
<b>IHEWS</b>	Integrated helicopter EW suite.
<b>IHFA</b>	International Helicopter Firefighters Association (office in US).
<b>IHIRSS</b>	Improved hover IR suppression system.
<b>IHM</b>	International Helicopter Museum [Weston-super-Mare, BS22 8PP] (UK/Int.).
<b>IHMD</b>	Integrated helmet-mounted display.
<b>IHO</b>	International Hydrographic Organization.
<b>IHOC</b>	International Helicopter Operations Committee.
<b>i.h.p.</b>	Indicated horsepower.
<b>IHPA</b>	Irish Hang-gliding and Paragliding Association.
<b>IHPRPT</b>	Integrated high-payoff rocket-propulsion technology.
<b>IHPTE</b>	Integrated high-performance turbine-engine technology, principally focused on propulsion of super-sonic-cruise aircraft: takes off with maximum BPR, meeting civil noise legislation with simple nozzle, accelerates with BPR $\leq 1$ , cruises with BPR near 3, lands at high BPR (GE/USAF/Darpa).
<b>IHST</b>	International Helicopter Safety Team.
<b>IHTTET</b>	Improved high-temperature turbine-engine technology (DoD).
<b>IHTU</b>	Inter-Service Hovercraft Trials Unit (UK, from 1962).
<b>IHU</b>	Integrated helmet unit.
<b>IHUMS, I-Hums</b>	Integrated health and usage monitoring system
<b>IHV</b>	Improved high-velocity [ammunition].
<b>II</b>	Image intensifier.
<b>IIAE</b>	Instituto de Investigaciones Aeronauticas y Espaciales (Argentina).
<b>IIASA</b>	International Institute for Applied Systems Analysis.
<b>IIC</b>	Image isocon camera.
<b>IID</b>	Integrated instrument display [S adds system].
<b>IIDS</b>	1 Istituto Italiano di Diritto Spaziale. 2 Integrated instrument display system.
<b>IIE</b>	Institution of Incorporated Engineers (UK).
<b>IIF</b>	Inserted in flight (data, target, destination etc).
<b>IIMS</b>	Initial implementation of Mode-S [ES adds enhanced surveillance].
<b>IIN</b>	1 Istituto Italiano di Navigazione. 2 Information infrastructure network (RAF).
<b>IIP</b>	Instrument, or instrumentation, incubator program (NASA).
<b>IIR</b>	1 Imaging infra-red. 2 Infra-red imaging radar (US). 3 Infinite impulse response (signal processing). 4 Incident [usually involving aircraft damage] investigation report.
<b>IIR</b>	Institute for International Research (US).
<b>IIRA</b>	Integrated inertial reference assembly.
<b>IIRS</b>	1 Instrument inertial reference set. 2 Imagery interpretability rating scale.
<b>IIS</b>	1 Infra-red imaging system. 2 Integrated instrument system.
<b>IISA</b>	Integrated inertial sensor assembly.
<b>IISL</b>	International Institute of Space Law [office, F75015 Paris] (Int.).
<b>IISS</b>	International Institute for Strategic Studies [London WC2R 3DX] (UK).
<b>IIT</b>	Image-intensifier tube.
<b>IITR</b>	Inter/intra team radio.
<b>IIIS</b>	Infra-theatre imagery transmission system.
<b>IIIV</b>	Image-intensified TV.
<b>IIW</b>	Image interpretation workstation, portion of GIES tasked with target location and selection.
<b>IIWD, I<sup>2</sup>WD</b>	Intelligence and Information Warfare Directorate (USA).
<b>IJMS</b>	Interim JTIDS message standard, or structure, or system.
<b>IJPS</b>	Initial Joint Polar System [1998–] (US/Europe).
<b>IK</b>	Club of Aeronautical Engineers (Finland).
<b>IKAT</b>	Interactive keyboard and terminal.
<b>IKBS</b>	Intelligent knowledge-based systems.
<b>IKI</b>	Space research institute (Soviet academy of sciences).
<b>IKPT</b>	Initial key personnel training.
<b>IKSANO</b>	English rendition of Information co-ordination council on air-navigation charges debts (R).
<b>IKW</b>	Intercept and kill weapon.
<b>IL</b>	1 Infantry liaison (aircraft category, USA, 1919–25). 2 Instytut Lotnictwa [aviation institute, PL-02-256 Warsaw] (Poland). 3 Internationale Luftverkehrsliga eV [Munich, G].
<b>ILA</b>	1 International Law Association [office London WC1B 5DR] (Int.). 2 Internationales Luftfahrt-Archiv (G). 3 Image light amplifier. 4 Instrument landing aid.
<b>ILAA</b>	Integrated landing and approach aid.
<b>ILAAS</b>	Integrated low-altitude attack subsystem.
<b>ILAC</b>	Intake-lip acoustic liner.
<b>ILAD</b>	Inner-layer air defence.
<b>ILAF</b>	Identical location of accelerometer and force.
<b>ILAS</b>	Improved limb atmospheric spectrometer.
<b>ILC</b>	1 Integrated laminating centre (or center). 2 Increased-life core (engine).
<b>ILCA</b>	International Legal Committee for Aviation (from 1909, office Paris).
<b>IL-check</b>	C-check plus more detailed inspection, repair and update of systems and furnishing.
<b>ILD</b>	Injection laser diode.
<b>ILEAV</b>	Inherently low-emission airport vehicle.
<b>ILF</b>	In-line filter.
<b>ILFPS</b>	Integrated lift-fan propulsion system.
<b>ILGH</b>	Interessengemeinschaft Luftfahrtgeräte-Handel (G).
<b>ILL</b>	Internationale Luftverkehrsliga.
<b>ILLF</b>	Initial long-lead funding.
<b>illuminance</b>	Intensity of illumination, luminous flux per unit area, symbol E, unit lux, $I_x = \text{lm}/\text{m}^2$ .
<b>illumination</b>	1 Illuminance. 2 Lighting of target by radar or other signals, esp. to make it an emitter for SARH missile.
<b>illuminator</b>	The aircraft in an attacking force charged with aiming a laser precisely at the target.
<b>ILM</b>	1 Independent landing monitor. 2 Intermediate-level maintenance.
<b>ILO</b>	International Labour [Labor] Organization.
<b>ILP</b>	Inventory logistics program[me].
<b>ILS</b>	1 Instrument landing system. 2 Integrated logistic (or logistics) support.

- 3 Integrated [or intelligent] library system.
  - 4 Initial launch services.
  - 5 Integrated, or intelligent, [missile] launch system.
  - 6 Inventory Locator Service (US).
- ILS integrity** Trust which can be placed in correctness of information supplied by ILS (1) facility (ICAO).
- ILSMT** Integrated logistic support management team.
- ILS Point A** On extended runway centreline 4 nm from threshold.
- ILS Point B** On extended runway centreline 1,050 m (3,500 ft) from threshold.
- ILS Point C** Intersection of straight line representing nominal (mean) glideslope and horizontal plane 30 m above threshold.
- ILS Point D** 6 m above centreline, 600 m upwind (ie towards localizer) of threshold.
- ILS reference datum** Point at specified height vertically above intersection of centreline and threshold through which passes straight line representing nominal (mean) glideslope.
- ILS reliability** 1 Facility: probability its signals are within specified tolerances.  
2 Signals: probability signal in space of specified characteristics is available to aircraft.
- ILS-S** Integrated logistics system-supply (USAF).
- ILS(V)** ILS with emergency voice facility.
- ILT** Institute of Logistics and Transport [office London] (UK).
- ILVSI** Instantaneous-lag [or lead] VSI.
- ILWS** International living with a star (NASA).
- IM** 1 Inner marker.  
2 Intermediate maintenance.  
3 Inventory management.  
4 Intra-mural.  
5 Insensitive munition[s].  
6 Instant messaging [satellite].
- IMA** 1 Institut Médical de l'Aviation (Switzerland).  
2 Intermediate maintenance activity.  
3 Individual mobilization augmentee.  
4 Integrated modular avionics, or architecture.  
5 Integrated multifunction apertures.  
6 International Museum of Airlines [Rockville, MD 20849] (US, Int.).
- IMAA** Irish Microlight Aircraft Association.
- IMAAWS** Infantry man-portable anti-armour/assault weapon system.
- IMAC** Integrated microwave amplifier converter.
- Imacs** Integrated manufacturing control systems.
- IMAD** Integrated multisensor airborne display (Elint).
- Image** Instrument for the measurement of air-traffic flow using ground environment.
- image convertor** Converts image from invisible to visible wavelengths.
- image degradation** That due to error in sensor operation, processing procedure or other fault by user.
- image intensifier** Any of large family of electron tubes which multiply electron flow due to signal while ignoring noise; hence IIT, \*\* tube.
- image-motion compensation** Synchronization of target image with recording sensor in vehicle, esp. low-level reconnaissance aircraft.
- imagery** Representation of objects reproduced by optical or electronic means.

- imagery collateral** Reference materials supporting imagery interpretation function (ASCC).
- imagery correlation** Mutual relationship between different signatures on imagery of same object from different sensors.
- imagery data-recording** Auto record of sensor speed, height, tilt, geographical position, time and possibly other parameters onto sensor matrix block at moment of imagery acquisition (ASCC).
- imagery exploitation** Entire process from acquiring imagery to final dissemination of information.
- imagery interpretation** Process of location, recognition, identification and description of objects visible on imagery (DoD, NATO).
- imagery intelligence** Conveyed by photographs, diagrams, electronic images and other media.
- imagery interpretation key** Diagrams, examples, charts, tables etc, which aid interpreters in rapid identification of objects.
- imagery pack** Assembly of all records from different sensors covering common target area (ASCC).
- imagery sortie** One flight by one aircraft for acquiring imagery (DoD, NATO, Cento).
- IMAS** Integrated mission-avionics system.
- I<sub>max</sub>** Peak value of current.
- IMBP** State institute of biomedical problems (R).
- IMC** 1 Instrument meteorological conditions (UK, see *IWR*).  
2 Image movement compensator (reconnaissance).  
3 Intermetallic-matrix composite.  
4 Indirect maintenance cost.  
5 See *InstMC*.
- IMCC** 1 Integrated mesoscopic cooler circuit.  
2 International Military Control Commission.
- IMCPU** Improved master-controlling processor unit.
- IMD** 1 Indian Meteorological Department.  
2 Integrated mechanical diagnostics.
- IMDS** Integrated maintenance data system[s] (USAF).
- IMDT** Immediate.
- IME** 1 Indirect manufacturing expense.  
2 Integrated modelling environment.
- IMEA** Integrated munitions effects assessment, tool for selecting aim points.
- IMechE** Institution of Mechanical Engineers [1847–; office, London SW1H 9JJ] (UK).
- IMEP** International materiel evaluation program (US).
- i.m.e.p.** Indicated mean effective pressure.
- IMET** International Military Education and Training (NATO).
- Imets** Integrated meteorological system.
- IMEWS** Integrated missile early-warning system, or satellite.
- IMF** 1 International Monetary Fund (UN agency).  
2 International Metalworkers Federation (trade union, office Geneva).
- IMFCA** Institut de Mécanique des Fluides et Constructions Aérospatiales (Romania).
- IMFF** Inlet mass flow function.
- IMFIS, Imfis** Interoperability of military forces and information systems (Canada).
- IMG** 1 Immigration.  
2 Implementation management group.
- IMI** 1 Intermediate maintenance instruction.  
2 Improved manned interceptor.

- 3** Initial maintenance interval, or inspection.  
**4** Interactive multimedia instruction.  
**5** Imbedded [=embedded] message identifier.
- Imint** Imagery intelligence.
- IMIS** Integrated maintenance information system.
- IMK** Increased maneuverability kit (US).
- IML** *1* International micro-gravity laboratory (Spacelab).  
*2* Inner mould line.
- IMLS** Interim MLS.
- IMM** *1* Intelligent menu-management.  
*2* Interacting multiple model.  
*3* Ignition-mitigation means [fuel-tank explosion].  
*4* Integrated marketing management.
- IMMC** Integrated mission-management computer.
- Immed** Immediate.
- immediate air support** That meeting specific request during battle and which cannot be planned in advance.
- immediate award** Decoration awarded without the usual assessment process.
- Immelmann** Air-combat manoeuvre. Two definitions current: (a) first half of loop followed by half-roll, resulting in 180° change of heading and gain in height; (b) steep climbing turn to bring guns to bear on target again following dive attack from front or rear.
- immersed pump** Booster pump.
- IMN** *1* Indicated Mach number.  
*2* Induced matrix norm.
- IMO** *1* International Maritime Organization.  
*2* International Meteorological Organization (1872–).
- I<sub>mo</sub>** Motor specific impulse (solid propellant).
- IMOK** I am OK.
- IMP** *1* Interactive microprogrammable.  
*2* Indication of microwave propagation (anaprop) to exploit gaps in hostile radars and assess friendly radars in defence.  
*3* Incremental modernization program [simulators].  
*4* Inter-modulation product.  
*5* Interplanetary monitoring platform.  
*6* Integrated missile panel.
- Impact** Integrated multistatic passive/active concept testbed (sonobuoys).
- impact area** Area having designated boundaries within which all ordnance is to hit ground.
- impact microphone** Sensitive to small vibrations, as of micrometeoroid impact.
- impact point** *1* Point on drop zone where first parachutist or air-dropped cargo should land (NATO, IADB).  
*2* Point at which projectile, bomb or re-entry vehicle impacts or is expected to impact (DoD).  
*3* Reference point of accident from which all surveys are plotted, easily identifiable and either central or having highest density of contamination (USAF); this need not be actual point of impact.
- impact pressure** See *stagnation pressure*.
- impact tests** Charpy, Izod and similar tests to measure resistance of material to suddenly imposed stress.
- Impatt** Impact-ionisation avalanche transit time (solid-state oscillator).
- IMPD** Interactive multipurpose display.
- IMPDS** Improved missile point-defence system.
- impedance** Resistance to a.c. (1), symbol  $Z = \sqrt{R^2 + X^2}$  where R is ohmic resistance and X is reactance.
- impeller** Single-stage radial-flow compressor rotor.
- Imperial** System of units previously standardized in UK, such as foot (ft) and pound (lb).
- Imperial gallon** See *gallon*.
- impervious canopy** One through which ejection is prohibited.
- impingement** Impact of high-velocity air or gas on structure (eg in reverse-thrust mode).
- impingement cooling** Cooling of material by high-velocity air jets directed on to surface (usually internal surface of hollow blade or vane).
- impingement injector** Liquid fuel and oxidant jets impact on each other to cause swift breakup and mixing.
- implosion** Detonation of spherical array of inward-facing shaped charges (eg to crush fissile core of nuclear weapon).
- IMPR** Improving.
- impress** To commandeer a civil aircraft into government service in time of emergency.
- improved climb T-O** Take-off at increased weight allowed by raising V<sub>2</sub> where second segment is limiting factor and runway distance is available.
- improved conventional munition** Usually means fitted with electronic time fuze or RF proximity fuze.
- IMPS** International Microelectronics and Packaging Society (Int.).
- IMPT** Important.
- impulse** Rocket burn-time multiplied by burn-time average thrust; total energy imparted to vehicle.
- impulse magneto** One whose drive incorporates stops and spring-loaded coupling (bypassed by centrifugal clutch in normal running) to give series of sudden rotations and thus hot sparks during starting.
- impulse/reaction** Common form of gas turbine, combining impulse and reaction techniques.
- impulse starter** Incorporated in impulse magneto.
- impulse turbine** One whose working fluid enters at lowest pressure and maximum velocity, expands through diverging passages, and leaves at similar pressure and low velocity.
- IMR** *1* Imaging microwave radiometer.  
*2* Initial manufacturing release.
- IMRO** Industrial Marketing Research Organization (UK).
- Imron** Range of du Pont polyurethane enamels.
- IMRS** Integrated maintenance recording system.
- IMS** *1* Information management system.  
*2* Integrated management system.  
*3* Intermediate maintenance squadron.  
*4* International Military Services (MoD, UK) or Staff (NATO).  
*5* Integrated multiplex[ing] system, ties nav, weapons, air data and FBW.  
*6* Inertial measurement system.  
*7* Integrated mission system.  
*8* Inventory management system.  
*9* Ion mobility spectroscopy, or spectrometer (explosives/narcotics detection).  
*10* Intelligent munition system.
- I'm safe** One of 35 English-language safety-related mnemonics: illness, medication, stress, alcohol [+ drugs], fatigue, emotional problems.
- IM-6** Structural graphite/epoxy composite material (Hercules).
- IMSS** Integrated multisensor system.

**IMT** 1 International mobile telecommunications.

2 Immediate[ly].

**IMTA** Intensive military training area.

**IMTS** Integrated maintenance training system.

**IMU** Inertial measurement unit.

**IN** 1 Inertial navigator (or navigation).

2 Instrument navigator (arch.).

**in** 1 Inch, inches.

2 When applied to airbrakes, usually means retracted, not in use.

**INA** 1 International Navigation Association Inc. [office, Arlington, VA 22202-0324] (Int.).

2 Initial approach.

**INACP** Integrated navigation-aids control panel.

**inactivate** Of military unit, withdraw all personnel and transfer to inactive list.

**InAF** Indian Air Force [UK usage].

**INAS** Integrated, or inertial, navigation/attack system.

**InAs** Indium arsenide.

**InAsSb** Indium antimony arsenide.

**INB** Iron-neodymium-boron magnetic alloy.

**INBD, inbd** 1 Inbound.

2 Inboard.

**inboard aileron** Aileron situated on inner wing between, or in place of, flaps.

**inboard profile** Side-elevation drawing showing internal systems and equipment, sometimes as true section along centreline.

**inboard quadrant** Inner selectable position of power (throttle) lever on left side of cockpit giving operative afterburner.

**inbound** Approaching destination, thus \* traffic, \* controller etc.

**inbound bearing** Normally QDM, not QDR or VOR radial.

**INC** 1 Insertable nuclear component.

2 Interchangeability code.

3 In cloud.

4 Increase, increasing.

5 Information network computing.

**Inc** Incorporated (US company).

**Inca** 1 Intelligent correlation agent (data fusion).

2 Integrated nuclear communications assessment.

3 Initiative en combustion avancée, future engines (F).

**Incans** Interference cancellation system.

**Incas** Integrated navigation and collision-avoidance system.

**INCD** Integrated navigation cockpit display.

**incendiary bomb** Bomb designed to ignite enemy infrastructures.

**inceptor** Cockpit control forming interface between pilot and major change in trajectory, eg stick/yoke, throttle, pedal, cyclic, collective or nozzle angle lever.

**Incerfa, INCERFA** Code: phase of uncertainty (ICAO).

**inch** 1 To command powered actuator in rapid succession of small cycles to achieve target condition.

2 Non-SI unit of length, = 25.4 mm exactly.

**inches** Traditional US measure of piston engine manifold pressure, = \* Hg (mercury), see next.

**In Hg** Non-SI unit of pressure, = (at 0°C]  $3.38639 \times 10^{-3}$  Nm<sup>-2</sup>.

**incidence** 1 Angle between chord of wing at centreline and OX axis.

2 Generally, the angular setting of any aerofoil or other plate-like surface to a reference axis.

3 Widely and incorrectly used to mean angle of attack.

**incidence instability** Divergent aerofoil load caused by wing flexure simultaneously resulting in increased incidence.

**incidence wires** Diagonal bracing wires in plane of biplane interplane struts.

**incident report** Normal report of incident; this falls short of an accident, takes place on ground or in air during flying operations, and usually stems from human error.

**incl** Inconclusive, include[d].

**inclination** Angle between isobar and wind or airflow at given point.

**inclined shock** Shockwave generated by body in airflow at Mach number significantly greater than 1, with angle such as to turn flow parallel to surface of body; in air-breathing inlet generated by centrebody or sharp-edged plate and focused on lip.

**inclinometer** Instrument for measuring inclination; many forms, one being spirit level on pivoted arm [end of arm shows degrees on protractor while slight curvature of sliding spirit level gives minutes]. Some authorities call this a *clinometer*, which see.

**included angle** That between longitudinal axis of body and free-stream vector.

**incoherent backscattering** Random backscatter of a signal by individual electrons in the ionosphere.

**Incomap** Family of mechanically alloyed Al alloys, esp. Al-Mg-Li-C-O.

**Inconel** High-nickel chromium-iron refractory alloys (Int. Nickel and Mond).

**Incos** Integrated control system [Hartman ASW].

**Incose** International Council on Systems Engineering (Int.).

**Incospar** Indian National Committe for Space Research.

**Incr** Increase.

**incremental airbrakes** Capable of being controlled to intermediate positions.

**incremental ejection** Dispensing chaff in discrete bundles.

**incremental sensitivity** Change in received signal per unit displacement of ILS receiver from mean glideslope.

**INCRSG** Increasing.

**incumbent** Airline long established in the market [cf. entrant].

**incursion** 1 Conflict, especially between two aircraft, on runway or elsewhere on airfield [FAA adds ‘with active control tower’].

2 Any entry by aircraft into forbidden area, either on ground or in flight.

**Ind** Indicator (for wind or landing direction).

**INDAE** Instituto Nacional de Derecho Aeronautica y Espacial (Argentina).

**indefinite callsign** C/s assigned to individual units/facilities etc and to large groupings.

**INDEFLY** Indefinitely.

**independence** One meaning is Busemann’s principle that aerodynamic forces on a wing of high aspect ratio are independent of any V component in the spanwise direction.

**independent** 1 Military unit with complete authority over tasking [e.g. UK \* Air Force 1918].

**2 R&D** or programme not relying on external funding.  
**3** Airline run by private company.

**independent overspeed protection** Gas-turbine engine subsystem independent of the EEC or other control which automatically shuts the engine down upon sensing rotor overspeed.

**indexed wing/fins** Aerodynamic surfaces are at same angular setting to [usually missile] body, measured in transverse plane, eg all at 45° to horizontal or two vertical and two horizontal.

**index error** That caused by misalignment of measurement mechanism of instrument (ASCC).

**Indian** Hostile aircraft, esp. fighter.

**indicated airspeed** See *airspeed*.

**indicated altitude** That shown by altimeter set to latest known QNH.

**indicated course** Locus of points in any horizontal plane at which ILS Loc needle is centred.

**indicated course sector** Sector in any horizontal plane between loci of points at which ILS Loc needle is at FSD left or right.

**indicated glidepath** Locus of points in vertical plane through runway centreline at which G/S needle is centred.

**indicated hold** Autopilot mode maintaining present IAS.

**indicated horsepower** Theoretical power developed by a reciprocating engine, ignoring losses due to friction, windage and other causes, numerically proportional to  $P_{\text{PLAN}} = \frac{P}{L} \cdot A \cdot N$  where P is the brake mean effective pressure, L is the piston stroke, A total piston area and N the rotational speed, all units being compatible. See *horsepower*.

**indicated Mach number** That shown on Machmeter.

**indicator** Identifying 4-letter code for every airfield [in England and Wales beginning EG].

**indicator diagram** Plot of piston engine cylinder pressure against piston position, often drawn by instrument attached to cylinder.

**indirect air support** Given friendly land/sea forces by action other than in tactical battle area, eg by interdiction and air superiority.

**indirect cycle** Nuclear propulsion with primary circuit, heat exchanger and secondary circuit.

**indirect damage assessment** Revised target assessment based on new data such as actual weapon yield and ground zero.

**indirect wave** One arriving by indirect path caused by reflection/refraction.

**indium** In, soft silver-white metal, density 7.28, MPt 156.4°C.

**individual controls** Control surfaces not attached to fixed surface but cantilevered from body (guided weapons).

**induced downwash angle** Loosely called induced angle, the downwash angle at any radius of a propeller blade due to lift, one symbol, being  $\epsilon_i$ .

**induced drag** Drag due to component of wing resultant force along line of flight; drag due to lift. For a conventional wing in subsonic flight  $C_{D_i} = C_L^2 / \pi Ae$  where e is an efficiency factor very close to unity.

**induced flow** Fluid flow drawn in and accelerated by a high-velocity jet.

**induced force** Usual aircraft design consideration is that caused by air entering engine inlet.

**induced velocity** That due to wing vortex system and downwash, normally considered proportional to lift.

**inducer** 1 Booster vanes at entry to centrifugal impeller, esp. rocket-engine turbopump.

2 Bleed ejector to induce cooling airflow.

**inductance** Property of electric circuit to resist change in current as result of opposing magnetic linkage; see *self\**, *mutual\**.

**induction** 1 In a piston engine, sucking in air or mixture on downstroke.

2 In the overhaul process [of anything], accepting the item, plus documentation, into the overhaul facility.

**induction compass** Based on induction coil pivoted to rotate in Earth's field.

**induction heating** Heating electrically conductive material by h.f. field.

**induction manifold** Pipe system conveying mixture to piston engine cylinders.

**induction period** Specified delay between adding catalyst or hardener and applying or spraying material (coating, adhesive or thermo-setting structure).

**induction phase** In pulsejet, portion of cycle when air is admitted.

**induction stroke** In piston engine, portion of cycle when air or mixture is admitted.

**induction system** In piston engine, entire flow path from combustion-air inlet to cylinder.

**induction tunnel** Wind tunnel driven by jet engine(s) or compressed air via ejector system.

**inductive coupling** 1 Mechanical shaft drive relying on magnetic linkage.

2 Magnetic coupling between primary and secondary coils, eg of transformer.

**inductive reactance** Impedance due to inductance.

**inelastic collision** Theoretical impact with no deformation or energy loss.

**inert gas** Gas incapable of chemical reaction.

**inertial anti-icer** Free-spinning vanes or other device for imparting rotation to engine airflow, ice or snow being flung out away from engine inlet.

**inertial coupling** See *coupling (1)*.

**inertial flight** No propulsion, controls locked central or free.

**inertial frame** A reference frame subject to Newton's Laws.

**inertial guidance** Guidance by INS.

**inertial gyro** Gyro of characteristics and quality to meet INS requirements.

**inertial navigation system, INS** Assembly of super-accurate gyros to stabilize a gimballed platform on which is mounted a group of super-accurate accelerometers – typically one for each of the three rectilinear axes – to measure all accelerations imparted, which with one automatic time integration gives a continuous readout of velocity, and with a second time integration gives a readout of present position related to that at the start.

**inertial orbit** Trajectory when coasting.

**inertial platform** Rigid frame stabilized by gyro(s) to carry accelerometer(s).

**inertial restraint** Of a structural beam, free at one end but with an attached mass which damps movements.

**inertia starter** Rotary-drive starter whose energy is stored in flywheel.

**inertia welding** Welding by rapid rotation and pressure between mating surfaces.

**inerting** Filling the space above the fuel in a tank with

## **inert round**

inert gas, usually nitrogen [USSR in WW2 used cooled engine exhaust, which contains oxygen].

**inert round** Missile or ammunition partly or entirely dummy, and lacking propulsion.

**INES** IUE newly extracted spectra.

**INET** Inertial navigation equipment tester.

**INEWS, Inews** Integrated electronic-warfare system [or suite].

**INF** 1 Intermediate-range nuclear force(s).

2 Infantry.

**infant mortality** Failure at start of life-cycle.

**Info** Standing Committee for Science and Technology Information (ISO).

**inferior planet** Planet with orbit inside that of Earth.

**infiltration** Manufacturing stage with FRM (fibre-reinforced metal) components in which molten metal is used to fill gaps between compressed metal-coated fibres. **infinite aspect ratio** Many aerofoil calculations ignore effects at the ends (tips) and accordingly are true only for a wing of infinite aspect ratio (ie, it goes on forever or touches both walls of tunnel).

**infinity** Symbol  $\infty$ , used as subscript to denote free-stream values.

**Infis** Inertial-navigation flight inspection system.

**inflatable aircraft** One whose airframe is of flexible fabric, stabilized by internal gas pressure. Term usually applied to aerodynes.

**inflatable de-icer** One whose action is the repeated inflation and deflation of a flexible surface, thus breaking off accreted ice.

**inflation manifold** Links several sources of gas to gas-filled aerostat.

**inflation sleeve** Large thin-wall tube to which inflation manifold is connected.

**inflator** Trolley-mounted powered fan to begin inflation of hot-air balloon.

**inflection** Point at which curve reverses direction.

**in-flight advisory** Sigmet/airmet broadcast to enroute pilots notifying conditions not anticipated at preflight briefing.

**in-flight weight** Maximum authorized weight after in-flight refuelling, can exceed MTOW.

**inflow** 1 The component of velocity through a helicopter main rotor normal to the tip-path plane.

2 There are two more [rare and confusing] meanings: increase in relative speed as air is sucked into a propeller; and inwards radial velocity as air is sucked into a propeller.

**inflow ratio** Ratio of rotorcraft TAS and peripheral velocity  $r\omega$  at tips of blades.

**influence line** Graphical plot of shear, bending moment and other variables as point load moves along structure.

**Info** Information frame.

**informatics** Word gaining some ground in English from transliteration “informatique” (F) = EDP (1).

**information dominance** Being quicker than the enemy in assessing combat situation and launching weapons.

**information operations** Central method of waging war, including EW, psyops, comint and defence against cyber attack.

**information pulses** Those repeated parts of the transmission in SSR or IFF that convey information (eg identity, flight level).

## **initial attack**

**information technology management** The ground-based portion of an ADMS.

**Infosec** Information security.

**Infowar** Information warfare.

**Infraero** Airports authority (Brazil).

**infra-red, IR** Portion of EM spectrum with wavelength longer than deep red light, thus not visible, but sensed as heat. Near \* wavelengths  $0.75\text{--}1.5\mu$ , intermediate \*  $1.5\text{--}20\mu$ , far \*  $20\text{--}1,000\mu$ .

**infrasound** Sound, especially at very high power, at very low frequency [ $<c 20\text{ Hz}$ ] and very large amplitude.

**infrastructure** Fixed installations needed for activity (eg airfield, hangars, control tower, communications, fuel pipelines).

**infrastructure authority** Those responsible for airfields, communications, radar and other ground installations.

**infringement** Violation of air traffic control or other rules regarding operation of aircraft.

**ingestion** Swallowing of foreign matter by engine (usually gas-turbine engine), including birds, ice, snow/slush/water, sand, rocket gas, catapult steam and metal parts; hence \* test, \* certification.

**ingress** To re-enter spacecraft after EVA, including expeditions on lunar or planetary surface.

**ingress route** Attack aircraft track from base to initial point.

**in ground effect** With a [notional] impervious flat horizontal surface immediately underneath a hovering aerodyne.

**inherent stability** In-flight stability achieved by basic shape of aircraft.

**in Hg** Inches of mercury, non-SI unit of pressure =  $3,386.39\text{ Nm}^2$ .

**inhibiting** 1 To spray interior of machine or other item with anti-corrosion material before storage.

2 To coat inner surfaces of rocket solid-propellant grain to prohibit burning over treated areas.

3 The worst case in flight performance situations, eg instrument flight, failed engine and other adversities.

**inhibitor** 1 Additive to fuel or other liquid, eg Methyl Cellosolve (often +0.4% glycerine) to protect against ice and against formation of gumming residues, corrosion or fuel oxidation.

2 Refractory inert coating to control burning of solid grain.

3 Anti-corrosion oil for long-term storage.

**INI** Instituto Nacional de Industria (Spain).

**INIT, Init** Initialization or initial.

**initial altitude** Altitude(s) prescribed for IA (1) segment (FAA).

**initial approach** 1 Segment of standard instrument arrival or STAR between IA (1) fix and intermediate fix or point where aircraft established on intermediate approach course (FAA).

2 Portion of flight immediately before arrival over destination airfield or over reporting point from which final approach is commenced (Seato, IADB).

**initial-approach area** See *initial area*.

**initial area** Ground area of defined width between last preceding fix or DR position and either intersection of ILS, facility to be used in instrument approach or other point marking end of IA (1).

**initial attack** Tanker effort to contain a fire until ground firefighters can reach it (USFS).

## initial contact frequency

**initial contact frequency** That used for ATC communication as aircraft enters new sector of controlled airspace.

**initial defensive operations** The initial deployment of an ABM system (MDA/White House).

**initial heading** That at start of rating period while using astro-gyro control (ASCC).

**initial mass** 1 That of rocket or rocket vehicle at launch.

2 That of fissile or other nuclear material before reaction.

**initial operational capability** Time at which particular hardware (eg weapon system) can first be employed effectively by trained and supported troops (USAF). Particular parts of the system may still be lacking.

**initial point** 1 Well defined fixed surface feature usable visually and/or electronically as starting point for attack on surface target (most existing definitions state 'starting point for bomb run').

2 Similar surface point where aircraft make final correction of course to pass over drop zone or other surface target.

3 Air-control point near landing zone from which helicopters are directed to landing sites.

4 First point at which moving target is located on plotting board or display system.

**initial radiation** That emitted from fireball within 60 s of nuclear burst, mainly neutrons and gamma rays.

**initial surface** That at start of solid-rocket burn; its area.

**initial surface/throat area** Fundamental non-dimensional characteristic of solid motor.

**initial throat area** Cross-section area of unused solid-motor throat.

**initial-value problem** One which, from given state, determines state of dynamic system at any future time.

**initiation** 1 Starting sequences leading to nuclear explosion.

2 Birth of new inbound track on air-defence system.

**initiation phase** In autoland, 10 nm from threshold, 2,500 ft (usually 205 kt, 15° flap).

**initiator** 1 Person assigned to initiate tracks in air-defence system.

2 Starts automated sequence in modern crew ejection.

**INL/A** International Narcotics and Law Enforcement Affairs, office of Aviation (Int.).

**INJ** Injection.

**injection** Insertion of satellite into orbit, or spacecraft on to desired trajectory.

**injection carburettor** One delivering metred flow to nozzle in induction system, usually without venturi and with insensitivity to flight attitude.

**injection flow** Primary flow in ejector pump or induced augmenter.

**injection point** That at which satellite enters orbit.

**injection pressure** Pressure in system between turbopump and injector.

**injection pump** 1 Ejector.

2 Injection carburettor.

3 More usually, multi-plunger pump in direct-injection engine.

**injection velocity** That at injection point.

**injector** Point at which one or both propellants in liquid rocket enters chamber (usually many are used, distributed around chamber).

**ink** Verb, to sign a formal contract (US, colloq.).

**INL/A** International Narcotics and Law Enforcement Affairs, office of Aviation (Int.).

**inlet** Usually air intake at upstream end of air-breathing system.

**inlet blocker** Fixed or movable screen inside inlet duct[s] to engine[s] of combat aircraft to prevent hostile radar seeing front of engine.

**inlet distortion** 1 Departure from ideal airflow through inlet, esp. in yawed or turbulent conditions.

2 Plot of flow velocities across plane normal to axis of air-breathing engine, eg at entry to fan, entry to combustor or entry to turbine.

**inlet duct** Air passage linking inlet (intake) to engine.

**inlet guide vane** Fixed or variable-incidence stators preceding compressor rotor or turbine.

**inlet mass flow function** Corrected value for airflow through a gas-turbine engine,  $W\sqrt{T/P}$ .

**inlet particle separator** Dynamic (usually centrifugal) device that removes solid particles from airflow entering engine.

**inlet unstart** Sudden gross disruption of airflow through supersonic engine inlet causing near-total loss of thrust; hard-to-cure hazard at Mach 3 and above (see *unstart*).

**inline engine** 1 Piston engine with all cylinders in single linear row; loosely (probably incorrectly) applied to engines with two or more rows such as the vee or opposed configurations.

2 Turbojet and ramjet mounted in tandem, sharing same airflow (usually with variable-geometry ducting).

**INM** Integrated noise model; rv adds research version.

**Inmarsat** International Maritime Satellite Organization [office, London EC1Y].

**INMG** Instituto Nacional de Meteo e Geofisica (Portugal).

**InN** Indium nitride.

**inner** Applied to aeroplane, = closer to centreline.

**inner horizontal surface** Specified portion of local horizontal plane located above airfield and immediate surroundings.

**inner loop** Control loop via pilot, not autopilot.

**inner marker** ILS marker rarely installed near threshold, 3,000 Hz dots and white panel light.

**inner mould line** Low-cost technique for composite-structure tooling.

**inner planets** Four nearest Sun: Mercury, Venus, Earth, Mars.

**inner space** Within Solar System.

**inner wing** 1 Loosely, inboard part.

2 That on the inside of a turn, usually with reduced airspeed.

**innovative controls** Many forms, e.g. replacing rudder and ailerons by rotating wingtips or slot/spoilers.

**INO** Indian Ocean region (ICAO).

**IN100** HPT material, high-Ni alloy, 1975.

**INOP, Inop** Inoperative.

**inoperative** Deliberately taken out of use (thus not a failed engine or other device).

**I-NOSC** Integrated network operations and security center (USAF).

**INP** If not possible.

**InP** Indium phosphide, semiconductor.

**INPE** Instituto de Pesquisas Espaciais [space research, São José dos Campos] (Brazil).

**inph** Interphone.

**in-phase** Occurring at the same point in each of a series of phugoids or other SHM or repeated cycles, but caused by external stimulus.

**in-plane bleeder** Sustained max-rate turn without change of height.

**inplant** Done within factory instead of subcontracted, or relative to the factory (thus \* facilities, \* modification).

**INPR** In progress.

**input** 1 Point at which signal, data, energy or material enters system.

2 Signal, data, energy or material entering system.

**input axis** Axis normal to gyro spin axis about which rotation of base causes maximum output.

**INREQ** Request for information.

**INRIA** Institution Nationale de Recherches d'Informatique et Automation (F).

**INS** 1 Inertial navigation system.

2 Ion neutralization spectroscopy.

3 Immigration and Naturalization Services; PASS adds passenger accelerated service system (US).

4 Information network system.

**ins** Confusingly, inches.

**Insacs** Interstate airway communication station (US).

**In-Sap, IN-SAP** Intelligence special-access program.

**InSb** Indium antimonide, IR detector  $3\text{--}5\mu$ .

**INSC** Instrument comprehension.

**insensitive munition** One impossible to detonate except by its own triggering system.

**insert** 1 Small D-section body fixed inside propelling nozzle to trim area.

2 To place spacecraft in desired trajectory.

3 To convey friendly force (usually small and covert) to point on ground deep in enemy territory, usually by helicopter; hence insertion.

**inserted blades** Not forming an integral [monolithic] part of the disc.

**inset balance** Mass located within movable surface.

**inset hinge** On conventional control surface one whose axis is to rear of leading edge.

**inset light** One flush with airport pavement.

**INSI** Inertial navigation system interface.

**inside wing** That pointing towards centre of a turn.

**insolation** Solar radiation received, usually at Earth or by spacecraft.

**INSP** Inspection.

**inspectability** Unquantifiable measure of extent to which fault, esp. structural, may escape notice of inspectors because of inaccessibility or any other reason.

**inspect and repair as necessary** Not to pre-ordained schedule.

**inspection** Search of hardware for evidence of existing or impending fault condition.

**inspection record** Meticulous written account of every technical event, including e.g. record of each stall or other possibly significant manoeuvre.

**inspin yaw** Yawing moment holding or accelerating aircraft into spin.

**INST, inst** Instrument.

**instability** 1 Structural condition in which strut, web or other member buckles under compressive load.

2 Aerodynamic condition in which slightest disturbance triggers gross disruption or flight of body.

3 Meteorological, normal meaning.

**installation envelope** Overall three-view dimensioned outline drawings.

**instantaneous readout** System with zero lag between sensor and display.

**instantaneous VSI** One giving instantaneous readout, with accelerometer air pumps to counteract lag. Also called instant-lead.

**Inst. E** The Institute of Electronics (UK).

**INSTL** Installed, installation.

**InstMC** Institute of Measurement and Control (UK, 1944-).

**INSTR** Instruction.

**instruction to proceed** Informal document accepted as guaranteeing payment in advance of contract.

**instructor** In pilot training, pilot qualified and appointed to teach pupils.

**instrument approach** Made under non-visual guidance, normally from aids on the ground.

**instrument approach area** Volume of sky in which non-visual landing aid operates.

**instrument approach runway** One providing non-visual directional guidance for straight-in approach.

**instrument error** Difference between indicated and true value.

**instrument flight** Using instruments in place of external cues.

**instrument flight rules, IFR** Rules applied in cloud or whenever external cues are below VFR minima which prohibit non-IFR pilots/aircraft.

**instrument landing** Ambiguous but usually IMC landing without ground aids (thus, non-ILS).

**instrument landing system, ILS** Standard ground aid to landing comprising two radio guidance beams (localizer for direction in horizontal plane and glideslope for vertical plane with usual inclination 3°) and two markers for linear guidance. See headings beginning *glidepath*, and *categories*.

**instrument meteorological conditions** Conditions less than minima for VFR.

**instrument monitor** Various meanings from traditional flight-test panel camera(s) to automatic systems for notifying faults, ensuring majority vote or isolating failed instrument (rare).

**instrument rating** Endorsement to pilot's licence allowing flight in IMC.

**instrument runway** Instrument-approach or precision-approach runway.

**insulators** Poor conductors of electricity, heat, noise or other forms of energy.

**Int** 1 Intersection (FAA).

2 Intercom.

**Inta** Instituto Nacional de Tecnica Aeroespacial Esteban Terradas (Spain).

**intake** 1 Air inlet to propulsion or internal system.

2 Narrow-chord leading member of upper flap in CCW augmentor wing, upstream of shroud and separated by a slot.

**intake duct** See *inlet duct*.

**intake heater** Heat exchanger inserted to prevent icing in piston-engine inlet system.

**intake stroke** See *induction stroke*.

**intcp** Intercept[or] or intercept.

**integral construction** Made from single slab of metal by

## integral stator

machining and/or etching, or by forging and machining, to finished shape.

**integral stator** Fabricating a section [typically containing six to eight vanes] of the turbine HP stator ring as a monolithic extension of a flame tube.

**integral tank** Tank formed by coating aircraft structure with sealant.

**integrated acoustic structure** Noise-absorbent structures forming load-bearing part of main structure.

**integrated aeroplane** One in which single shape (eg Gothic delta with no separate fuselage) serves all functions, with no demarcation between parts.

**integrated cargo carrier** Unpressurized payload carrier fitting cargo bay of Shuttle.

**integrated circuit** Microelectronic device fabricated by successive etching, doping etc of single-crystal (usually silicon) substrate.

**integrated communications control** Switches audio paths, controls and displays 40 channels of NVM, formats synthesized alerts and provides for antenna selection and Bite.

**integrated decision support tool** Used in CDM to bring critical National Airspace System status and traffic management data together, graphics offering what-if capability.

**integrated drive generator** Electric generator (alternator) made as one unit with CSD to give constant-frequency output.

**integrated dynamic system** Combination of helicopter rotor hub, main transmission, swash plates, control system and hydraulic servos into single unit (MBB).

**integrated electronic standby instrument** Solid-state replacement for pneumatic airspeed, altitude and horizon.

**integrated flight system** Computer-linked FCS and panel displays which to a large degree relieve pilot of need to exercise judgement [arguable definition].

**integrated flight test** Current [1990–2020] meaning is to demonstrate identification and tracking of ICBM targets in space.

**integrated flight training** One meaning is ab initio use of flight instruments.

**integrated instrumentation display** Combines engine, transmission, accessory systems, rotor track/balance and vibration monitoring plus caution/warning.

**Integrated Modular Avionics** In the early years of the new Century IMA is the latest stage reached in avionics packaging. LRUs are replaced by uniform narrow modules in an integrated pack, sharing common power supplies. First used in the Lockheed Martin F-22, IMA saves space and power [and thus heat generation], and makes possible greater redundancy [e.g., in computer power].

**integrated power unit** APU plus IDG.

**integrated sensor suite** Usually means EO/IR.

**integrated servoactuator** Flight-control power unit with integral failure-correction and only electric [or other] valve inputs, devoid of mechanical input from pilot.

**integrated spar inspection system** Pressurizing the interior of a helicopter main-rotor blade so that leakage reveals the presence of a crack.

**integrated surveillance system** TCAS, TAWS and weather radar with PWTD.

**integrating accelerometer** Accelerometer whose output

## interconnectors

signal is first or second-order integration with respect to time (viz velocity or position).

**integrating circuit** Electronic circuit whose function is to integrate (mathematically) one variable with respect to another (usually time).

**integrating flowmeter** Shows not only rate of flow of fuel, or other consumable, but also quantity [mass] consumed, or remaining.

**integration** Assembly of stages, boosters and payloads of spacecraft (post-\* normally means after mating of payloads).

**integrator** 1 Device, usually digital, for giving numerical approximation to integration (mathematical).

2 Mechanical latch for devices such as an escape slide or brake chute enabling ground engineers to open up for routine maintenance.

**integrity** Validity of structure or system, functioning in design role after suffering damage; usually, but not always, a mechanical quality associated with avoiding mechanical breakup. Loosely, resistance to failure.

**integrity beacon landing system** Combines DGPS with ground-based pseudolites to give accuracy  $\pm 10$  cm (ESTOL).

**intelligent missile** Vague popular concept normally taken to mean self-homing.

**Intelsat** International Telecommunications Satellite Organization.

**intensive flying** Purpose is to log flight hours on new equipment at maximum rate under operational conditions.

**intensive student area** Regions of US airspace where IFR flight is restricted.

**Inter** Intermittent, also *INTMT*.

**interaction parameter** Basic measure of relative dominance of fluid motion or magnetic field in MHD and plasma physics.

**interactive computer** One capable of progressive dialogue with human operator, via displays and lightpen or other method.

**intercalation** Insertion of chemical compounds in plasma layers between planes of base material such as graphite to enhance electrical conductivity.

**intercase** *Intermediate case*.

**interception** 1 Flight manoeuvre to effect closure upon another aircraft or spacecraft.

2 To capture and hold desired flight condition (eg, VOR radial or ILS).

**interceptor** 1 Aircraft or spacecraft designed to intercept, and if necessary destroy, others.

2 Small hinged strip to block local airflow, esp. between slat and wing or immediately to rear of slat, operated on one wing only by applying aileron.

**intercept point** Computed location in space towards which vehicle (eg interceptor aircraft or spacecraft) is vectored.

**interchanger** Variable gearbox in one axis of powered flight-control system.

**intercom** Communication system within aircraft using crew headsets or loudspeakers but without any radio emission.

**interconnectors** Tubes conveying flame from each gas-turbine combustor primary zone to neighbour [in US called flame tube, which has different meaning in UK].

**intercontinental ballistic missile** Land-based, range over 5,500 nm (6,325 miles) (USAF).

**intercooler** Radiator for rejecting excess heat in enclosed fluid system., e.g. downstream of piston-engine supercharger

**intercostal** Short longitudinal structural member (stringer) joining adjacent frames or ribs, usually to support access door or equipment.

**inter-cylinder baffle** See *baffle*.

**intercrystalline corrosion** Originating and propagating between crystals of alloy.

**interdiction** See *air interdiction, battlefield air interdiction*.

**interface** Boundary between mating portions of system; can be mechanical (eg inlet duct and engine) or electronic (eg central computer and navigation display).

**interference** 1 Mutual interaction between solid bodies in fluid flow, eg upper and lower biplane wings (see *Prandtl*\*).  
2 Disruption of radio communications by unwanted emission on same wavelength, as from unscreened ignition.

**interference drag** Drag caused by aerodynamic interference.  
**interference factor** Arbitrary drag multiplier, from 1 to 1.5, correcting for location of external bodies in proximity to aircraft [usually to the wing].

**interference fit** Fit between parts where male dimension exceeds female (several exact definitions).

**interference foul** Physical conflict between fixed and moving parts, esp. between control column/wheel/yoke and an obstruction.  
**interference strut** Obstructs cockpit if flight controls locked.

**interferogram** Display or photograph of interferometer patterns for precise measurement or aerodynamic research.

**interferometer** Optical measuring system using divided light beam later rejoined to give phase interference seen as light/dark fringes.

**interferometer array** Aerial (antenna) able to emit or receive simultaneously at large number of accurately related locations.

**interior ballistics** Branch of ballistics concerned with bodies under propulsion.

**interlacing** 1 Scanning technique for raster display in which all odd-number lines are scanned and then all even.

2 IFF technique in which pulse trains of different modes are transmitted sequentially (to achieve enough transponder returns per scan it is rare to interlace more than three modes).

**interline** Between different air carriers, hence interlining.

**intermediate approach** That part of approach from arrival at first navigational facility or pre-determined fix to beginning of final approach.

**intermediate case** 1 Gas-turbine casing; several meanings, eg between two compressor spools or over compressor spool downstream of fan.

2 In a three-shaft engine, the case linking the IP and HP components.

**Intermediate contingency** 1 Turboshaft power rating below emergency (max. contingency) level, usually allowed for 30 [sometimes 60] min.

2 Of afterburning turbofan or turbojet, usually means maximum cold thrust.

**intermediate frequency** That to which signal is shifted between its reception and transmission.

**intermediate gearbox** See *step-aside gearbox*.

**intermediate maintenance** At least six meanings, the most common being maintenance performed on a military user airbase in a specialized workshop.

**intermediate-pressure** Compressor/turbine spool between LP and HP in three-shaft engine, abb. IP.

**intermediate range** Traditional figure for ballistic missiles is 1,500 nm, about 1,727 miles, 2,780 km (originally USAF).

**intermediate rating** Intermediate contingency.

**intermediate shop** Flightline fault-isolating system, esp. for avionics, synthesising all forms of EM signal for HUD, radar, etc.

**intermetallics** Compounds or alloys in which atoms of two or more metals are arranged in complex structures in fixed ratios. Some are semiconductors, but immediate work is concentrated on aluminides of refractory metals.

**intermittent duct** Resonant air-breathing engine; also known as intermittent jet, but more common term is pulsejet.

**intermodal** Capable of use by more than one form of transport, ideally by air, rail and truck.

**internal air system** All airflows and pressure differences having no direct effect on engine thrust or power.

**internal balance** By control-surface area ahead of hinge [called the shelf] fitting in vented chamber in fixed structure. See *compound shelf*.

**internal burning** Solid propellant rocket grain whose exposed surface is along centreline [e.g., star centred].

**internal combustion** Originally described prime mover whose fuel was burned in the cylinder, unlike steam engine; in gas turbine and nuclear era meaning is blurred.

**internal combustion turbine** Accepted term for gas turbine [UK Government establishments, 1926–46].

**internal efficiency** Rocket thermal efficiency.

**internal engineering notice** Issued by manufacturer, esp. to customers.

**internal fuel** Contained in aircraft or spacecraft, as distinct from fuel in removable or jettisonable tanks.

**internal gearbox** In a two-shaft engine the starter must drive the HP spool, and this normally calls for a bevel gear inside the core. There are usually bevel gears from adjacent ends of the LP and HP shafts from which drive is taken to external gearbox[es].

**internal lip contraction** In an externally mounted turbofan, the ratio  $\frac{r_{hl}}{r_{th}}$ , hilite plane to throat.

**internally blown flap** 1 Usually, large conventional flap through which main propulsion jet(s) or bleed air can be ducted.

2 Rarely, jet flap.

**internal power** Generated in the aircraft (electrical, hydraulic, etc.).

**internals** 1 Items inside cockpit.

2 Frames, longerons and stringers, or spars and ribs.

**internal service** Air route wholly within one country.

**internal starter/generator** Built into centre of engine as part of it.

**internal supercharger** Downstream of carburettor.

**international** As applied to flight, service or route, one passing through airspace of more than one country

## International Accounting Unit

inverse monopulse

(though departure and destination may be in same country).

**International Accounting Unit** Used by NATO and in other multinational infrastructure programmes, originally equal to £ sterling prior to 1967 devaluation.

**international airport** Designated as airport of entry and departure for international traffic, and provided with necessary extra facilities (typically 12).

**international altitude** That shown by ISA-calibrated pressure altimeter set to 1013.25 mb.

**international boost** Piston engine boost control set to ISA.

**International knot** See *knot*.

**International power** The b.h.p. a piston engine is rated to develop at full throttle at International rpm at specified altitude.

**International rpm** Highest crankshaft speed permitted in climbing flight for period exceeding 5 min.

**International Standard Atmosphere, ISA** That agreed by ICAO and still used as common standard; defines pressure (1013.25 mb at MSL, about 29.92 in Hg), temperature (15°C at MSL) and relative density up to tropopause (see *atmosphere*). Hence, Standard Day.

**InterNIC** Internet network information centre.

**inter-ocular** Between eyes.

**interphone** Intercom serving crew stations, service areas and ground-crew jacks (2).

**interplane** Adjective 'between [biplane] wings', hence \* drag, \* interference.

**interplane strut** Joins superimposed [biplane] wings.

**interplanetary** Between planets [assumed, within plane of their orbits].

**interpolation** Process of calculating or approximating values of function between known values.

**interpretation** Extraction of maximum intelligence from reconnaissance imagery.

**interpulse period** PRI.

**interrogate** To transmit IFF, SSR or ATC signal coded to trigger transponders.

**interrogation mode** Any mode in which signals include code to trigger transponder; eg Modes A, B and D for ATC transponders.

**interrogator** Radio transceiver scanning in synchronism with primary radar or SSR requesting replies from all cooperative airborne transponders to reply; replies sent to video displays.

**interrupted Bite** Ground test facility initiated manually via on-board control panel to enhance detection/location capability of C-Bite.

**interrupter gear** Device for enabling rapid-fire gun[s] to fire safely past blades of propeller. In contrast *synchronization* gear matches the two frequencies. In practice the blade passing frequency was much greater than the rate of fire of even two guns, so \* soon became obsolete.

**interscan** Brief time between scans on a timebase.

**Intersect** Strictly, intesect, intelligent sensors for control technologies.

**intersection** 1 Point where centrelines of runways coincide, hence \* departure starts T-O at \*.

2 Point on Earth, and vertical line through this point, where centrelines of airways cross.

**interservices** Linking turbofan core to aircraft, thus \* strut, \* couplings, \* interface.

**Intersputnik** Soviet Bloc comsat system.

**interstage** Space launcher airframe section between stages designed as major assembly housing guidance for other systems but without propulsion.

**inter-tropical front, ITF** The assumed giant front where tradewinds meet N and S of Equator, also called ITCZ; not a normal front.

**inter-turbine burner** Compact combustion system between HP and LP turbines in reheat-cycle engine.

**intervalometer** Mechanical or electronic system controlling spacing of events (eg reconnaissance photographs).

**in the blind** Without external cues, ie no visual reference outside aircraft.

**in the groove** In the desired flight condition, esp. correctly aligned on the approach.

**in the slot** Correctly lined up for landing.

**INTL, intl** International.

**INTMT** Intermittent.

**Into** Intelligence officer.

**into engine** With asymmetric power, towards the operating engine [the other being at flight idle]; thus, when flying on L engine, the application of L aileron or rudder.

**into the mission** Measured from T-O or liftoff at end of countdown, thus 30 s \*\*\*.

**INTPS** Integrated navigation and tactical plotting system.

**INTR** Interior.

**intra-flight data-link** Secure communications between pilots and their sensors.

**intraformation positioning system** Allows aircraft to fly close formation in blind conditions.

**in-trail procedure** To be followed by large jet following another, especially when using ADS-B.

**intramarket** Market for civil air transport in particular geographical region, which can be a single large country.

**intrascopic** See *borescope*.

**intravehicular** Between two spacecraft.

**intrepid birdman** Jokey reference to any pilot.

**INTRG** Interrogated, interrogator.

**introscope** Another name for a *borescope*.

**INTRP** Interrupted, interruption.

**intruder** 1 Aircraft engaged on interdiction, esp. against hostile aircraft and airfields (not necessarily by night).

2 An altitude-reporting aircraft considered to be a potential threat and processed by TCAS threat-detection logic.

**inst** Intensity.

**INTXN, intxn** Intersection.

**INU** 1 Inertial navigation unit.

2 Inertial nav/attack unit.

**Inv** Inverter.

**Invar** Alloys formulated for near-zero coefficient of thermal expansion; \*36 [36 per cent Ni] widely used for large CFRP moulds.

**inventory** Complete list of hardware, esp. of items assigned to military units.

**inventory carrying cost** Total cost of [airline] inventory, factored for depreciation, divided by [usually] fleet time per annum or per aircraft.

**inventory service** Assigned to operational unit, including training units, but excluding those in evaluation, development, research and other non-operational status.

**inverse monopulse** Missile or other guidance radar in which target Doppler shift is detected early in RF amplifier chain instead of at late stage.

**inverse-square law**

**inverse-square law** States point-source radiation and most other emissions fall off in intensity as square of distance from emitter.

**inverse synthetic-aperture radar** Use of SAR/DBS technique but using a fixed (or moving) radar to integrate successive echoes from a moving target.

**inversion** Local region of atmosphere where lapse rates are negative, ie temperature increases with height.

**inversion point** Height at which inversion ceases and normal lapse rate begins.

**inverted bipolar** Inverted gate.

**inverted engine** Piston engine with crankshaft above cylinders.

**inverted-flight valve** Commonest form is fitted in delivery from fuel tank to maintain feed under negative-g.

**inverted gate** Bipolar with emitter downwards.

**inverted gull wing** Seen in front elevation, slopes down from body with pronounced anhedral and then (suddenly or gradually) slopes up with dihedral to tip.

**inverted loop** See next two entries. BS: "A complete revolution in flight in a vertical plane about lateral axis with upper surface on outside of curved flight path." Some insist \* must be started with aircraft inverted, thus from bottom of manoeuvre.

**inverted normal loop** Normal loop begun from inverted position.

**inverted outside loop** See *bunt*.

**inverted spin** Spin in inverted position. Strangely, BS definition is: "A spin with negative mean angle of incidence" [AOA is meant].

**inverted vee-engine** Two inclined banks of cylinders below crankshaft.

**inverter** Electrical machine or static rectifier that inverts polarity of each alternate AC sine wave to give DC output.

**investment casting** Casting complex shapes in ceramic moulds formed as coatings on wax patterns which are then melted and run out, hence term lost-wax casting.

**investment prediction** Assessment of required inventory of spares and GSE.

**INVH** Integrated night-vision helmet.

**inviscid** Without viscosity.

**invocon** Innovative concepts in systems engineering.

**INVOF** In the vicinity of.

**involuntary boarding refusal** Passenger denied access to aircraft, for whatever reason.

**involuntary retirement** Of aircraft, caused solely by legislation, esp. environmental non-compliance.

**INVR** Institute of Noise and Vibration Research (UK).

**INVRN** Inversion [weather].

**inwales** Longitudinal members at junction of flying-boat topsides and deck. Often = gunwales.

**inward relief valve** One-way valve in fluid system triggered by abnormally low local pressure in container.

**in-weather** Flying in conditions that are wet and/or icy, but not poor visibility (USAF).

**In-WX** In weather.

**IO** 1 Identification officer (air-defence systems).

2 Direct-injection, opposed cylinders (US piston engines).

3 Image orthicon.

4 Information officer (US).

5 Information operations (US).

6 Integrated optics.

**I/O** Input/output; C adds computer.

**Io** Mean spherical candle power.

**IOA** 1 Initial operational assessment.

2 International Omega Association (office, Arlington, VA).

**IoA** Institute of Acoustics.

**IOAT** Indicated outside air temperature.

**IOB** International Operations Bulletin.

**IOBP** Imagery on-board processor.

**I-obs** Index of crew and maintenance observations.

**IOC** 1 International Oceanographic Commission (UN).

2 Initial operational [or operating] capability [or clearance].

3 Indirect operating cost.

4 International order of characters.

**I/OC** Input/output concentrator, or controller.

**I/OCE** Input/output control element.

**IOCU** International Organization of Consumers' Unions.

**IOD** 1 Inflight-opening doors (Stovl engine).

2 Internal- [as distinct from foreign] object damage.

**iodine** Shiny black solid element, symbol I, density 4.9, sublimes to purple vapour, see silver iodide.

**IOE** 1 Initial operating experience.

2 In-orbit experience.

**IOFP** Intensive operational flying programme.

**IOI** Item of interest/importance.

**IOIC** Integrated operations intelligence center, or communications (USN).

**IOIS** Integrated operational intelligence system.

**IOL** Society of Austrian aeronautics companies [office, Vienna].

**IOM** Input/output module.

**I-omega, Io** Angular momentum.

**ION** The Institute of Navigation [office, Alexandria, VA22314] (US).

**ion** Electrically charged atom or group of atoms; can be in solid or solution or free; charge can be positive (missing electron) or negative (usually through extra electron).

**IONDS** Integrated operational nuclear detection system.

**ionic propulsion** See *ion rocket*.

**ionization** Conversion of atoms to ions.

**ionization potential** Work measured in eV necessary to remove or add electron in ionization.

**ionization screen** Barrier to charged particles which would otherwise damage human tissue.

**ionogram** Plot of radio frequency against pulse round-trip time, ie electron density level for reflection (approx. equal to altitude of reflective layers).

**ionopause** Ill-defined base of ionosphere; also known as D-region.

**ionosphere** Entire ionized region of Earth's atmosphere (Kennelly-Heaviside, Appleton, E and F layers). Not Van Allen Belts.

**ion rocket** Propulsor, usually small thruster, generating high-velocity jet of ions in electrostatic field.

**IOP** 1 Institute of Petroleum.

2 Information operations planning [S adds system].

3 Independent overspeed protection.

**I/OP** Input/output processor.

**IOR** 1 Indian Oceanic Region.

2 Immediate operational requirement.

**IOS** 1 Instructor operating [or operated] station [or system].

2 Internal operating system.

3 Innovation and opportunity selection.

4 Integrated operational support [contract] (UK).

**IOSA** 1 Integrated optical spectrum analyser.

2 Integrated overhead Sigint architecture.

3 IATA, or international, operating, or operational, safety audit (IATA).

**IOT** 1 In-orbit test.

2 Initial officer training (RAF)

**IOTE, IOT&E** Initial operational test and evaluation.

**IOV** In-orbit validation (ESA).

**IOVC** In overcast.

**IP** 1 Initial point.

2 Intermediate-pressure.

3 Instructor (rarely, instrument) pilot.

4 Identification pulse (SSR).

5 Identification position (IFF).

6 Intellectual property (company law), R adds right[s].

7 Initial provisioning of spares.

8 Industrial participation.

9 Internet protocol.

10 Instrumented prototype [A adds aircraft].

11 Ice pellets.

12 Intercept point (radio dBm).

13 Initial production.

14 Instrument [flight] procedure[s].

**I/P** Identification position (US).

**IPA** 1 Independent Pilots' Association [office, Haywards Heath] (UK).

2 Instrumented production aircraft.

**IPACG** International Pacific ATC Co-ordinating Group.

**IPAD** 1 Integrated programs for aerospace [vehicle] design.

2 Improved processing and display [S adds system].

**IPARS, Ipars** International programmed airlines reservation system.

**IPAS** Integrated pressure air system.

**IPAT** 1 Inertial pointing-aided tracking.

2 Integrated propulsion analysis tool.

**IPATS** International Police Aviation Training School.

**IPB** 1 Illustrated parts breakdown.

2 Intelligence preparation of the battlespace, one of the pillars of PBA.

**IPBS** In-flight propeller balancing system.

**IPC** 1 Intermittent positive control (ATC backup, IPS used in US).

2 IP compressor.

3 Illustrated parts catalogue.

4 Integrated processing cabinet.

5 Instrument proficiency check.

**IPC-ASA** IPC (1) automatic separation assurance; advises conflicts to DABS/Adsel aircraft.

**IPCC** International Panel on Climate Change.

**IPCS** 1 Institution of Professional Civil Servants (UK).

2 Intelligent power-control system.

3 Ice-protection control system.

**IPD** 1 Instituto de Pesquisas e Desenvolvimento (Brazil).

2 Improved point defence [MS adds missile system].

3 Initial production delivery.

4 Integrated product design [by prime plus suppliers], or delivery.

5 Imagery processing and dissemination; S adds system.

6 Information processing division.

7 Initial professional development.

**IPE** 1 Institution of Production Engineers (UK).

2 Increased- (or improved-) performance engine.

3 Interconnect, passive and electro-mechanical.

**IPEC** 1 Inflight passenger entertainment and communications; C adds conference, S systems.

2 Integrated planning and execution center.

**IPES** Individual passenger entertainment system.

**Ipex** Immediate-purchase excursion; low-price fare without advance booking and without guarantee of seat.

**IPF** Integrated, or integration and processing facility.

**IPF** Identification position feature.

**IPFA** Inspection des Programmes et Fabrications de l'Armement (F).

**IPFD** Integrated primary flight display.

**IPG** Indian Pilots' Guide.

**IPI** 1 Intercept pattern for identification.

2 Inertial position insertion.

3 Initial protocol identifier.

**IPID** 1 IR perimeter intrusion detection.

2 Indefinite quantity, indefinite delivery.

**IPK** International Prototype Kilogramme, a platinum body kept at Sèvres.

**IPL** 1 Illustrated parts list.

2 Image Product Library (NIMA).

**IPM** 1 Interplanetary medium.

2 Immediate past Master (GAPAN).

**IPMS** 1 International Plastic (singular) Modelers (US spelling) Society.

2 Integrated platform management system.

3 Institution of Professionals, Managers and Specialists (UK).

**IPN** Iso-propyl nitrate.

**IPNVG** Integrated panoramic NVGs.

**IPO** 1 Initial public offering.

2 Integrated product ownership.

**IPP** 1 Institut für Plasma-Physik (G).

2 Information-processing panel.

3 Industrial preparedness planning (US).

4 Impact-point prediction.

**IPPS** Integrated power plant system.

**IPR** 1 Intellectual property rights, has particular relevance to software.

2 Inches per revolution.

3 Internet protocol router.

**IPRA** 1 Independent precision radar approach.

2 Industrial participation risk assessment.

**I/P, I/Press** Intermediate pressure.

**IPS** 1 Information presentation or processing system.

2 Instrument-pointing system.

3 Inlet particle separator.

4 Intelligence and planning squadron (RAF).

5 Intermediate pitch stop (helicopter).

6 Interactive pilot station.

7 Intermittent positive control (ATC).

8 Integrated power system.

**i.p.s.** Instructions per second.

**IPSA** Infirmières-Pilotes Parachutists Secouristes de l'Air (F).

**IPSE** Integrated product (or project) support environment (software).

**IPT** 1 Integrated project team; L adds leader (UK).

- 2 Integrated product team (US).
- 3 Intermediate-pressure turbine.
- 4 Integrated physiological trainer [a simulator].
- 5 Intelligent power terminal.

**IPU** 1 Interface processor unit.

- 2 Integrated power unit [usually electric].
- 3 Image processing unit.

**IPV** 1 Improve.

- 2 Icy runway, also IR.

**IPW** 1 Institut für Physikalische Weltraumforschung (G).

- 2 Ice-pellet shower.

**IP/XML** Internet protocol, extensible markup language.

**IQA** The Institute of Quality Assurance (UK).

**IqAF** Iraqi air force [UK usage].

**IQSY** International Quiet Sun Years [1964–65].

**IQT** Initial qualification training, or testing.

**IQTG** International Qualification Test Guide (ICAO).

**IR** 1 Infra-red.

- 2 Instrument rating [or route, or rules].
- 3 Inspection report.
- 4 Incident report.
- 5 Initial reserve (RAF).
- 6 Ice on runway.
- 7 Ice reconnaissance.
- 8 Implementing rules.

**IR** Rotor-system inertia.

**IRA** 1 Inertial reference assembly.

- 2 Infra-red astronomy.
- 3 Initiated by requesting authority.
- 4 Intercooled recuperated aero-engine (Clean).

**IRAC** 1 Interdepartmental Radio Advisory Committee (US).

- 2 IR array camera.

**IRAD** 1 Investigate, research and define.

- 2 Independent research and development.
- 3 IR acquisition and designation [S adds system].

**IRAN** Inspect and repair as necessary.

**IR&D** Internal research and development, ie company funded.

**IRAS** 1 Interdiction/reconnaissance attack system.

- 2 IR astronomy satellite.

**eraser** IR laser (not recommended).

**Irasi, IRASI** IR atmospheric sounding interferometer.

**IR augmenter** Flare or otherwise intense IR source carried by vehicle to facilitate IR tracking.

**IRAWS** IR attack weapon system.

**IRB** 1 Industrial revenue bonds.

- 2 Integrated Requirements Board.

**IRBM** Intermediate-range ballistic missile.

**IRC** Industrial Reorganisation Corporation (UK).

**IRCA** Integrated real time in the cockpit/Real-time out of the cockpit for combat aircraft (AFRL).

**IRCAM** IR camera acquisition module.

**IRCC** International Radio Consultative Committee.

**IRCCD** IR-sensitive charge-coupled device.

**IRCCM** IR counter-countermeasures.

**IRCM** IR countermeasures (sometimes rendered IRC). Measures adopted to minimise IR emissions or render them misleading (eg by ejecting flares which it is hoped

hostile IR-homing weapons will prefer instead of one's own aircraft).

**IRCS** Intrusion-resistant communications system.

**IRD** 1 Interoperability requirements document.

- 2 Independent (or internal) research and development (company-funded).
- 3 Inlet ram drag.
- 4 Integrated receiver/decoder.

**IR decoy** Intense heat source intended to distract IR-homing missiles.

**IR detector** Device containing cell sensitive to IR which raises electrons (cryogenically cooled to reduce noise) to higher energy level.

**IRDF** IR direction-finding.

**IRDS** IR detecting set, or detection set, or suite, or system.

**IRDT** Inflatable re-entry and descent technology.

**IRDU** IR detection unit.

**IRE** 1 Institution of Radio Engineers (UK).

- 2 IFF reply evaluator.
- 3 Instrument rating examiner.
- 4 Internal roll extrusion.

**IR/EO** IR electro-optical.

**Ireps** Integrated refractive effects prediction system (anaprop).

**IREW** IR electronic warfare.

**IRF** 1 Immediate Reaction Force (NATO).

- 2 Institute of space physics (Sweden).

**IRFFE** Intelligent RF front end.

**IRFI** International Runway Friction Index.

**IRFIS** Inertial-referenced flight inspection system.

**IRFITS** IR fault-isolation test system.

**IRFNA** Inhibited red fuming nitric acid.

**IRFPA** IR focal-plane array.

**IR guidance** Use of IR seeker cell and combined optics and flight control to make vehicle home on suitable heat source.

**IRI** Inadvertent runway incursion.

**IRIA** Institut de Recherche Informatique et d'Automatique (F).

**iridium** Ir, hard, inert silvery metal, density 22.562, MPt 2,410°C.

**IRIG** Inter-range instrumentation group.

**Iris** 1 IR [or integrated radar] imaging system.

- 2 Inferential retrieval index system.
- 3 IR interferometer spectrometer.

**iris scanner** Looks into human eye to give unequivocal confirmation [or not] of identity.

**IRJ** IR jammer.

**IRLS** 1 IR linescan, or line scanner.

- 2 Interrogation, recording and location system.

**IRM** 1 Information resources management.

- 2 Intelligent robotics manufacturing.
- 3 Ion-release module.
- 4 Implementing Rules on Maintenance, new legislation for General Aviation [2006–] (IAOPA).

**IRMA** International Registry of Mobile Assets [2001–].

**IRMP** Inertial reference mode panel.

**IRMS** Integrated radio management system.

**I<sub>rms</sub>** Effective [root mean square] current.

**IRMW** IR missile warning [S adds system or subsystem].

**I-RNAV** Boeing term for RNP-RNAV, meaning integrated-RNAV.

**IROC** International Requirements Oversight Council (US).

**iron** 1 Metallic element, Fe, density about 7.86, MPt 1,539°C.

2 All magnetic parts of compass, aircraft etc, of whatever material.

3 Colloquially, aircraft (especially warbird).

**iron ball** General term for a common magnetic RAM, powders of ferrites or carbonyl iron embedded in flexible matrix or sprayed on, see *iron paint*.

**iron bird** Ground rig to test major aircraft system[s].

**iron bomb** Simple free-fall bomb (colloq.).

**iron compass** Railway used as navaid (US colloq.).

**ironless** Constructed of non-magnetic materials.

**iron mike** Autopilot (colloq., obs.).

**iron paint** RAM (2) sprayed-on coating comprising ferrite magnetic balls of microscopic size contained in epoxy binder. Multiple layers give desired thickness.

**iron reserve** Fuel for taxiing at destination.

**irons** See *eating irons*.

**Irotis, IR-OTIS** IR optronic tracking and identification system.

**IRP** 1 Intermediate rated power.

2 Interphone receptacle panel.

3 Integrated refuelling panel.

4 Intruder role player.

**IRPG** IR plume generator.

**IRR** 1 Integral rocket/ramjet.

2 Infra-red radiation, or radiometer.

3 Installation readiness review.

**IRRCA** Integrated real-time info into the cockpit/real-time info out of the cockpit for combat aircraft.

**irreversible control** Position of output governed only by input (thus, \* flight control is unaffected by air load on surface).

**irreversible screwjack** Thread chosen so that linear position governed solely by rotation, not by operating load.

**IRROLA** Inflatable radar-reflective optical location aid.

**irrotational flow** Individual elements or parcels do not rotate about own axes.

**IRRS** IR reconnaissance system.

**IRS** 1 Inertial reference system, or set.

2 Improved radar simulator.

3 Indian remote satellite.

4 IR signature, or spectrograph.

5 Internal Revenue Service (US).

6 Interface requirements specification.

**IR seeker** See *IR detector*.

**IR signature** Complete plot of IR emissions from given source or vehicle, usually in form of intensity plotted against wavelength.

**IRSM** IR surveillance measures.

**IR telescope camera system** Hand-held, on long wand, for inspection [or search for explosives or drugs] in dark places.

**IRSP** Instrumentation radar support programme.

**IRST** IR search and track; S adds system.

**IRT** 1 Instrument-rating test.

2 Incident, or immediate, response team.

**IRTH** IR terminal homing.

**IRTS** 1 Initial radar training simulator.

2 IR threat simulator.

3 IR track and scan.

**IRTT** IR tow target.

**IRU** Inertial reference unit.

**IR/UV** Infra-red [and] ultra-violet.

**IRV** 1 Infra-red vision.

2 Inward[s] relief valve.

**IRVAT** Infra-red video automatic tracking.

**Irvin** Trade name of Irving Air Chute (parachutes).

**Irving flap** Split flap pivoted to links near mid-chord and lowered by actuator thrust on the leading edge.

**Irvin suit** Two-piece flying suit of fur-lined leather, from c1928 (UK).

**IRVR** Instrumented runway visual range.

**IRWR** IR warning receiver.

**IS** 1 Institut für Segelforschung (G).

2 Implementation staff.

**ISA** 1 *International standard atmosphere*.

2 International Stewardess, Hostess and Airliner Association, now ISAA (2).

3 Instrument Society of America [office, Pittsburgh, PA] (US)..

4 Instruction set architecture.

5 Inter-service agencies.

6 Industry standard architecture.

7 Integrated servoactuator.

**ISA+21** International Society of Women Airline Pilots [ISA, international social affiliation].

**ISAA** 1 Israel Society of Aeronautics & Astronautics [61028 Tel Aviv] (Israel).

2 International Steward/ess & Airliner Association.

**ISA/AMPE** Inter-service agencies/automated message processing exchange.

**ISABE** International Society for Air-Breathing Engines.

**ISAC** Institute of Space and Aeronautical Science (J).

**ISADS** 1 Integrated strapdown air-data system.

2 Integrated sensor[s] and display system.

**ISAE** International Society of Airbreathing Engineers.

**ISAF** International Security Assistance Force [NATO-led].

**IsAF** Israeli air force [UK usage].

**ISAG** International Simulation Advisory Group.

**ISAHRS** Improved standard AHRS.

**ISAL** Inverse synthetic-aperture lidar (or ladar).

**isalobar** Line joining all places where, over given period (typically 3 h), barometric pressure at surface changes by same amount.

**ISAMP** International Society of Aviation Maintenance Professionals (1996).

**ISAN** Integrity of satellite navigation (G, research programme).

**IS&S** Integrated systems and solutions, merger of command and control intelligence and data fusion (DoD).

**ISAR** 1 Inverse synthetic-aperture radar.

2 Integrated, or intelligence, surveillance and reconnaissance; C adds cell.

**ISAS** 1 Institute of Space and Aeronautical Science (India).

2 Institute of Space and Astronautical Science (J).

**ISASI** International Society of Air Safety Investigators [office, Sterling VA 20164-4421] (Int.).

**ISA-SL** ISA (1) at sea level.

**ISAT** 1 Integrated site acceptance test.

**2** Innovative space-based radar antenna technology.

**Isatis** Integrated system for ATIS (1 or 2) (F).

**ISAW** International Society of Aviation Writers.

**ISB** Inspection Service Bulletin.

**ISB, isb** Independent sideband.

**ISBA** Inertial-sensor-based avionics.

**IS-BAO** International standard[s] for business aviation, or aircraft, operations (IBAC).

**ISC** *1* Integrated semiconductor circuit.

*2* Instrumentation system[s] coupler.

*3* Intercom set control.

*4* Integrated systems controller.

*5* Industry Steering Committee (Int.).

**ISCA** International Steering Committee for Consumer Affairs.

**ISCC, ISC<sup>2</sup>** Integrated space command and control.

**ISCS** Integrated sensor control system.

**ISD** *1* In-service, or initial service, date.

*2* Interim situation display (FAA).

*3* Integrated systems development.

*4* Integrated self-defense.

**ISDN** Integrated services digital [or data] network.

**ISDOS** Information system design and optimization system.

**ISDR** International Strategy for Disaster Reduction.

**ISDS** *1* Image switching and distribution system.

*2* IRCM, or improved, self-defence system.

**ISDU** Inertial system display unit.

**IS/DX** Integrated services, digital exchanges.

**ISE** *1* Interconnected stabilizer/elevator.

*2* Intelligent synthesis environment.

*3* In-service evaluation.

**ISEE** International Sun/Earth Explorer.

**ISEI** Improved-specific emitter identification.

**Iseman rivet** Hollow blind rivet set by driving drift pin from manufactured-head end.

**isenergetic** Without change in total energy per unit mass of fluid (in bulk or along a streamline).

**isentropic** Without change in entropy (usually along streamline, with respect to time).

**ISF** *1* Industrial space facility, two modules, one remaining in space and the other shuttling raw materials and completed products.

*2* Integrated support facility.

**ISFI** Internally staged fuel injector.

**ISG** *1* Inflatable survival gear (esp. liferafts, escape slides).

*2* Internal, or integrated, starter/generator.

**ISH** Intermediate system hello.

**ISHM** Internal Security and Hazardous Materials office (FAA).

**ISI** *1* Institute for Scientific Information (international corporation, Philadelphia).

*2* International sale indicator (IATA).

**ISIP** Information systems improvement program.

**ISIS** *1* Integrated spar inspection system.

*2* Integrated strike and interception system.

*3* Integrated standby instrument system.

*4* International satellites for ionospheric studies.

**ISISP** Initial single integrated space picture, to provide COP to CAOC (USAF).

**ISIT** Intensified silicon intensified target [*sic*].

**ISJTA** Intensive student jet training area (US armed forces).

**ISL** Inactive-status list.

**island** *1* Enclosed area on 2-D graph or plot.

*2* Superstructure above aircraft-carrier deck.

**ISLN** Isolation.

**ISLS** Interrogation, or interrogator, side-lobe suppression.

**ISM** *1* Institut Suisse de Météorologie (Switzerland).

*2* Internationale Segelflugzeugmesse (G).

*3* Inflatable space module.

**ISMLS** Interim-standard MLS.

**ISN** Inter-simulator network.

**ISNS** International satellite-navigation system (FAA).

**ISO** *1* International Organization for Standardization. [Numerous aerospace documents, eg ISO 9000, International standards for quality; ISO. 9002, 19-part qualification of companies engaged in aerospace logistics, maintenance and training; office, CH-1211 Geneva] (Int.).

*2* Also **iso**, isolation, isolated.

**iso** Prefix, equal.

**isobar** *1* Line on map or chart joining points of equal atmospheric pressure, usually reduced to MSL by ISA law.

*2* Line on tunnel model or free-flight vehicle joining points of equal aerodynamic (surface stagnation) pressure.

**isobaric range** Band of flight altitudes over which cabin pressure can be held constant.

**isobar sweep** Angle between transverse axis and local direction of isobar (2).

**isocentre** Intersection of interior bisector of camera tilt angle with film plane.

**isochoric** Without change in volume.

**isochrone** Line joining points of equal time difference in reception of radio signals.

**isocline, isoclinic line** Line joining points of equal magnetic dip.

**isoclinic wing** One maintaining constant angle of incidence while flexing under load.

**isocontour** On weather radar = contour.

**isodoppler contour** Joins all points of equal Doppler velocity.

**isodynamic line** Line joining points of equal horizontal magnetic field intensity.

**iso-echo** Radar display mode in which cloud turbulence centres appear dark or coloured, width of surround indicating rain/turbulence gradient; also called contour mode.

**isogonal, isogonic line** Line joining points of equal magnetic declination (variation).

**isogram** See *isopleth* (also specif. line joining places where meteorology event has same frequency of occurrence).

**isogrid** Pattern of reinforcing webs stiffening thin sheet (machined, chem-milled etc), usually based on equilateral or isosceles triangles.

**isgriv** Line joining points of equal angular difference between grid and magnetic north (grid magnetic angle).

**isohyet** Line joining places of equal rainfall.

**Isolane** PU/AP + al (F).

**isolated drag** Drag of a body considered in isolation; thus \* of a jet-engine pod may be significantly less than its drag when hung on the aircraft.

**ISOL[D]** Isolated.

**isolux** Line joining points of equal light intensity.

**isomers**

**isomers** Compounds having same chemical formula but different structure.

**isometric** Drawing projection in which verticals are vertical, other two axes are equally inclined, and distances along all three axes are correct.

**isometric switch** Governs lock-on to aerial radar target.

**iso-octane** Hydrocarbon of paraffin series used as reference index for anti-knock ratings, normally C<sub>8</sub>H<sub>18</sub>.

**iso-opinion charts** Graphic attempts to portray general consensus of pilot evaluations, eg plotting undamped natural frequency against short-period damping.

**ISO-PA** ISO(1) protocol architecture.

**isopleth** Line joining points of a constant value of a variable with respect to space or time.

**isopod** Patented multi-mode packaging system.

**iso-propyl nitrate** Monopropellant for rockets and fuel for starters.

**isopycnic** Of unchanging density, or of equal densities, with respect to space or time.

**ISOR** Initial statement of requirements.

**ISOS** Inertially stabilized optronic sensor.

**isoshear** Joins places of equal wind shear.

**isostatic** Under equal pressure from all sides.

**isotach** Line joining points of equal wind speed, irrespective of direction.

**isotherm** Line joining points of equal temperature.

**isothermal** At constant temperature.

**isothermal atmosphere** Hypothetical atmosphere in hydrostatic equilibrium with constant temperature, also called exponential.

**isothermal change** Change of volume-pressure humidity and possibly other variables of perfect gas or gas mixture at constant temperature.

**isothermal forging** Manufacturing a metal part close to finish dimensions by squeezing it as powder in a die, or between dies, under high pressure, both the die and the part being under the same high temperature. See *sintering*.

**isothermal layer** See *stratosphere*.

**isotope** Radioactive form of (normally non-radioactive) element.

**isotope inspection** X-ray using isotope as energy source.

**isotope power** Using isotope radiation as source of heat energy in closed fluid cycle.

**Isotran** Isolator transition, isolates Gunn diode from load mismatches and couples to waveguide and coaxial conductor.

**isotropic** Having same properties in all directions.

**ISP** 1 Interim support plan (FAA).

2 Internet, or Inmarsat, service provider.

3 Integrated switching panel.

**Isp** Specific impulse.

**ISPA** International Society of Parametric Analysts.

**ISPA, Ispa** International Society of Parametric Analysis (Int.).

**Ispan** Integrated strategic planning and analysis network (Stratcom).

**ISQC** Intersound quality-control facility [checks video-cassettes].

**ISR** 1 Initial, or intermediate, Service Release.

2 Intelligence, surveillance, reconnaissance.

3 Integrated signature reduction.

4 Image storage and retrieval.

5 Interrupt[ed] service routine.

**Israc, ISRAC** Intelligence, surveillance and reconnaissance cell (NATO).

**ISRBM** Intelligence, surveillance and reconnaissance battle manager (USAF).

**ISRC** 1 International Search and Rescue Convention.

2 Intelligence, surveillance and reconnaissance cell.

3 Intelligence, surveillance, reconnaissance and communications (USAF).

**ISRO** Indian Space Research Organization (office, Bangalore).

**ISRU** In situ resource utilization [space exploration].

**ISS** 1 Inertial, or integrated, sensor system, or suite.

2 Integrated sensor structure (Darpa).

3 Instrument subsystem.

4 Indonesian Space Society.

5 International Space Station [MCETF adds management and cost evaluation task force] (US + R).

6 Information support system (ATC).

7 Integrated Satellite System.

8 Imaging scence subsystem [planetary].

9 Integrated surveillance, or sensor, system.

**ISSC** Integrated system support contract.

**ISSI** International Space Science Institute (Berne).

**ISSM** Institute of Safety and Systems Management, (U of S California, Pasadena).

**ISSN** Intermediate system subnetwork.

**ISSR** Independent secondary surveillance radar.

**ISST** ICBM silo superhardening technology.

**IST** Institute for Simulation and Training (University of Central Florida).

**Istar** 1 Integrated system test of an air-breathing rocket (NASA).

2 Intelligence, surveillance, target acquisition and reconnaissance.

**ISTAT** International Society of Transport Aircraft Traders/Trading [office, Arlington, VA].

**ISTD** Integrated space-technology demonstration (USAF).

**ISTN** Interfacility Satellite Telecommunications Network.

**ISTP** Integrated Space Transportation Plan (NASA).

**ISTR** Integrated systems test rig.

**Itres** Location of chief French Government flight-test establishment, the Centre des Essais en Vol (CEV), whose other locations are at Brétigny and Cazaux.

**ISTS** Integrated space transport system.

**ISU** 1 Intelligent, or inertial, or integrated, sensor unit.

2 Ignition servo unit.

3 Initial signal unit.

4 Intercommunication set [control] unit.

5 International Space University [F-67400 Illkirch] (F).

6 Information switching unit.

**ISURSS** Interim small unit remote sensing system[s].

**ISV** 1 Intensified silicon target vidicon.

2 In-seat video [TV screen].

**ISVR** Institute of Sound and Vibration Research (Southampton, UK).

**ISWL** Isolated single-wheel load.

**IT** 1 Inclusive tour.

2 Information technology.

3 Interactive touchscreen.

4 Integral terminal, an HMI.

5 Independently targetable.

**IT** Total impulse.

- ITA** 1 Institut du Transport Aérien [office, F-75008 Paris] (Int.).  
 2 Instituto Tecnologico de Aeronautica (Brazil).  
 3 International trade in arms/armaments.
- I<sub>TA</sub>** Motor specific impulse.
- ITAA** 1 Inspection Technique de l'Armée de l'Air (F).  
 2 Information Technology Association of America.
- ITAC** 1 Integrated tactical-aircraft control.  
 2 Intelligence and Threat Analysis Center (USA).
- ITACS** Integrated tactical air control system (USAF).
- ITALD** Improved theater [or tactical] air-launched decoy.
- ITAM** Institute for Theoretical and Applied Magnetics (R).
- IT&E** Integrated test and evaluation.
- ITAP** Interim track analysis program (US).
- ITAR** 1 International traffic[king] in Arms Regulations.  
 2 Integrated terrain access and retrieval system.
- Itars** Integrated terrain access and retrieval system.
- ITAS** 1 Improved tracking adjunct system.  
 2 Integrated tactical avionics system.  
 3 Integrated tower/approach system.  
 4 Improved target-acquisition system.
- ITAV** Ispettorato Telecommunicazioni e Assistenza al Volo (I).
- ITB** 1 Integrated testbed.  
 2 Inter-turbine burner.
- IT<sub>B</sub>** Burn time impulse.
- ITC** 1 Inclusive-tour charter.  
 2 Investment tax credit.
- ITCI** Interhost through check-in.
- ITCM** Integrated tactical countermeasures (USA, USAF).
- ITCS** 1 Integrated track and control system for RPV.  
 2 Integrated target control system.  
 3 IR telescope camera system.
- ITCZ** Inter-tropical convergence zone (see *inter-tropical front*).
- ITD** 1 Interactive-touchscreen display.  
 2 Integrated technology demonstrator.
- ITE** 1 Integral throat entrance.  
 2 Involute throat and exit [rocket nozzle].  
 3 Integrated test environment.  
 4 Impact to egress [time spent on planetary surface].
- ITEA** 1 Integrated Test, Evaluation and Acceptance.  
 2 International Test & Evaluation Association [office, Fairfax, VA22033] (Int.).
- ITEC** 1 Involute throat and exit cone (rocket).  
 2 Interoperability through European co-operation (Int.).
- ITEM** Integrated test and maintenance system.
- Items** Integrated turbine-engine monitoring system.
- ITER** Improved triple ejector rack.
- ITF** 1 Inter-tropical front.  
 2 Intelligence task force (US).  
 3 International Transport Workers Federation [125 countries, office London SE1 1DS] (Int.).  
 4 Integrated test facility.
- ITGS** Integrated track guidance system.
- ITM** 1 Information technology management, ground-based ADMS/EDMS.  
 2 Institute of Travel Managers in Industry & Commerce [office, Stamford, Lincs.] (UK).
- 3 Impact trajectory maneuver.  
 4 Inventory technical management.
- ITMS** Ion-trap mobility spectrometry.
- ITO** 1 Independent test organization (software V&V).  
 2 Indium-tin oxide.  
 3 Instrument takeoff.
- ITO<sub>C</sub>** Integrated tasking and operations centre.
- ITOD** International technical order digitization.
- ITOS** Improved Tiros operational system.
- ITP** 1 Instruction [or intention] to proceed (UK).  
 2 Initial technical proposal (US).  
 3 Invitation to propose.  
 4 Intent[ion] to purchase.  
 5 In-trail procedure.
- ITPR** IR temperature-profile radiometer.
- ITPS** International Test Pilots' School (UK).
- ITR** Integrated-technology rotor (USA).
- ITRR** Imaging-time resolved receiver.
- ITS** 1 Initial Training Squadron (rarely, school) (RAF).  
 2 Integrated test, trajectory or tower, system.  
 3 Integrated targeting system [2009–] (RAF).
- ITSE** Integrated test and support environment.
- ITSO** Integrated training suite operations.
- ITSS** Integrated tactical surveillance system (USN).
- ITT** 1 Inter-stage turbine temperature.  
 2 Invitation to tender.  
 3 Innovation and technology transfer.  
 4 Institute of Travel and Tourism (UK).
- ITTCC** International Telegraph & Telephone Consultative Committee.
- ITTS** 1 Instrumentation targets and threat simulations.  
 2 Integrated tower and terminal system.
- IT21** Info technology for 21st Century.
- ITU** International Telecommunications Union (formed as I Telegraph U in 1865).
- IT-UAV** IT (1) for UAVs.
- ITV** 1 Instrument test vehicle.  
 2 Inert test vehicle.  
 3 Inclination to vertical (parachute).  
 4 Idling throttle valve.  
 5 Independently targeted vehicle.
- ITW** Initial Training Wing (RAF).
- ITWL** Instytut Techniczny Wojsk Lotniczych [air force institute of technology] (Poland).
- ITWS** Integrated terminal weather system (US, under development).
- ITX** Inclusive-tour excursion.
- IU** Input, or interface, or instrument[s], unit.
- IUAI** International Union of Aviation Insurers [office London EC3R 8DT] (Int.).
- IUCP** Interface unit control panel.
- IUE** International UV Explorer.
- IUKAdge** Improved UK Air Defence Ground Environment.
- IUMS** Integrated utilities management system.
- IUOTO** International Union of Tourist Organizations.
- IUPS** Internal uninterruptible power supply.
- IUS** Inertial upper stage.
- IUT** Instructor under training (US).
- IV** 1 Isolation valve.  
 2 Interactive voice [M adds module, R response].  
 3 Inverted-vee piston engine.  
 4 Intelligent vehicle.

- I/V** Instrument/visual controlled airspace.
- IVA** 1 Input video amplifier.
- 2 Istituto del Valore Aeronautico (I).
- 3 Ingenjörsvetenskapsakademien [Stockholm], (Sweden).
- Invadize** Patented process of ion-vapour deposition of aluminium on steel.
- IV&V** Independent verification and validation (software).
- IVD** 1 Interactive video disk.
- 2 Integrated voice and data; M adds modem, N network.
- IVDU** Intelligent visual display unit.
- IVH** Integrated vehicle health [M adds management, MS monitoring, or management, system].
- IVI** Interchangeable virtual instrumentation (sets software standards).
- IVKDF** Institut von Kármán de Dynamique des Fluides (Int., also called VKIFD).
- IVMMS** Integrated vehicle mission-management system.
- IVMS** Integrated vehicle management system.
- IVR** Instrumented visual range.
- IVRI** Intelligent vehicle research initiative (NASA).
- IVRS** Interim voice-response system.
- IVS** 1 Intelligent vehicle system.
- 2 Interactive video system.
- IVSC** Integrated vehicle support, or subsystem, control[s], or controller.
- IVSI** Instantaneous VSI.
- IVSN** Initial voice-switched network (NATO).
- IVV** Instantaneous vertical velocity.
- IW** 1 Individual weapon.
- 2 Imminent warning (UK, WW2).
- 3 Information warfare [also InfoWar], D adds defense [UK = defence], O offensive, or officer.
- 4 Integrated Wing, ATPV adds advanced-technology verification programme (UK 2004-).
- I<sub>w</sub>** Moment of inertia of rotating wheel or disc.
- IWAAS** Initial wide-area augmentation system.
- IWAC** Integrated weapon-aiming computer.
- IWASM** International Women's Air and Space Museum (Cleveland, OH).
- IWBPs** Independent wide-band repeater.
- IWC** Integrated weapon complex.
- IW/EW** Information warfare and electronic warfare.
- IWFN** Inhibited white fuming nitric; A adds acid.
- IWG** Internet Working Group.
- IWG-BAO** Industry Working Group on Business Aircraft Operations (DoT).
- IWI** Interceptor weapons instructor.
- IWIDS** Integrated weather information display system.
- IWIU** Integrated weapons interface unit.
- IWM** 1 Imperial War Museum (London, UK).
- 2 Institution of Works Managers (UK).
- I-W/M** Index of warnings and malfunctions.
- IWR** Instrument weather rating, proposed by JAA to replace UK's IMC.
- IWS** Integrated weapons system.
- I<sub>x</sub>** Moment of inertia about the X-axis.
- I<sub>y</sub>** Moment of inertia about the Y-axis.
- IYQS** International Years of the Quiet Sun.
- I<sub>z</sub>** Moment of inertia about the Z-axis.
- I<sub>ζ</sub>** Helicopter blade moment of inertia about the lagging hinge.
- Izild** IR zoom laser illuminator/designator.
- Izod** Standard test for impact strength of notched specimen subjected to transverse blow[s] of known energy.
- IZS** Satellite (R).

# J

- J**
- 1 Turbojet (US military engine designation).
  - 2 Jet route in Class-A airspace (civil airways).
  - 3 Joule[s].
  - 4 General EM signal power.
  - 5 RPV direction aircraft (DoD aircraft designation prefix).
  - 6 Special test, temporary (DoD aircraft designation prefix).
  - 7 Polar moment of inertia; also inertia matrix.
  - 8 Aircraft category, transport (1926–31), utility (1931–55) (USN).
  - 9 Life jackets.
  - 10 Current density.
  - 11 Propeller advance/diameter ratio.
  - 12 Torsion constant units = length<sup>4</sup>.
  - 13 Cost function [or italic *J*].
  - 14 Bessel function of first kind.
  - j**
    - 1 Mass flux (gaseous diffusion).
    - 2 Square root of minus 1.
    - 3 Usually as subscript, fully expanded jet.
    - 4 Operator, 90° (electrical).  - J2** Diesel fuel (G, WW2).
  - J3E** Single-sideband suppressed-carrier mode, ie HF SSB.
  - J9** Joint Experimental Directorate (USA).
  - J-band** EM radiation 30–15 mm, 10–20 GHz.
  - J-curves** Atmospheric post-stall manoeuvres by thrust-vectoring aircraft [X-31].
  - J-dinghy** Circular, for crew of 6 (RAF, WW2).
  - J-display** Time base is ring near edge of display, echo blip position varies with range; main use radar altimeters.
  - J-nose** Fixed leading-edge structure.
  - J-turn** Cobra followed immediately by rapid [30°–40°/s] yaw to reverse direction of flight.
  - JA** Judge-advocate.
  - JAA**
    - 1 Japan Aeronautic Association.
    - 2 Joint Aviation Authorities [2000–, office at 2130 KA Hoofddorp, Netherlands] (EAAC, Int.).
  - JAAA** Japan Ag-Aviation Association.
  - JAATT** Joint air attack team tactics (outcome of Jaws [1]); hence JAAT.
  - Jabo** Fighter-bomber (G).
  - JaboG** Fighter-bomber wing (NATO, Luftwaffe).
  - JAC**
    - 1 Joint airworthiness code (AICMA).
    - 2 Junta de Aeronautica Civil (Chile).
    - 3 Joint Air Component [HQ adds headquarters] (UK).
  - JACIS**
    - 1 Japan Association of Air Cargo Information Systems.
    - 2 Joint applications command information system (multiservice, UK).
  - jack**
    - 1 Powered linear actuator.
    - 2 Jack box.
  - jack box** Socket for plugging in communications headset. Except in light aircraft, probably enables any crew member or ground crew to access intercom.
  - jack pad** Strong plate, usually square, distributing support of lifting jack into surrounding airframe.
  - jackscrew** Screwthread converting rotary power to linear (jack) output, usually irreversible (see *ball*\*).

- jack stall** Aerodynamic load on the surface overcomes force applied by powered flight-control unit.
- jackstay** Hinged strut for bracing cowl or other large panel when in open position.
- JACMAS** Joint Approach Control Meteorological Advisory Service.
- Jacobs-Relf** Original equations for calculation of  $M_{crit}$  and related  $C_p$ .
- Jacola** Joint Airports Committee Of Local Authorities (UK).
- JACTS** Joint Air Combat Training Squadron (USAF/USN).
- JAE** Judge Advocate-General Executive Office (USAF, Pentagon).
- JAEA** Japan Aerospace Exploration Agency.
- JAF** Royal Jordanian air force [UK usage].
- JAFE** Joint advanced fighter engine (US).
- Jafna** Joint Air Force/NASA (US).
- Jafü** Jagdführer, fighter leader (G, WW2).
- JAG** Judge-Advocate-General.
- Jagd** Hunt (G), hence Jagdfighter [fighter pilot], Jagdflugzeug [fighter], Jagdgeschwader [fighter group (US = wing)], Jagdgruppe [fighter wing (US = group)].
- Jago, JAGO** Joint air/ground operations [G adds Group, S School, at Nellis] (USAF).
- Jaguar** Joint air/ground operations unified adaptive replanning [or preplanning] (USAF).
- JAIC** Japanese Aircraft Industry Council.
- JAIST** Japan[ese] Advanced Institute of Science & Technology.
- JALS** JAA-ATPL integrated learning system.
- jam** Obliterate hostile EM transmission (esp. radar) by powerful emission on same wavelength(s).
- Jamac** Joint aeronautical materials activity (USAF).
- James** Air-damped pendulum driving deceleration (g) pointer carried in braked truck to give friction measure on runway (see *JBD, JBI*).
- jammer** High-power emitter to jam specific wavelengths.
- jammer support receiver** Automatically scans through programmed range of frequencies of interest.
- jamming**
  - 1 Noise \* obliterates by sheer power.
  - 2 Deception \* attempts to mislead enemy by causing false indications on his equipment.
- jam nut** Thin lock-nut.
- JAMSCE** Joint Advanced Materials and Structures Center of Excellence (FAA).
- Janap, JANAP** Joint Army, Navy, Air Force Publication (US).
- Janet flights** Contractor flights bringing staff to classified Nellis/Tonopah sites.
- Janis, janis** Joint Army/Navy intelligence studies (US).
- jankers** Punishment, confined to camp (RAF, colloq.).
- JAN-TX** Joint Army-Navy technical documentation (US).
- Janus system** Doppler radar technique in which frequency shift is measured as difference between beams to front and rear.
- JAOC** Joint Aerospace Operations Center (USAF).

**JAOPA** Jamaica Aviators, Operators and Pilots' Association.

**japanning** Coating with enamel.

**JAPCC** Joint Airpower Competence Centre [D-47546 Germany] (NATO).

**JAPHAR, Japhar** Joint airbreathing propulsion for hypersonic applications research.

**JAPNMS** Jtids air-platform network management system (RAF).

**JAR** Joint Aviation Requirement[s] [eg Pt 23 light aircraft, 25 based on FAR-25 + national variants, 66 training for maintenance engineers, 145 approval for maintenance organizations; – AWO adds all-weather operations, E Europe, FCL flight-crew licensing, OPS aircraft operation, VLA very light aircraft] (EC).

**jaric, JARIC** Joint Air Reconnaissance [&] Intelligence Centre [now part of DGIIA, at RAF Brampton] (UK).

**JART** Joint assessment and ranking team.

**JAS** 1 Joint Airmiss Section, now Airprox (UK, civil/military).

2 Fighter, attack, reconnaissance (Sweden).

**JASA** Joint airborne, or avionics, Sigint architecture.

**JASC** Joint Airmiss Steering Committee [ECAC].

**JASDF** Japanese Air Self-Defence Force = air force.

**JASIF** Joint airborne signal intelligence family.

**JASM** Joint air-to-surface missile.

**Jasmad** Joint AirSpace Management and Deconfliction (USAF).

**Jasman, JASMAN** Joint aircraft survivability to Manpads.

**JASO** Joint Air-Support Organization (UK).

**Jaspo** Joint Aircraft-Survivability Program Office (US).

**JASS** 1 Joint Anti-Submarine School (UK).

2 Joint airborne Sigint system.

**JASSM** Joint air-to-surface standoff missile (US).

**JAST** Joint advanced strike technology.

**JASU** Jet aircraft start[ing] unit (US).

**JAT** Joint affordability team (DoD).

**JATCC** Joint air-traffic control centre (UK).

**JATCCCS** Joint advanced tactical command control/com system (US tri-service).

**JATCRU** Joint Air Traffic Control Radar Unit (UK).

**JATE** Joint Air Transport Establishment (UK).

**JATEU** Joint Air Transport Evaluation Unit (RAF Brize Norton).

**Jato** Jet (ie, rocket) assisted takeoff.

**Jats, JATS** 1 Jamming analysis and transmission selection (ECM).

2 Joint Air Traffic Services.

**Jaumann absorber** Multilayer RAM (2) absorber consisting of sandwich of Salisbury screens graded from high resistivity at front to low resistivity at back.

**JAWG** Joint Airprox [previously Airmiss] Working Group (ICAO and UK NATS).

**Jaws** 1 Joint attack weapon systems (fixed and rotary-wing against armour hostile to USA).

2 Jamming and warning system (ECM).

3 Joint airport weather studies.

**JAXA** Japan[ese] Aerospace Exploration Agency (from October 2003, incorporates ISAS, Nasda).

**Jazz Rock** Joint Survival System/Regional Operational Control Center (Adcom).

**JB** 1 Jet-propelled bomb category (USAAF, WW2).

2 Jet barrier.

**J-bar** Jet runway barrier (FAA).

**JBC** Joint C4ISR Battle Center (US).

**JBCSA** The Joint British Committees for Stress Analysis.

**JBD** 1 James brake decelerometer.

2 Jet blast deflector.

**JBF** Joint Blue Force; SA adds situational awareness.

**JBG** JagtBombergeschwader [also JaboG] (G).

**JBI** James brake index.

**JBMC2** Joint battle management, command and control (US).

**JPBDS** Joint biological point detection system.

**JCA** Joint Combat Aircraft [=F-35 JSF] (RAF).

**JCB** Japanese Civil Aviation Bureau.

**JCAP** Joint Committee on Aviation Pathology.

**JCAS** Joint close air support.

**JCASR** Joint Committee on Avionics Systems Research.

**J-catch** Joint countering attack helicopters (US programme against hostile battlefield helicopters).

**JCC** Jorn Control, or Co-ordination, Centre.

**JCCDC** Joint CCD(4) Center.

**JCDP** Joint conceptual definition phase.

**JCEWS** Joint combat electronic-warfare system.

**JCIDS** Joint capabilities integration and development system.

**JCIT** Joint combat information terminal (USA).

**JCM** Joint Common Missile; P adds Program (US, could involve UK).

**JCMPO** Joint Cruise Missiles Project Office (USAF/USN).

**JCMT** Joint collection management tools.

**JCO** Joint co-ordination order.

**JCOA** Joint Center for Operational Analysis (US).

**JCP** Joint Certification Procedures [WG adds Working Group] (JAA).

**JCR** (Not JRC) Joint Research Centre of EC7 based in Ispra and co-ordinating some 50 laboratories on remote sensing and related problems.

**JCS** 1 Joint Chiefs of Staff (US).

2 Jet-capable ship.

**JCU** Joint common user.

**JDA** 1 Japan Defence Agency.

2 Joint Deployment Agency.

**JDAM** Joint direct-attack munition (US).

**JDCC** Joint Doctrine and Concept Centre (UK).

**JDCU** Jamming detection control unit.

**JDI** Just do it.

**JDP** 1 Joint defensive planner (USAF).

2 Joint definition phase.

**JDRADM** Joint dual-role air-dominance missile.

**JEA** Joint endeavour agreement.

**JEC** Joint Economic Committee (US Congress).

**JECCS** Joint enhanced core communications system (USMC).

**JEDEC** Joint experimental (sometimes engineering) development of electronic components.

**Jedmix** Joint engineering data-management information and control system.

**Jeep** Escort carrier or CVE (WW2).

**JEF** Joint Expeditionary Force[s]; E adds experiment, X exercise, but [2002] also means experiment (USAF + others).

**JEFS** Joint Elementary Flying School (UK).

**JEFTS** Joint Elementary Flying Training School (RAF Barkston Heath, since 2003 called DEFTS).

**JEM** 1 Jet-effects model.

2 JTRS enhanced MBITR.

**jempers** JEMPRS (colloq.).

**JEMPRS** Joint en-route mission planning rehearsal system [typically 10 laptops, Ethernet network and palletized EMS terminal] (US DoD).

**Jemtos** Jet-engine maintenance task-oriented system.

**JENA** Jet-engine neural analyser.

**Jengo** Junior engineering officer (RAF).

**Jenisy** Joint-effects network-integrated system solution.

**JEPES** Joint engineer planning and execution system.

**Jeppesen** Widely used commercially-sold database of airway and airport charts and electronic information, named for Ebroy Jeppesen, whose 1926–40 notes formed basis.

**jerk** Rate of change of acceleration, V (esp. in ECM target or input motion).

**jerk offload** Extraction of large unit load from airlifter by sudden pull through ramp door (by parachute, ground extraction system etc).

**Jesus nut** Holds main rotor to rotor shaft on helicopter or, especially, light autogyro.

**JET** 1 Joint estimate team.

2 Joint experimental toolkit.

**jet** 1 High-velocity gas flow discharged from nozzle (eg from \* 2 or from open-\* wind tunnel).

2 Turbojet engine (loosely, turbofan).

3 Aircraft powered by 2 (loosely, also by rocket).

4 Calibrated orifice(s) in carburettor.

5 To travel by 3.

**Jet A** Turbine kerosene similar to JP-5; freezes about -40°C; available US only.

**Jet A-1** Turbine kerosene; freezes below -50°C, flash above 37.8°C; standard commercial fuel.

**jet advisory area** Specific regions along jet routes extending 14 nm each side of route segment from FL240–410 (radar) or FL270–310 + FL370–410 (non-radar).

**jet advisory service** That offered to certain civil jets in jet advisory areas; IFR separation or (in radar areas) other facilities (FAA).

**jet age** Loosely, era in which jet (3) aircraft became dominant.

**JFTL** Joint Future Theater Lift [USA-USAF].

**jetavator** See *jetlevator*.

**Jet B** Wide-range distillate fuel similar to JP-4; freezes below -60°C, vapour pressure 2–3 lb/sq in.

**jet blast** Disturbance caused by ground running jet engine, hence need for blast fence.

**JETDS** Joint electronics type designation system (NATO).

**jet-edge shear** Rate of change of velocity per unit radial distance at outer boundary of jet (1), including on large scale the velocity profile at edge of atmospheric jetstream.

**jet engine** Any propulsion system whose reaction is generated by a jet (1), thus a turbofan, turbojet or ramjet.

Generally used to mean air-breathing, esp. turbofan/turbojet, and thus arguably not a rocket, and certainly not applied to space thrusters of ES, ion, plasma and similar types.

**jetlevator** Small power-actuated flap, spoiler or ring on skirt or nozzle exit or rocket for TVC.

**jet flap** Flap through which passes high-energy gas or air flow, discharged along trailing edge.

**jet-fuel starter** Main-engine starter burning main-engine fuel.

**Jethete** Proprietary refractory sheet metal (high-nickel).

**Jeti** 1 Jet-engine test instrumentation.

2 Joint European Technology Initiative (Int.).

**jet-impingement stagnation pressure** That which would be achieved if a high-velocity jet were to be brought precisely to rest on a fixed surface.

**jet lag** Mild temporary symptoms produced in human beings by fast travel through large meridian difference, ie through five or more time zones.

**jet lift** Using jet-engine thrust to support V/StOL aircraft.

**jet noise** To a first approximation, the noise caused by interaction at the edge of a propulsive jet (from a jet engine or propeller) is proportional to the eighth power of the relative velocity. See *noise*.

**jetpipe** Pipe carrying hot gas from engine core [in a turbojet, turboshaft or turboprop, from whole engine] to propulsive nozzle.

**jet propulsion** Aircraft propulsion by jet engine(s).

**jet route** High-altitude route system for aircraft with high-altitude navaids, normally extending from 18,000 ft AMSL to FL450 (FAA).

**JETS** Joint effects targeting system.

**jet sheet** High-velocity fluid flow of essentially two-dimensional nature.

**jet shoes** Astronaut shoes for weightless walking.

**jetstream** Quasi-horizontal wind exceeding 80 kt (148 km/hr) in warm air at sharp boundary with cold, high troposphere or stratosphere, mid latitudes, predominantly westerly.

**jet tab** See *jetlevator*.

**jettison** Discard fuel, canopy, external stores or other mass to reduce weight or remove a hazard; hence \* pipe(s), \* pump(s), \* handle or switch.

**Jets, JETTS** Joint effects tactical targeting system, a software-driven C<sup>2</sup> tool for managing defensive systems and sensor platforms (UK).

**jet vane** See *jetlevator*.

**jet velocity** In turbojet or turbofan core, proportional to square root of absolute temperature. In rocket, proportional to square root of absolute temperature divided by mean molecular weight of jet.

**jetway** See *bridge*.

**JEWC** Joint Electronic Warfare Center (US).

**Jezebel** Passive acoustic ASW search system (see *Julie*) (US).

**JFAC** Joint Force[s] Air Component; C adds Commander (US).

**J-Fact-SU, JFACTSU** Joint FAC Training and Standardization [in 2007 changed to Support] Unit (RAF Leeming, UK).

**JFASCC** JFACC plus space (US).

**JFC** 1 Jet fuel control.

2 Joint Force, or Field, Commander.

**JFCC** Joint Functional Component Command[s] (Stratcom).

**JFCOM** Joint Forces Command (US).

**JFDP** Joint force development process, broad initiative at inter-service co-operation (US).

**JFET** Junction field-effect transistor.

**JFHQ** Joint Forces HQ.

**JFI** Joint fires initiative.

**JFIT** Joint fires integration and interoperability team (US).

**JFL** Joint Futures Laboratory (JFC2).

**JFN** 1 Joint fires network [forest-fire mission planning].  
2 Joint Forces Network.

**J-FOCSS, J-fox** Joint-force command support system.

**JFS** Jet-fuel starter.

**JFTO** Joint flight-test organization.

**JFTC** Joint Force Training Center (NATO).

**JFTL** Joint Future Theater Lift [USA–USAF].

**JG** 1 Jagdgeschwader, fighter unit equivalent to UK group or US wing (G).  
2 Junior Grade (USN).

**JGr** Jagdgruppe, equivalent to UK wing or US group (G).

**JGSDF** Japanese Ground Self-Defence Force (= army).

**JHC** Joint Helicopter Command [multi-service, 1999–] (UK).

**JHCU** Jamming-head control unit; P adds processor.

**JHL** Joint Heavy Lift, proposed multiservice logistics aircraft (US).

**JhmcS, JHMCS** Joint helmet-mounted cueing system.

**J-HPSSL** Joint high-power solid-state laser (US multi-Service).

**JHQ** Joint Headquarters.

**JHSU** Joint Helicopter Support Unit (UK).

**JHU** Johns Hopkins University; APL adds Applied Physics Laboratory.

**JI** Joint implementation.

**J<sub>2</sub>** Non-dimensional damped natural frequency [often J<sub>1</sub>].

**JIAAC** Junta for civil air accidents (Argentina).

**JIADS** Joint integrated air-defense system.

**JIAWG** Joint Integrated [also rendered as Industrial] Avionics Working Group (US).

**JIC** 1 Jet-induced circulation.  
2 Joint industrial company, prime contractor interface in typical collaborative programme with members assigned by all participating nations.  
3 Just in case.  
4 Joint intelligence centre.

**JICF** Jet in cross-flow.

**Jico, JICO** Joint interoperability, or interface, control officer.

**JIEDDO** Joint IED Defeat Organization (DoD).

**JIES** Joint interoperability evaluation system.

**Jifdatas** Joint-services in-flight data transmission system (US).

**jig** Hard tooling; any rigid frame in which a part (eg of airframe) is assembled.

**JIGI** Joint-Stars imagery geolocation improvement.

**jigsaw** Multi-lobed rotor forming moving element of wheel brake.

**JILL** Jet-induced lift loss.

**Jimpacs** Joint improved multi-mission payload aerial surveillance, combat-survivable.

**jink** To take sharp avoiding action, eg against AAA fire.

**Jintaccs** Joint interoperability of tactical command and control systems.

**JIO** Joint Intelligence Organisation (Australia).

**JIOC** 1 Joint Information Operations Center (USSC).  
2 Joint Intelligence Operations Center (USA).

**JIP** Joint Interface Program, between different systems or services (US).

**JIRD** Joint initial, or interim, requirements document.

**J/IST** Joint, or JSF, integrated subsystems technology.

**JIT production** Just in time.

**JITS** Joint Integrated Technical Support (MoD/RAF).

**jitter** 1 Transmission of DME pulses with random spacing, to avoid locking-on to another aircraft interrogating same beacon.  
2 ECCM technique in which p.r.f. is made to vary unpredictably.

**jitterbug** Hand-held rotary buffer/polisher.

**jitters** JTRS.

**Jiva, JIVA** Joint intelligence virtual architecture.

**JJPPT** Joint jet-pilot training programme.

**J-Lars, JLARS** Joint-liaison advanced radio system (US civil government).

**JLD** Jet-lag diet.

**J-lens, JLENS** Joint land-attack missile/cruise missile defense elevated netted sensor system.

**JM** JTIDS module[s].

**JMCC** Johnson Missile Control Center (NASA JSC).

**JMCIS** Joint Maritime Command information system (US).

**JMD** Joint manufacturing demonstration.

**JMEM** Joint munitions effectiveness manual (US armed forces).

**JMG** Joint Meteorological Group.

**JMIC** Joint Military Intelligence College (Washington DC).

**JMOD** JSAF(1) Block Modernization Program.

**JMPS, Jumps** 1 Joint mission planning system.  
2 Joint Combat Aircraft mission planning system (UK).

**JMR** Jason microwave radiometer.

**JMRC** Joint mobile relay centre.

**JMSDF** Japanese Maritime Self-Defence Force, = navy.

**JMSNS** Justification of major-system new start.

**JMSPO** Joint Meteorological System Program Office (DoD).

**JMTSS** Joint multichannel trunking and switching system.

**JNC** Jet navigation chart.

**JNI** Java native interface.

**JNLWD** Joint Non-Lethal Weapons Directorate (DoD).

**JNR** Jamming-to-noise ratio.

**JNT** Joint.

**JNWPU** Joint Numerical Weather Prediction Unit (US 1954–).

**JOAC** Junior Officers Air Course (RN).

**Joanna** Joint airborne night navigation and attack.

**JOAP** Joint oil analysis program (USAF).

**job card** Actual piece of card traditionally used to record in handwriting details of maintenance task, part number and other information required in order to provide authority to draw item[s] from stores. Now becoming obsolete.

**Jo-bolt** Patented internally threaded three-part rivet.

**JOC** 1 Joint operations centre.

**jock, jockey**

2 Jet orientation course.

**jock, jockey** Combat aircraft pilot (colloq.).

**JOCS, Jocs** Joint operations, or operational, command [and control] system.

**joggle** Small vertical offset along edge of sheet or strip to allow it to overlap adjacent component.

**joggling** Local squeezing of sheet-metal parts to improve abutment of mating surfaces.

**Johanssen block** Super-accurate metal block for reference of various dimensions and surface finishes.

**Johnson noise** RF thermal noise.

**joined wing[s]** *Diamond wing*.

**Joint Aerospace Operations Center** Carried in MC2A-X to control global task force (USAF).

**Joint Aviation Authorities** Regulations adopted by Austria, Belgium, Cyprus, Czech Rep., Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland and UK.

**jointery** Willing co-operation between armed forces (UK colloq.).

**jointship** Vague buzzword meaning air/land/sea [space?] is all one conflict.

**Joint-Stars** Joint surveillance and target-attack radar system (USAF).

**joint-use restricted area** Restricted area in which, when not in use by using agency (eg USAF), FR or VFR clearance can be given for FAA traffic.

**Joint Weather Impact System** Automatic database supporting MAAP.

**joint-wing** *Diamond wing*.

**Joker** Fuel planning level selected to warn of imminent approach of Bingo.

**JONA** Joint Office of Noise Abatement (DoT/NASA).

**JOP** 1 Junior officer pilot (RAF).

2 Joint operations picture.

**JOPES** Joint operation[s] planning and execution system.

**JOpsC** Joint Operations Command [being prepared by Joint Forces Command 2003 for major combat and stability operations] (US).

**JORD** Joint Operational Requirements Document.

**JORN, Jorn** Jindalee OTH radar network (Australia).

**Josephson junction** Formed by weakly linking superconductors at below 4°K, offering immense possibilities 0–1,000 GHz.

**JOSS** Joint overseas switchboard (DoD).

**Jostle** Powerful RAF active jammer, 1942–45.

**JOTS** Joint operational tactical system.

**JOTT** Junior officer tactics team (USN).

**joule** SI unit of energy [potential, heat or kinetic], J = Nm = Ws =  $10^7$ erg; MJ = 0.37251 hp-h.

**Joule constant** Mechanical equivalent of heat, = 4.1858 J/15°C calorie, used in definition of 15° calorie.

**Joule/Kelvin effect** Expansion of gas from high pressure through throttling orifice or porous plug; also called Joule/Thomson effect, see next.

**Joule/Thomson coefficient** Rate of change  $\left(\frac{dT}{dP}\right) H$

where T = temp, P = fluid pressure and H = enthalpy in reversible flow through porous plug.

**Joule/Thomson cooling** Achieved by passing compressed gas through porous plug or small aperture.

**Jovial** A real-time language for embedded computers [replaced by Ada].

**joy** Success, satisfaction; thus “no \*” = it failed to work (RAF).

**joystick** Control column (suggest archaic).

**JP** 1 Jamming pulse.

2 Jet propulsion/propelled/propellant.

**JP-1** Original kerosene, Avtur (Jet Propulsion -1) fuel, replaced by Jet A-1, NATO F35.

**JP-2** Improved kerosene, soon obsolete.

**JP-3** Original wide-cut, including gasolines, kerosene and gas oil fractions.

**JP-4** Wide-range distillate, Avtag, FS II, NATO F40, commonly available but reduces pump life and increases fire hazard; equivalent is Jet B fuel.

**JP-5** Avcat, NATO F44, denser high-flash kerosene.

**JP-6** ‘Heart-cut distillate’, close control, good thermal stability, experimental use only.

**JP-7** Special fuel for Mach 3 extreme-altitude aircraft (SR-71).

**JP-8** Narrow-cut distillate, Jet A-1, F34, Avtur FS II.

**JP-9** Starter fuel for cruise missiles [start at high altitude].

**JP-10** High-density fuel developed to extend range of cruise missiles.

**J-Pads** Joint precision airdrop system.

**J-Pals, JPALS** Joint precision approach [and] landing system (USAF/USN, replaced ACLS).

**J-Pass, JPASS** Joint precision advanced strike system.

**J-Pats, JPATS** Joint primary-aircraft training system (USAF/USN).

**JPC** J-tids portable capability (RAF).

**JPDO** Joint Planning and Development Office [also often called Joint Program Development Office and Joint Planning and Development Organization], charged with developing Ngats (FAA, DoC, DoD, DHS, NASA, White House).

**JPF** Joint programmable fuze; PO adds Program Office.

**JPI** Joint precision interdiction (NATO).

**JPITL** Joint prioritized integrated target list.

**JPL** Jet Propulsion Laboratory, a major facility of NASA, operated by Caltech [Pasadena, CA91109] (US).

**JP900** Experimental jet fuel prepared from coal (Penn. State Energy Institute, 2004).

**JPO** 1 Joint program(me) office or organization.

2 Joint planning and development office for the transformation of the US aviation system (White House).

**JPS** Journal processing system.

**JPSD** Joint precision strike demonstration [PO adds project office] (USA).

**j.p.t., JPT** Jet-pipe temperature.

**JPTL** Joint prioritized target list.

**JPTS** Jet propulsion, thermally stable, fuel for ultra-high altitude aircraft [originally for the U-2].

**JR** Utility transport aircraft class (USN 1935–55).

**JRB** Joint Reserve Base (US).

**JRBA** Joint Review Board Advisory Committee.

**JRC** 1 Joint Research Centre (Euratom Belgium/Germany/Italy/Netherlands).

2 Joint Resources Council (FAA).

**JRCC** 1 Joint Rescue Co-ordinating Centre (UK).

2 Joint Requirements Oversight Council (DoD).

**JRDF** Joint Rapid Deployment Force (UK).

**JRDOD** Joint research and development objective document.

**JRFL** Joint [services] restricted frequency list (US military).

**JRIA** Japan Rocket Industry Association.

**JRMB** Joint Requirements and Management Board (Office of JCS, US).

**JRO** Joint Repair Organization [RAF Cottesmore] (MoD, UK).

**JROC** Joint Requirements Oversight Council (DoD, US) or Committee (UK).

**JRP** 1 Joint Robotics Program (DoD).

2 Joint reconnaissance pod (RAF).

**JRPG** Joint Radar Planning Group (USAF/CAA, from 1956).

**JRRF** Joint Rapid Reaction Force (NATO).

**JRS** Japan Rocket Society.

**JRSC** Jam-resistant secure communications programme.

**JRT** Joint Review Team [CAA/industry] (UK).

**JRTC** Joint Readiness Training Center (USA, USAF).

**JS** Job sheet.

**J/S** Jam-to-signal ratio.

**JSA** 1 Jet standard atmosphere.

2 Joint security area.

**JSAF** 1 Joint Sigint airborne family.

2 Joint Sigint avionics facility; LBSS adds low-band subsystem.

**JSAM** Joint Service aircrew mask.

**JSAS** Japanese institute of Space and Astronomical Sciences.

**JSAT** 1 Joint safety analysis team.

2 Joint system acceptance test.

**JSC** 1 Lyndon B. Johnson Spaceflight Center [Houston, TX77058] (NASA).

2 Joint Security Commission (DoD).

3 Joint Steering Committee (ECAC-JAA and JARs).

4 Joint stock company.

**JSCM** Joint supersonic cruise missile (USN).

**JSCMPO** Joint-Service Cruise-Missile Program Office (USAF/USN).

**Jscope** Joint synchronized common operational planning environment [provides COP from CAOC] (USAF).

**JSD** 1 Jackson system development (Ada).

2 Joint-Service[s] Designation.

**JSDC** Joint Service Defence College (Greenwich, UK).

**JSDF** Japan Self-Defence Force [=army; A adds Agency].

**J-Sei** Joint second-echelon interdiction (USA/USAF).

**JSESPo** Joint Surface-Effect Ship Program Office (US).

**JSEW** Joint-Service EW; S adds School.

**JSF** Joint Strike Fighter [40+ possible suffixes].

**JSG** Jump-strut [landing] gear.

**J-Ship, JSHIP** Joint shipboard helicopter integration process.

**JSIAP** Joint signal intelligence avionics program.

**JSIC** 1 Joint Security Industry Council.

2 Joint Systems Integration Command (US).

**JSIES** Joint-Services imagery exploitation system (UK).

**JSims** Joint simulation system.

**JSIPS, J-sips** Joint-Services imagery process[ing] system (US).

**JSLO** Joint-Services Liaison Organization (G).

**JSME** The Japan Society of Mechanical Engineers.

**JSMRC** Joint Service Medical Rehabilitation Centre (UK).

**JSOA** Joint Special-Operations Agency (US).

**JSOR** 1 Joint Strategic-Objective Plan (US).

2 Joint Services Operational Requirement (UK).

**JSOW** Joint-service stand-off weapon (US).

**JSP** Joint Services Publication, notably \*318, Military Flying Regulations, esp. instrument, approach and departure procedures (UK).

**JSPI** Joint School of Photo Interpretation.

**JSR** 1 Joint Staff Requirement.

2 Jammer saturation range.

3 Jammer support receiver.

4 Jamming-to-signal ratio.

**JSRC** Joint Service Rescue Centre (UK).

**JSRR** Jam/signal ratio required.

**JSS** Joint Surveillance System (replaced Sage/BUIC).

**JSSC** Joint Services Staff College, or Course (UK).

**JSSEE** Joint-Service software engineering environment[s].

**J-Stars** *Joint-Stars*.

**JSTPS** Joint strategic target planning staff.

**JSTU** Joint Service Trials Unit (UK).

**JSWDL** Joint-service weapon datalink.

**JSWS** Joint-Stars workstation.

**JTA** Joint technical architecture.

**JTAC** 1 Joint Tactical Air Controller.

2 Joint terminal attack control[ler] (US).

**JTACMS** Joint tactical missile system (USA/USAF).

**JTAG** Joint Test Action Group.

**JTAGG** Joint turbine advanced gas-generator (USA).

**JTAGS, j-tags** Joint tactical air/ground station, using IR data from DSP sensors to provide missile defence (USA).

**JTAMD** Joint theater air and missile defense; O adds organisation or office (USA).

**JT&E** Joint test and evaluation.

**JTAO** Joint tactical air order[s].

**JTAV** Joint total-asset visibility.

**JTC** Joint targeting cycle.

**JTC<sup>3</sup>A** Joint Tactical Command, Control and Communications Agency (US).

**JTCGAS** Joint Technical Coordinating Group for Aircraft Survivability (USN, industry).

**JTCTRS** Joint terminal control training and rehearsal system (USAF).

**JTDE** Joint technology-demonstrator engine (APSI).

**JTE** Joint targeting effects.

**JTEG** Joint Test and Evaluation Group[s].

**JTEGG, j-tegg** Joint turbine-engine gas-generator.

**JTF** 1 Joint task force.

2 Joint tactical fusion; P adds program (US).

3 Joint test facility.

**JTGS** Joint Tactical Ground Station (US).

**JTI** Joint Technology Initiative (Acare).

**JTIDS, j-tids** Joint tactical information distribution system (all US Services, most of NATO).

**JTR** Joint transport rotorcraft.

**JTRS** Joint tactical radio system[s]; SCA adds software communications architecture.

**JTRU** Joint Tropical Research Unit.

**JTSO** Joint technical standing order.

**JTSTR** Jetstream.

**JTT** 1 Joint tactical terminal.

2 Joint Trials Team.

**JTTR** Joint Tropical Trials and Research Establishment (Australia).

**JTUAV** Joint [-service] tactical UAV.

**JTW** Joint targeting workstation.

**JTWG** Joint Targeting Working Group (NATO).

**JU** Joint undertaking.

**J-Ucas** Joint unmanned combat air system[s] (USAF/USN).

**Judy** 1 Interceptor has contact and is assuming control of engagement (US).

2 Target in practice interception: I have been hit (UK).

3 See *Contact*\*.

**JUEP** Joint UAV experimental programme (UK).

**JUG** Joint Users Group.

**jug** 1 Piston-engine cylinder.

2 Drop tank (both meanings colloq.).

**JUKL** ATC association (Yugoslavia, Serbia).

**Julie/Jezebel** ASW system based on Julie plotting target position from echoes from ≤60 explosive charges detected by Jezebel.

**Jumbo, jumbo jet** Boeing 747.

**Jump** Joint upgrade [and] maintenance programme (RAF).

**jumper** Cable temporarily attached to terminals to bypass part of electric power circuit.

**jump jet** Jet VTOL aircraft (colloq.).

**jumpliner** STOL transport (colloq.).

**jumpmaster** Person in command of stick of parachutists.

**jump seat, jumpseat** Extra seat in cockpit or on flight deck not required by flight crew, but possibly occupied by authorized member of aircraft crew such as loadmaster.

**jumpseater** Anyone occupying jump seat, eg passenger invited to flight deck (rare after '9-11').

**jump strut gear** Main or (usually) nose landing gear capable of forcible extension to reduce TO ground roll of STOL aircraft.

**jump takeoff** 1 Autogyro takeoff using stored rotor energy to achieve initial lift at zero airspeed.

2 Jet VTO.

3 Launch of anti-tank missile with initial jump to operating height.

**junction** Mating surface between different types (eg p and n) of semiconductor material.

**jungle penetrator** SAR device lowered into dense jungle by helicopter.

**Jungly** Assault-transport helicopter, especially crew-member thereof (UK).

**Junkers double wing** Plain flap mounted entirely aft of wing trailing edge.

**junkhead** Head of sleeve-valve cylinder.

**junkhead ring** Gas sealing ring between head and sleeve.

**JUP** Joint university program.

**JURA** Joint-use restricted area.

**jury strut** 1 Additional or temporary strut for particular short-term purpose.

2 Short strut joining mid-point of main wing strut to wing.

**Jusmag** Joint US Military Advisory Group.

**juste retour** Division of workshares according to a partner-nation's investment, or commitment to purchase. The Eurofighter programme is the first in which this philosophy is no longer being applied.

**Juxco** Joint unexploded ordnance co-ordinating office.

**JV** 1 Joint venture.

2 Jettison vehicle [missile test].

**JVATF** Joint Vertical Airlift Task Force (DoD, August 2003–).

**JVC** Jet-vane control.

**JVMF** Joint variable message format.

**JVX** Joint-services advanced vertical lift aircraft (US).

**JWA** Joined-wing aircraft (microlight).

**J-Warn** Joint warning and reporting network.

**JWC** 1 Joint Warfighting Center (JFCOM, Suffolk, VA).

2 Joint warfare capabilities.

**JWE** Joint Warfare Establishment, Old Sarum [closed].

**JWI** Joint Warrior, or warfare, interoperability; D adds demonstration.

**JWIS** Joint Weather Impact[s] System (USAF).

**JWTC** Joint Warfare Training Centre (Northwood, UK).

# K

- K**
- 1 Kelvin, used without degree symbol.
  - 2 Telemetry, computing (JETDS).
  - 3 Prefix (non-SI or metric) = 1,000, thus K-bit or K-byte, 32K, K-lb or Kp (kilopounds).
  - 4 Factor of wing planform efficiency, or gain.
  - 5 Tanker (UK and US aircraft category, US being a role prefix).
  - 6 Airfield subgrade 300 lb/cu ft, ie dense concrete.
  - 7 See *Knudsen number*.
  - 8 Various ratios, eg surface area of solid grain to nozzle throat; or ratio of propeller pitch to diameter at any chosen radius.
  - 9 Circulation round aerofoil.
  - 10 Potassium.
  - 11 Km/h (flight plan).
  - 12 Thermocouple of chrome/alumel type.
  - 13 Invitation to transmit.
  - 14 Knots (deprecated).
  - 15 Smoke, obstruction to vision.
  - 16 Bulk modulus.
  - 17 Vehicle record category: spacecraft (FAI).
  - 18 Diagonal tension factor in web-stiffened sheet; from this is derived the shear-buckling constant  $\sqrt{K_s}$ .
  - 19 Helicopter rotor reduced frequency  $\Omega_c/2V$ .
- k**
- 1 Prefix kilo ( $\times 1,000$ ).
  - 2 Cathode.
  - 3 Cold (air mass), or colder than surface.
  - 4 Boltzmann constant.
  - 5 Radius of gyration.
  - 6 Various time-constants, identified by suffix.
  - 7 Thermal conductivity [also  $\lambda$ ].
  - 8 Location of point load on beam as fraction of 1.
  - 9 Direction of propagation of radiation.
- K-band** EM radiation, 15-75 mm, 20-40 GHz.
- k-bit** 1,000 bits.
- K-chart** List of multipliers for calculating setback for bends other than  $90^\circ$  in metal or other elastic sheet.
- K-dinghy** For one man (RAF, WW2).
- K-display** Horizontal timebase shows two blips from target which vary in height if aerial azimuth direction is incorrect.
- K-index, K-number** Combined measure of moisture content and lapse rate over a range of pressure altitudes.
- K-ration** Standard field rations (USA, WW2, Korea).
- K-loader** Standard US military cargo aircraft loader elevating to side-door sill.
- K-site** Dummy airfield (UK, WW2).
- K-wing** Usually combination of canard plus slender delta.
- K-words** Kilo-words.
- KA** Message prefix (Morse).
- KAB** Guided bomb (R).
- KADS, Kads** Knowledge acquisition data system.
- KAF** Kenya Air Force.
- Kagohl** Heavy-bomber unit (G, WW1).
- KAI** Kazan Aviation Institute (USSR, R).
- Kai** Kaizo (modification) suffix (J Army 1932-45).
- Kaizen** Meetings at which all concerned plan and then implement work flow [clean manufacturing].

- Kalman filter** Powerful software routine for combining multiple inputs (eg INS output and Doppler radar) to give most accurate single answer.
- Kampf** Battle, hence \* *geschwader* = battle group [US wing] = bomber group; \* *Zerstörer* = battle destroyer = heavy fighter (G).
- Kamsin** Hot, dry, southerly wind [Egypt and SE Mediterranean].
- kanat** Underground aqueduct with surface breather tubes (NATO).
- Kan-ban** Use of coloured balls, cards or similar symbols to identify exact location of production-line hold-up (J).
- Kapitän** Commander of a Staffel (G).
- Kapse** Kernel APSE (software).
- Kapton** Polyimide materials, esp. age-resistant plastic sheet used as substrate for solar arrays or with gold coating as thermal insulation for spacecraft (DuPont).
- Kapustin Yar** Soviet ICBM/space ‘cosmodrome’ on flat territory near Caspian.
- karabiner** Steel D-ring on harness for clipping to ‘dog lead’ to prevent photographer, despatcher or other aviator from falling out of aircraft.
- KARI** [South] Korea Aerospace Research Institute [1989-].
- Karldap** Administration centre for Karlsruhe ATC area.
- Kármán-Moore** Classic (1932) theory for aerodynamics of slender body of revolution travelling nose-first in supersonic gas flow.
- Kármán street** Endless succession of vortices, alternate left/right and clockwise/counterclockwise rotation, behind vibrating wire or strut in airflow.
- Kármán-Tsien** Classic (1939 and 1941) theory for compressibility effects on aerofoils, especially variation of  $C_p$  with  $M$ ; most useful form is
- $$C_{pM} = \frac{C_{po}}{(1 - M^2)^{1/2} + \frac{1}{2}C_{po}(1 - [1 - M^2]^{1/2})}$$
- KAS** Killed on active service.
- KASA** Kenya Air Sports Association.
- katabatic wind** Cold air flowing down mountain slope at night (keeps airfield on slope fog-free).
- Katie** Killer alert threat identification and evasion.
- Kaus** SE/E winds in Persian Gulf heralding winter depression.
- KAZ** Air-refuelling unit (R).
- KB**
- 1 Construction (design) bureau (USSR).
  - 2 Kite balloon (WW1).
- K<sub>b</sub>** Wing vortex span factor, distance between wingtip vortices divided by the span.
- kb** Kilobyte[s].
- KBAC** Royal Belgian aero club [Flemish language].
- KBAS** Design bureau for automatic systems (R).
- K<sub>B</sub>** Rolling-moment coefficient of horizontal tail.
- KBF** Kalman-Bucy filter.
- kbit**  $10^3$  bits.
- KBO**
- 1 Weapon-system officer (G).
  - 2 Kuiper-belt objects.
- kb/s, KBPS** Kilobytes per second.
- KBS** Knowledge-based systems.

**KBU** Keyboard unit.

**KC** 1 Kill chain[s].  
2 Keyboard cursor.

**Kc** Propeller chord-line pitch/diameter ratio.

**KCAB** Korean (South) Civil Aviation Bureau.

**kcal** Kilogramme-calorie.

**KCAS** Knots calibrated airspeed.

**KCCU** Keyboard-cursor control unit.

**KCD** Kill-chain development (network warfare).

**KCI** Kill-chain integration.

**KCK** Composite sandwich, Kevlar/carbon/Kevlar.

**kc/s** Kilocycles, ie kHz.

**KCT** Kill-chain timeline.

**KD** Induced-drag factor.

**KDA** Kongelig [Royal] Dansk Aeroklub [Copenhagen Airport] (Denmark).

**KDAR** Kleindrohne anti-radar = small harassment drone (G).

**KDC** Knock-down components.

**KDD** K-band dual digital.

**KDEP** Depth of smoke in thousands of feet.

**KDR** Kill/detection ratio (ASW).

**KDS** Keyboard display station.

**KE** Kenetic energy.

**Ke** Overall buckling coefficient.

**Ke** Dielectric constant.

**KEAS** Knots equivalent airspeed.

**KE-ASAT** Kinetic-energy anti-satellite.

**KEBPI** Kinetic-energy boost-phase intercept.

**keel** 1 Principal longitudinal member along ventral centreline of flying-boat hull or seaplane float.  
2 Underside of flying-boat hull or seaplane float.  
3 Principal centreline structural member of wing of microlight and similar aircraft.  
4 Internal or external rigid or [in semi-rigid] articulated longitudinal member along underside of airship.

**keel angle** That between transverse line joining keel and chine and horizontal.

**keel area** Strictly, projected plan area of keel (2).  
2 Loosely, total side area of aircraft below OX axis.

**keel section** The most-used part of runway, along centreline.

**keel slider** Attachment of pilot or load to keel (3), with ability to slide fore/aft for stability and control.

**keelson** I-beam forming structural backbone of marine hull.

**KEI** Kinetic-energy interceptor.

**KEK** Kinetic-energy kill; V adds vehicle.

**Kelvin** Absolute (SI) temperature scale, degree symbol ° not used; absolute zero is 0K, triple point of water [0°C] is 273.16K, units same as °C. Thus  $t_k = t_c + 273.16$ ,  $= \frac{5}{9}(t_f + 459.67)$ .

**Kennelly-Heaviside layer** Original name for part of ionosphere, E-layer.

**Kentucky windage** Deflection shooting by rule-of-thumb.

**KEP** 1 Key emitter parameters (PD, PRF, frequency, etc).  
2 Kinetic-energy penetrator.

**KEPD** Kinetic-energy penetrator and destroyer.

**Keplerian orbit** Satellite orbit linking two occasions when observer sees satellite against same point in space.

**kerosene** Spelling used by Webster, van Nostrand and most other US dictionaries, by Oxford English Dictionary

and by General Electric and Pratt & Whitney; **kerosine**, chosen by Chambers “**ene** is older spelling”; Encarta suggests “**ene** is US, Can, A, NZ”, also preferred by Rolls-Royce; former UK name **paraffin**. Wide range of petroleum-derived fuels, primarily used for aviation turbine engines. Homologous hydrocarbon series with general formula  $C_nH_{2n+2}$ ; first of this series (methane/ethane/propane/butane) are gases at STP, but next 11 are liquids (BPt 150–310°C) and form basis of jet fuels. Over 90 national designations, thus Jet A-1 is (among other things) DEngRD.2494 in UK, DEF(Aust) 240A, AIR 3405C (Fr), VTL 9130 (G), Gost-1027-67 and T-1 (R), FSD-M0754 (Sweden), 3-GP-23h (Canada), BA-PF-3 (Belgium), D1655-70/A-1 (ASTM), F-34 (NATO) and Avtur/FSII (International Service designation). For this fuel, density 0.796, thus 0.796 kg/l (c9.6 lb/Imp gal, 8.0 lb/US gal). Other major fuels include Avcat narrow-BPt fuel with high flash point (originally for carrier aircraft), Avtur (turbine kerosene, DEngRD 2482, JP-1) and Avtag (turbine aviation gasoline, arguably not a kerosene), originally called JP-4 and in civil use JET B. See *flame front*.

**Kerr cell** Extremely fast electro-optical shutter based on glass container of nitrobenzene in electric field.

**KET** Krypton evaluation technique.

**kette** Section of three fighter aircraft (G, WW2).

**Kevlar** Fibre-reinforced composite materials with fibre properties superior to those of most glasses. Kevlar-49 is called aramid fibre from resemblance to spider web (trade name, DuPont).

**KEW** Kinetic-energy weapon[s], especially for SDI.

**key** 1 Position at start of letdown to landing, usually hi-\* 15,000ft, lo-\* 9,000 ft (US).  
2 Tapered pin [suggest = cotter] to lock parts to move together.

**keyed emission** CW signal interrupted to convey intelligence.

**keying** Interrupting current or signal by make/break switch, eg Morse key.

**keying solution** Applied to give strong surface bond prior to application of dope, adhesive, corrosion protection or other coating.

**keys** 1 Piano keys.  
2 On electronic display, edge keys.

**keystroke** 1 Input from an edge key.  
2 Basic element in electronic-display writing.

**KF** Kinetic fires.

**KFD** Key-fill device.

**KFI** Krüger flaps indicator.

**KfR** Kommission für Raumfahrttechnik (G).

**KFS** Kerosene first stage.

**KG** Kampfgeschwader, bomber wing (G, WW2).

**K/G** Kevlar/graphite [IPH adds inter-ply hybrid].

**kg** Kilogramme[s].

**kg** Helicopter-rotor gust reduced frequency.

**KGB** State committee for security (USSR, previously NKVD).

**KGC** Japanese Science and Technology Agency.

**kgf** Kilogrammes force or thrust (non-SI).

**kgp** Kilogrammes force or thrust (poids, pond, puissance).

**KGSK** Japanese Aeronautical Council.

**KGV** Kryptographic variable (panel).

- kGW, KGW** Thousands of pounds gross weight (highly ambiguous).
- KH** Key Hole series of covert spy satellites (CIA/USAF).
- Kh** Western rendition of Russian X, one use of which is to designate ASMs.
- kh<sub>b</sub>, kh<sub>h</sub>** Factor for effect of forward speed on suckdown (jet lift).
- KhAI** Kharkov Aviation Institute (USSR, Ukraine).
- Kharif** Severe dust storm (Somalia).
- Khe Sanh** Extremely steep approach and departure (colloq., noun or verb).
- KHTT** Know-how transfer and training.
- kHz** Kilohertz, thousands of cycles per second.
- Ki** Kitai (airframe type) number (J Army 1932-45).
- k<sub>i</sub>** Radius of gyration.
- KIA** Killed in action.
- KIAS** Knots indicated airspeed.
- Kic** Fracture toughness.
- kick** Final impulse given by small upper-stage motor to space payload to achieve exact trajectory. Hence \* motor, \* stage, apogee \* motor.
- kickback** Bribe offered in large-scale contracting.
- kicker** Direction needle [SBA, ILS, colloq.].
- kick-off drift** In autoland, separate control signal inserted before touchdown to yaw aircraft parallel to runway (but too late for crosswind to move aircraft laterally from centreline).
- KIFA** Killed in flying accident.
- KIFIS, Kifis** Instantaneous vertical speed indicator.
- Ki-Gas** Piston-engine hand-priming system drawing fuel from main tanks.
- Kilfrost** British liquid and paste deicer materials including propylene and other glycols.
- kill** 1 Confirmed victory in air combat.  
2 Destruction of missile or RV in flight.
- kill box** Predesignated volume of sky, usually rectilinear, in which air or ground targets are sought.
- kill chain** Process linking discovery of target by sensor to lock-on by shooter, also called *S2S* and *TCT*.
- kill/loss ratio** Actual or claimed ratio of kills confirmed to losses suffered by a particular unit in a specified period; see kill ratio.
- kill probability** Mathematical likelihood, based on experience, that a particular missile or attack will destroy its target.
- kill ratio** 1 For a particular type of aircraft, total of its air victories divided by its own losses in air combat.  
2 Confirmed victories divided by number of hostile AAMs or SAMs launched.
- kilo** Prefix, multiplied by 1,000; symbol k. Confusingly, often loosely used to mean kilogramme[s] or even kilometre[s].
- kilobyte** Not 1,000 but 1,024 bytes, abb. kb.
- kilocalorie** Non-SI unit of energy, often defined as 1/860 kWh, but see *calorie*.
- kilocycle** Measure of frequency, = 1,000 Hz.
- kilogramme** SI unit of mass, = 1,000 grammes, in US kilogram, abb. kg, = 2.20462 lb. See *IPK*.
- kilogramme-metre** Unit of work in the gravitational system, = 9.80665 Nm or 98,066,500 ergs.
- kilohertz** SI unit of frequency, = 1,000 Hz, abb. kHz.
- kilojoule** Si unit of energy, = 0.94786 Btu.
- kilometre** In US often kilometer, unit of length = 1,000 m, 0.6214 statute mile, 0.5399568 Int. n.m., 0.5396129 UK n.m.
- kilometric** Having a wavelength in the order of kilometre[s].
- kilonewton** SI unit of force or thrust, abb. kN, = 224.80455 lb st.
- kilopond** Kilogramme force, falling into disuse.
- kiloton** Measure of NW explosive power, = that of 1,000 short tons of TNT (incorrectly, tonnes or long tons).
- kilovolt** Measure of electric potential, = 1,000 V, abb. kV.
- kilovolt-ampere** Measure of power of a.c. electrical machines, abb. kVA, numerically usually loosely = kW.
- kilowatt** SI unit of power, abb. kW = 1,000 W, = 1.341 hp.
- kilowatt-hour** Non-SI unit of electrical energy, kWh = 3.6 MJ.
- kiloword** Unit of memory storage holding 1,024 words.
- kinematic coupling** The rapid conversion in roll of high  $\alpha$  [AOA] to sideslip.
- kinematic ranging** Aiming ahead of target correct lead angle to allow for target relative motion.
- kinematic viscosity** Fluid viscosity divided by density,  $\mu/\rho$ , symbol *v*, unit  $\text{m}^2\text{s}^{-1}$  (no name) =  $10^4$  Stokes = 10.7643  $\text{ft}^2\text{s}^{-1}$ .
- kinetheodolite** Tracking and recording instrument comprising high-speed camera whose frames bear az/el measures.
- kinetic energy** That due to motion: for linear motion  $E=\frac{1}{2}mv^2$ ; for rotary  $E=\frac{1}{2}I\omega^2$  where *I* is moment of inertia and  $\omega$  is angular velocity. Unit = joule. Note: symbols T and W are also used.
- kinetic heating** Heating of boundary layer and surface beneath due to passage of body through gas, closely proportional to square of airspeed or Mach. For practical purposes synonymous with *aerodynamic heating*.
- kinetic kill** Space interception technique using weapon whose kinetic energy alone provides its direct-impact destructive effect.
- kinetic pressure** See *dynamic pressure*.
- kinetic valve** Gas-turbine fuel-system valve in which two jets, one pump delivery pressure, the other pump servo pressure, point directly at each other with a variable interrupter blade where they meet.
- kinetic weapons** All forms of projectile including bombs.
- kingpost** One or more strong vertical struts above (and sometimes below) aircraft centreline providing attachment for primary flying and landing wires or struts, rare post-1916.
- kink point** Any sharp corners on a graphical plot, e.g. of payload/range.
- kip** Kilopound, 1,000 lbf (half a short ton), = 4,448.221615N. Not to be confused with *kilopond*.
- kipper kite** Aircraft of Coastal Command [colloq. 1939-45] (RAF).
- Kips** Confusingly, in view of above, thousands of impulses, or instructions, per second.
- KIR, Kir** Kinematic infra-red (flare).
- Kirksite** Zinc alloy used for large airframe dies.
- Kirkwood gaps** Gaps in the asteroid belts.
- Kiruna** Swedish space launch and communications stations.
- KIS** Kick-in step.
- kiss landing** Touch at near-zero rate of descent.

## kitbuilt

**kitbuilt** Constructed by customer from factory-supplied kit.

**kite** 1 Aerodyne without propulsion tethered to semi-fixed point and sustained by wind.

2 Aeroplane (UK colloq. usage, 1913-c50).

**kite balloon** Balloon tethered to Earth or vehicle and shaped to derive stability (sometimes lift) from relative wind.

**kitplane** Aeroplane assembled by customer from factory-built kit.

**kitting** One of many aerospace meanings is to furnish item (engine, surface power unit, etc) with fresh consumables (filter elements, harnesses, circlips, gaskets) before reinstallation.

**kJ** Kilojoule, joules  $\times 10^3$ .

**KJT** Japan Air Self-Defence Force.

**KKKK** Air traffic controllers assoc. (J).

**KKV** Kinetic kill vehicle.

**KKW** Kinetic kill weapon.

**K<sub>L</sub>** Lift slope factor.

**KLB[s], Klbs** Pounds (lb)  $\times 10^3$  [suggest not used without explanation].

**KLD** Killed in line of duty, but not in action (US usage).

**Klégécel** GRP/foam low-density sandwich materials (Kléber-Colombes).

**klick(s)** Kilometre(s) (colloq.).

**klips, KLIPS** Thousands of logical inferences per second.

**KLV** Copenhagen airport authority.

**KLYR** Smoke layer aloft.

**klystron** Velocity-modulated electron-tube UHF oscillator.

**KM** 1 Kriegministerium (war ministry, G).

2 Kevlar monolith[ic].

**kM** Rare prefix, kilomega (giga).

**km** Kilometre[s]; hence km/h, kilometres per hour.

**K Monel** Ni-Cr alloy; strong and corrosion-resistant, non-magnetic.

**KMR** Kwajalein Missile Range, in mid-Pacific (USA).

**KMW** Kuratorium der Mensch und der Weltraumfahrt eV (G).

**KN, K/N** Kevlar/Nomex.

**Kn** 1 Solid rocket motor ratio of initial surface area to throat area.

2 Knudsen number.

3 Static margin.

**kN** Kilonewton; SI unit of force standard for most aerospace propulsion, = 224.809 lbf.

**KnAPI** Komsomolsk-on-Amur Polytechnic Institute.

**knee** Upper right corner on payload/range curve, or graph of similar shape.

**kneeboard** Historically, a notepad, stopwatch and other items strapped as unit to test pilot's leg above knee. Today an A5 panel with maximum information for G.A. pilot.

**knee line** Transverse line across [usually fighter] cockpit through front of pilot's knees.

**kneeling** Some landplanes have \* landing gear to tilt nose-down to reduce space (aboard carrier), adjust cargo floor to truck bed, or alter wing angle of attack for catapult launch. Hence \* parking.

**knee panel** Instrument or control panel at knee level, below side console.

**knee window** Low on side of cockpit [rare except helicopters].

## Kourou

**Knickebein** Navaid derived from Lorenz beam approach (G, WW2).

**knifedge** Airshow flypast with angle of bank held close to 90°, with top or underside facing audience.

**knife fight** Close combat, usually one-on-one, (US term).

**KNMI** Royal Netherlands Meteorological Institute.

**knock-down factor** Arithmetical factor reducing allowable stresses imposed by certifying authority on uncertain structure [e.g. casting with porosity].

**knockdown kit** Complete aircraft packaged for shipment in component parts for assembly by foreign customer (usually also a licensee).

**knock-down path** The route followed by fire-fighters to a crashed aircraft, esp. the final few metres in which a path is blown through flames.

**knocking** Detonation (1).

**knockout panel** Portion of skin near pilot or other crew-member, often a window, which can be forced open from inside for emergency escape [esp. after belly landing].

**knock rating** Standard scale of resistance to knock (detonation) of piston-engine fuels, measured relative to iso-octane (100) (see *fuel grade*).

**knot** 1 Speed of 1 nautical mile per hour, International and in US = 6,076.12 ft/h = 1.15078 mph = 1.852 km/h = 1.6878 ft/s = 0.5144 ms<sup>-1</sup>; in UK = 6,080 ft/h = 1.151 mph = 1.853184 km/h = 1.68 ft/s = 0.51477 ms<sup>-1</sup>.

2 Nautical mile = 6,080 ft, 1,853.184 m.

**knuckled** Original adjective for levered-suspension landing gear.

**knuckle pin** See *wrist pin*.

**Knudsen flow** Gas flow in long tube at such near-zero pressure that mean free path is greater than tube radius.

**Knudsen number, Kn** Mean free path divided by characteristic length of body.

**KNvL** Royal Netherlands Aeronautical Association.

**KO** Has been used to mean both kerosene and kerosene/oxygen.

**Koch fitting** Steel latches over wearer's chest connecting g-suit and harness to ejection seat and parachute.

**KOCTY** Smoke over city.

**KOD** Kick-off drift.

**KOH** Potassium hydroxide, used as standard in determining acidity and saponification of fuels, lubricants and hydraulic oils.

**Koku Kantai** Air fleet (J Navy, WW2).

**Kokutai** Complete air corps (J Navy, WW2).

**Kollsman number** Traditionally, altimeter setting, usually QFE or QFF.

**Kolmogorov eddies** The smallest eddies in a fluid flow, now considered in aircraft design.

**Kolokol** Controlled tail-slide manoeuvre (R).

**kombi** Release on glider suitable for winch launch or aerotow.

**Kommadore** Commander of a Geschwader (G).

**Komsomol** League of Young Communists (USSR).

**Komta** Committee for heavy aviation (USSR, obs.).

**Kops** Thousands of operations per second.

**Korex** Family of aramid/phenolic honeycombs.

**Koronas-F** Solar observatory launched 2001 (R-Ukraine plus others).

**KOSOS** Department of experimental aeroplane construction (USSR, obs.).

**Kourou** CSG.

**Kovar** Fe/Ni/Co alloy whose coefficient of thermal expansion is close to that of glass.

**Kp** Kilopound, also called kip.

**kp** Kilopond, 1 kgf.

**kPa** Kilopascal[s], 1,000 N/m<sup>2</sup>, SI unit of pressure.

**kph** Incorrect abbreviation for kilometres per hour.

**KPP** Key performance parameter[s].

**KPS** 1 Kilobytes per second.

2 Kills per sortie.

3 Knowledge-processing system.

**KPU** Keyboard printer unit.

**k<sub>Q</sub>** Torque coefficient.

**Kraken** Knowledge-rich acquisition of knowledge from experts who are non-logicians (USAF).

**Kriegsmarine** Navy (G, 1933-45).

**KRL** Khan Research Laboratories (Pakistan).

**KRs & ACIs** King's Regulations and Air Council Instructions (RAF 'bible' to 1952).

**Krueger** Not Krüger, leading-edge flap normally flush with undersurface, hinged down and forward to give bluff leading edge on high-speed profile.

**krypton** Kr, inert gas, density 3.7x10<sup>-3</sup>, BPt -52°C.

**K<sub>s</sub>** Factor of takeoff distance.

**K<sub>s</sub>** See K(17).

**k<sub>s</sub>** Stiffness of spring or shock absorber.

**KSA** Royal Swedish aero club [186 clubs, SE-16102 Bromma] (Sweden).

**KSC** 1 John F Kennedy Space Center, includes Capes Canaveral and Kennedy, Merritt Island and the ETR.

2 Most confusing, kg/sq cm.

**KSFC** Thousands of simulated flight-cycles.

**KSI, ksi** Most confusing, thousands of pounds per square inch.

**K<sub>σ</sub>** Gust-alleviation factor related to wing chord.

**K<sub>su</sub>** Spin-up factor on wheel hitting runway, = f (t<sub>su</sub>/t<sub>n</sub>), spin-up time and natural period of gear in fore/aft vibration.

**KT** Geometric stress-concentration factor.

**kT** Kiloton[nes].

**k<sub>T</sub>** 1 Thrust coefficient.

2 Stiffness of tyre [tire].

**kt** Knot[s].

**KTAS** Knots true airspeed.

**KTD** Key-transfer device.

**KTN** Knowledge-transfer network.

**kts, KTS** See kt.

**Küchemann carrot** See shock body.

**Küchemann 'Coke bottle'** Wasp-waisted fuselage of

high-subsonic aircraft with sides following local streamlines past wing. Not area ruled.

**Küchemann tip** Low-drag wingtip following outward-curved streamlines, with large-radius curve from leading edge to corner at trailing edge.

**kulbit** 1 A circle (R).

2 Somersault [Frolou], stopping motionless in vertical nose-up attitude whilst using vectoring to rotate in azimuth 360°.

3 Less dramatic, in horizontal or vertical flights point nose around circle centred on longitudinal axis.

**KUR** Key user requirement[s].

**Kussner function** A correcting factor for angle of attack as an aerofoil penetrates a gust, because the  $\alpha$  changes gradually, not instantaneously, symbol  $\tilde{\alpha}$ .

**Kutney bump** Drag-reducing bulge on inner side of pylon/wing junction.

**Kutta condition** The strength of the circulatory vortex on the underside of the wing is equal and opposite to that on the upper surface,  $\Gamma_l + \Gamma_u$  [sometimes written  $\gamma_l + \gamma_u$ ] = 0

**Kutta-Zhukovsky** Formula giving lift per unit span as  $K\rho V$  (circulation  $\times$  density  $\times$  velocity) for two-dimensional irrotational inviscid flow.

**KV** Kill vehicle.

**kV** Kilovolt[s].

**kVA** Kilovolt-ampere[s].

**KVAR** kVA-reactive, measure of reactive power.

**KVDT** Keyboard visual display terminal.

**KW** 1 Kinetic warhead.

2 Key word; IC and OC add in, or out of context.

**kW** Kilowatt[s].

**kWh** Kilowatt-hour[s].

**KWS** Kampfwertsteigerung (G).

**K<sub>x</sub>, K<sub>y</sub>** 'Engineering' drag and lift coefficients.

**k<sub>x</sub>, k<sub>y</sub>** Respectively, helicopter rotor longitudinal and lateral inflow gradients.

**kymograph** 1 See barograph.

2 Smoked-paper chart recording aircraft angular movements (arch.).

**Kyoto Protocol** The first international agreement on a [small] reduction in greenhouse-gas emissions [38 nations] (1997).

**kytoon** Combination kite + balloon or kite-shaped balloon.

**kZ** Vertical component of VSI (1).

**KZB** Drop tank (G).

**KZO** Mini-RPV for target detection and location (G).

**k×k** 1,000  $\times$  1,000 pixels.

**kΩ** Kilohm.

# L

**L** 1 Characteristic length of body; also used for linear spacing of frames, alternative to b.

2 Total lift, or section lift of helicopter rotor.

3 Sound pressure level, see *Noise*.

4 Inductance; unit, henry.

5 Luminance, brightness.

6 Distance to applied load.

7 Low (navaid category), under 18,000 ft and En

Route Low-altitude chart (FAA).

8 Low (synoptic chart).

9 Rolling moment.

10 Countermeasures (JETDS).

11 Lighted (airfield).

12 Code: IFR aircraft has DME and transponder.

13 Fighter designation prefix, low-altitude (UK, WW2).

14 Aircraft category, glider (prefix, USN, 1941–45), liaison (USAF from 1942, USN from 1962).

15 Modified-mission, cold-weather (prefix USAF, USN), searchlight carrier (USN until 1962).

16 Left (ident of parallel runway).

17 Lower wing.

18 Angular momentum.

19 In-line (piston engine).

20 Drizzle (ICAO).

21 Latitude.

22 Light (turbulence).

23 Locator.

24 Licensed airport.

25 Cleared to land.

26 Local.

27 Launch time of mission.

28 Low-intensity [airfield lighting].

29 Level [fluid].

**l** 1 Litre[s].

2 Aerofoil section lift.

3 Length of beam, or aircraft overall length, or length of influencing vortex filament.

4 Distance from c.g. of aeroplane to c.p. of horizontal tail.

5 Stagnation line.

6 Terrestrial longitude.

7 Subscript, lower surface.

**L̄** Average peak sound pressure level.

**L̄** Section lift of 2-D aerofoil [lift per unit span, normal to freestream].

**(L)** Lower-airspace radar service, preceded by frequency.

**L1** L-band carrier 1,575.42 MHz (GPS).

**L2** L-band carrier, 1,227.6 MHz (GPS).

**L2CS** Two GPS codes, one with navigation data, for improved accuracy for civil users.

**L3TV, L<sup>3</sup>TV** Low-light-level TV.

**L5** Third civil GPS frequency at 1,176 MHz, to be introduced 2005.

**L<sub>300/600</sub>** Sound pressure level for octave band 300/600 Hz, see *noise*.

**L-band** See Appendix 2.

**L-display** Central diametral timebase (usually vertical)

on which appear transmitter and target blips at position giving range and offset according to pointing error.

**LA** 1 Lighter than air.

2 Launch azimuth.

3 Loiter altitude.

4 Limited authority.

5 Lietuvos Aeroklubas (Lithuania).

6 Latvijas Aeroklubs (Latvia).

**La** Lanthanum.

**L<sub>A</sub>** A-weighted sound pressure level, see *noise*.

**LAA** 1 Light anti-aircraft gun or gunfire.

2 Low-altitude airspace.

3 Local-airport advisory.

4 Lowest acceptable altitude.

5 Low-altitude alert [S adds system].

6 Laboratory of Applied Anthropology.

7 Lateral accelerometer.

8 Light Aircraft Association [Turweston Aerodrome, Brackley, NN13 5YD] (UK).

**LAAAS, LA<sup>3</sup>S** Low-altitude airfield-attack system.

**LAAD** Low-altitude air defence; S adds system.

**LAADR** Low-altitude airway departure route.

**LAA/DR** Low-altitude arrival/departure route.

**LAANC** Local Authorities Aircraft Noise Council (UK).

**LAAP** Low-altitude autopilot.

**LAAS** 1 Laboratoire d'Automatique et d'Analyse des Systèmes (F).

2 Low-altitude attack, or alert, system.

3 Local-area augmentation system, or scheme, proposed as GPS-based successor to ILS (FAA).

**LAASH** Litef analytical air-data system for helicopters.

**LAAT** Laser-augmented airborne TOW.

**LAAV** Light airborne ASW vehicle.

**LABRV** Large advanced ballistic re-entry vehicle.

**Labs** Low-altitude bombing system (guidance for upward toss of NW).

**labyrinth seal** Gas seal between fixed and moving parts comprising series of chambers which, though their sides do not quite touch, reduce gas escape close to zero.

**LAC** 1 Leading Aircraftman (RAF, obs.).

2 Low-altitude en route chart.

3 List of assessed contractors.

4 Lebanon Aero Club.

**LACAC** Latin American Civil Aviation Commission [from 1969].

**LACC** London Air Control Centre.

**Lace** 1 Laser airborne communications experiment.

2 Liquid air cycle engine.

3 Low-power atmospheric compensation experiment.

4 Local adaptive contrast enhancement.

**Lacie** Large-area crop inventory experiment.

**lacing** 1 Process of intermittent wrapping to join wire bundle into tight loom.

2 Stitching fabric to aircraft structure.

3 Threading wire through holes drilled at same location in every blade of a fan or turbine rotor to damp vibration.

**lacking moral fibre** Condition, often unfairly diagnosed, which resulted in aircrew being instantly removed from

operations, and in most cases losing brevet and rank (RAF – WW2).

**LACM** Land-attack cruise missile.

**Lacors** Local Authorities Co-ordinators of Regulatory Services (UK).

**lacquering** Gradual but irreversible deterioration of fuel left to soak in a spray nozzle or similar hot part [so such places are purged].

**Lacta** Light-air-cushion triphibious aircraft.

**LACW** Leading Aircraftwoman (WRAF).

**LAD** 1 Laser acquisition device.

2 Large-area display.

3 Low-altitude dispenser.

4 Local-area differential [GPS, GNSS can be suffixed].

5 Launch-assist device.

**ladar** See *lidar*.

**LADD** Low-altitude (or angle) drogue delivery.

**ladder network** Cascade of electrical sub-circuits each controlled by its predecessor (central to test equipment).

**LADF** Lift-augmented ducted fan.

**LADGNSS** Local-area differential GNSS.

**LADGPS** Local-area differential GPS.

**lading** Placing load on aircraft, including bar stocks and food trolleys, excluding passengers and fuel.

**Lado, LADO** Launch, anomaly and disposal operations (Navstar).

**LADS, Lads** 1 Lightweight air-defence systems.

2 Laser airborne depth sounder, for charting seabottom depth to assist in-shore ASW.

**LAE** 1 Low-altitude extraction (para-drop cargo).

2 Licensed aircraft engineer (SLAET).

**LAEO** Low-altitude electro-optics, or optical.

**LAES** Landing Aids Experiment Station (Arcata, CA, from 1946).

**LAF** Load-alleviation function.

**LAFT** Light-aircraft flying task (RAF).

**LAFTS** Laser and FLIR test set.

**lag** 1 Angular crankshaft movement between a reference position (TDC, BDC) and open/closure of a valve.

2 Angular movement of electrical vector between reference position and current vector or other waveform.

3 Angular movement between helicopter main-rotor hub and (temporarily slower) blade; hence \* hinge, \* angle.

4 In instruments, eg VSI (1), normal meaning of delay.

5 In level bombing, horizontal distance between impact point [or an intermediate air position] and that achieved in vacuum.

**Lageos** Laser geodynamic satellite.

**lag-plane damping** Damping of fundamental mode of rotor system; critical for suppression of various instabilities, esp. ground and air resonance; expressed as % critical damping in non-rotating condition.

**Lagrangian co-ordinates** Identify fluid parcels by assigning each a series of time-invariant co-ordinates such as transient spatial position. Constant-pressure meteorological balloon observations are Lagrangian.

**Lagrangian points** Five positions in space where free body could maintain station with respect to satellite in existing two-body (eg Earth/Moon) system.

**LAH** Light attack helicopter.

**Lahat** Laser-homing anti-tank.

**Lahaws, LAHAWS** Laser homing and warning system.

**LAHC** Lincolnshire Aviation Heritage Centre.

**LAHRS** Low-cost attitude/heading reference system.

**LAHS** 1 Low-altitude high-speed route; military VFR training (US).

2 Land and hold short; O adds Operation.

**LAI** Lean aerospace [or aircraft] initiative.

**LAIRCM** Large-aircraft IRCM.

**Lairs** 1 Large-aperture IR sensor.

2 Lightweight advanced imaging radar system.

3 Light-aircraft reconnaissance system.

**LAL** Launch and leave.

**L $\alpha$**  Lift due to angle of attack (aircraft attitude), hence  $L_{\alpha WB}$  = lift of blended wing/body due to  $\alpha$ .

**LALS** Linkless ammunition loading system.

**LAM** 1 Long aerial mine (hence codename Mutton).

2 Loiter[ing] attack missile, or munition [-A adds aviation].

3 Logical acknowledgement message.

4 Laser additive manufacturing.

**LAMA** Light Aircraft Manufacturers' Association [office, Pleasonton, CA94588], (US).

**Lamars** Large-amplitude multi-mode aerospace research simulator.

**lambda foot** Bifurcated shockwave near solid surface, resembling Greek letter.

**lambert** Former unit of luminance,  $\frac{1}{\pi}$  cd/cm<sup>2</sup>; thus 1 foot-lambert = 3.426 cd/m<sup>2</sup>.

**Lambert projection** Map projection of modified conical type in which cone intersects Earth round two 'standard parallels' of latitude.

**LAME, Lame** Line (or licensed) aircraft maintenance engineer.

**Lamilloy** HP turbine cooling technology (former Allison co.).

**lamina** Elementary (ie infinitely thin) slice.

**laminar boundary layer** Comprises successive laminar layers, that adjacent to surface having zero relative velocity and successive layers adding velocity out to the free stream.

**laminar flow** Fluid flow in which streamlines are invariant and maintain uniform separation, with perfect non-turbulent sliding between layers.

**laminated** Made of thin layers bonded together.

**LAMP, Lamp** 1 Lockheed adaptive modular platform, or payload,

2 Large advanced mirror program for space laser (SDI).

3 Lyman-Alpha mapping project.

**LAMPS, Lamps** 1 Low-altitude multi-purpose system (USAf).

2 Light airborne multi-purpose system (USN).

**Lams, LAMS** 1 Load-alleviation and mode stabilization.

2 Light-aircraft maintenance schedule, or scheme, for aeroplanes  $\leq 2,730$  lb (1,238 kg) with 3-year C of A (CAA, UK).

3 Local-area missile system (ship defence).

4 Local-area mission system.

**LAMV** Light aerial multipurpose vehicle.

**LAN** Local area network.

**lan** Inland.

**LANA** Low-altitude night attack.

**Lance** 1 Line algorithm for navigation in combat environment.

2 Launch and network control equipment.

**land** Return to Earth or planetary surface of land-based vehicle; marine touchdown, preferred word is ‘alight’.

**land and hold short** Instruction by controller to landing aircraft to stop before first intersection or designated hold-short point to avoid conflict; recipient must tell ATC immediately if this clearance cannot be accepted.

**land arm** Display signifying system is functioning in autoland mode.

**land breeze** Offshore wind, towards sea.

**L&D** Lateral and directional stability test.

**lander** Spacecraft designed for soft landing on Moon or planet.

**landing** The act of bringing an aerodyne under full control back to land surface

**landing angle** Usually means angle between OX axis and ground at moment of touchdown.

**landing area** Area of unpaved airfield reserved for landing and takeoff.

**landing beacon or beam** Not recognized terms.

**landing charge** Tax levied as part of airport charge.

**landing circuit** Term used by Royal Navy in carrier operations.

**landing compass** Precision magnetic compass on bubble-levelled tripod used as master when swinging aircraft.

**landing crew** Large team(s) of handlers used in airship operations to hold ropes and manoeuvre ship to mast or walk it into hangar.

**landing direction indicator** Visual device [eg tee, tetrahedron] at uncontrolled airfield.

**landing distance, LD** Distance from runway threshold to aircraft stopping point.

**landing distance available** That declared to be available by airfield authority.

**landing flare** Released by aircraft over unlit airfield immediately before landing.

**landing forecast** Met. forecast for destination at ETA, or nearest equivalent.

**landing fuel allowance, LDG, ldg, LFA** Fuel mass required for theoretical circuit (go-around), landing and taxi at destination.

**landing gear** Any portions of aircraft or spacecraft whose function is to enable a landing to be made; this includes wheels/skis/floats and attachments, and hook, but not flaps or lift-dumpers. Maximum speeds are usually prescribed for flight with \* extended, as well as a lower maximum for cycling [act of retraction or extension], also called *LGOS*.

**landing gross weight** Total weight of aircraft at point of touchdown in a particular landing, normally less than MLW.

**landing ground** See *airfield*.

**landing light** Forward-facing aircraft headlight, usually retractable or on nose or in leading edge, formerly to illuminate airfield and now used mainly as anti-collision or anti-bird beacon and for illuminating surface taxied over.

**landing loads** Loads acting through structure of aircraft or spacecraft in design ultimate severe landing (or arrested landing).

**landing long** Landing to touch down far down the runway.

**landing mat** Various definitions, including flexible mat to reduce erosion or ingested debris in jet VTOL over unpaved surface.

**landing minima** Worst weather, especially in terms of

visibility, for legal landing; see *weather minima*. Traditionally involves DH and MDH.

**landing on, landing-on** Recovery of aircraft on carrier, or helicopter on deck, by normal landing.

**landing party** Landing crew (UK).

**landing point** Intended or achieved point of MLG touchdown.

**landing radar** Radio altimeter used by soft-landing spacecraft (rarely, by aircraft).

**landing run** Actual achieved distance from touchdown point to stopping point. Also called roll or rollout.

**landing runway** Runway assigned to arrivals.

**landing site** Target for soft-landing spacecraft.

**landing speed** Generally, TAS (sometimes defined as minimum TAS) at touchdown; plays no part in normal operation, which is based on VMCT and VAT.

**landing surface** Those areas declared by airfield authority to be available for landings.

**landing tee** Large T-shaped sign in signals area of simple lightplane field, rotated to show wind direction.

**landing weight** Predicted total mass of aircraft at landing.

**landing wires** Bracing wires used to bear landing loads (eg sag of wings); also known as anti-lift wires.

**landing zone** Area surrounding airfield where allowable heights of obstructions are limited (arch.).

**land mine** In 1940 Germany discovered magnetic mines could be countered, so existing stocks were fitted with direct-impact fuses and dropped (retaining the parachute) on British cities, receiving this name by recipients.

**land on** To land an aircraft on ship, especially carrier.

**landplane** Aircraft designed to operate from land or aircraft carrier, including ice or snow on skis.

**Landsat** Earth-resources satellite.

**LANE, Lane** Low-altitude navigation equipment.

**lane** 1 One conductor wire of a fly-by-wire or autopilot channel; in most modern flight-control systems there are three channels, each having three lanes.

2 One hyperbolic track in early Gee or Decca navigation.

3 One passenger guideway down escape slide.

4 Queues at check-in or departure security.

**lanes** Furrows on sea surface indicative of wind direction.

**Langley** NASA research centre near Hampton, VA. abb. LaRC.

**Langmuir-Blodgett** Film one molecule thick deposited on substrate in manufacture of very-high-speed devices.

**LANL** Los Alamos National Laboratory (New Mexico, US), see *LASL*.

**Lannion** French space communications ground station.

**Lans, LANS** Land navigation system.

**Lansu** Local air-navigation service unit (ATC).

**lanthanum** La, soft silver metal, density 6.1, MPt 921°C.

**Lantirn** Lo-altitude navigation[al] targeting IR for night (autonomous pod-mounted fire-control linked to HUD).

**LAP** 1 Large-scale advanced propeller or propfan.

2 Load, assemble and pack.

**lap** 1 To fit two mating metal surfaces by rubbing together with fine abrasives.

2 Crankshaft angular movement with inlet and exhaust valves open.

3 Overlap (air reconnaissance).

4 See *laps*.

**Lapads** Lightweight acoustic processing and display system.

**Lapam** Low-altitude penetrating attack missile.

**Lapan** National Institute for Aeronautics and Space (Indonesia).

**LAPB** Link access protocol, balanced.

**LAPCB** Live Animals and Perishable Cargo Board (IATA).

**Lapels** Large automated production of expendable launch structures.

**Lapes** Low-altitude parachute extraction system.

**lap joint** One sheet edge overlapping its neighbour.

**LAPL** Light Aircraft Pilot Licence

**Laplace** Name given to chief class of integral transforms, to elliptic partial differential equation and basic theorem on probabilities.

**lap pack** Parachute pack carried on seated wearer's lap.

**Laps** Local analysis and prediction system.

**laps** Flaws in surface of steel castings.

**lapse rate** Rate of reduction of temperature with height in atmosphere (see *dry adiabatic* \*\*, *wet adiabatic* \*\*).

**LAPSS** Laser airborne photographic scanning system.

**lap strap** Primitive seat harness with single belt across lap, almost universal in civil transport aircraft.

**LAR** Live-animals requirements (IATA).

**LARA**

- 1 Light armed reconnaissance aircraft.
- 2 Low-altitude radar altimeter.

**LARC** Low-altitude ride control (Softride); system for reducing vertical acceleration on crew compartment in high-speed flight through gusts.

**LaRC** Langley Research Center, [Hampton, VA, from 1920] (NASA).

**large aircraft** Over 12,500 lb (5,670 kg) MTOW (US).

**large bird** Mass 4 lb, 1.8 kg.

**large-scal integration** Typically c1,000 circuits, gates or logic functions on each chip; accepted upper limit is 16 kbit, above which is VLSI.

**large space structure** Assembly of beams and girders having overall dimensions in range of hundreds of metres, posing unique problems of vibration and attitude control.

**LARH** Light armed reconnaissance helicopter (USA).

**Larmor precession** Motion of charged particle attracted to fixed point in overall weak magnetic field.

**LARS**

- 1 Lower-airspace radar advisory service (UK NATS).
- 2 Large-amplitude resonance simulator.

**LAS**

- 1 Large astronomical satellite.
- 2 Lower airspace service.
- 3 Licensing administration and standardization.
- 4 Launch abort system.

**Las** Landing aid system (Boeing).

**Lasar** Light assault/attack reconfigurable.

**LASC** Lead-angle steering command (air-to-air HUD mode).

**Lascom** Laser communication (system).

**Laser** Light-activated silicon-controlled rectifier.

**LASE** Lidar atmospheric sensing experiment.

**laser** Any of many families of device for emitting coherent light (visible or outside visual spectrum); from light amplification by stimulated emission of radiation.

**laser altimeter** Measures time for laser pulse to return from ground directly beneath aircraft.

**laser centreline localizer** Amber on centreline, red or green, ultimately flashing, L or R.

**laser cladding** Use of laser to deposit layer of [usually exotic] material.

**Lasercom** Laser communications.

**laser gyro** Any system, usually triangular, which senses rotation by measuring frequency shift of laser light trapped in closed circuit in horizontal plane.

**laser inertial reference system** IRS using laser gyro(s).

**laser intelligence** An emerging technology involving analysis of hostile laser emissions.

**laser ranging** Radar technique but using laser to illuminate target, range being function of time of return journey to target.

**laser reference system** Gives attitude/heading, more precise than AHRS.

**laser shock peening** Rapidly repeated firing of high-power laser to cover surface of metal part to increase resistance to crack propagation [the laser fires through a film of water which sends a shockwave into the material].

**laser trimming** Use of laser mounted on travelling microscope to cut metal from specific sites in micro-electronic circuit or device.

**laser welding** Uses high-power (usually CO<sub>2</sub>) laser for micro-precision welding; technique related to EBW.

**LASH, Lash** Littoral airborne sensor hyperspectral, senses anomalies in light patterns to "see" through foliage or water.

**LASI** Large aircraft survivability initiative (AMC5).

**Lasint** Laser intelligence.

**LASL** Los Alamos Scientific Laboratory, centre of nuclear weapon and nuclear rocket research (University of New Mexico).

**LASM** Land-attack Standard Missile.

**Lasors** Licensing, administration and standardization, operating requirements and safety (CAA).

**Lasos** Lasers and space optical systems.

**LASP** Large aircraft security program [October 2008] (TSA).

**Laspac** Landing-gear avionics systems package.

**LASR** Low-altitude surveillance radar.

**Lass**

- 1 Low-altitude surveillance system.
- 2 Lightweight armament support system [helicopter].

**Lassi** Laser air speed sensor instrument.

**Lassie, LASSIE** Low airspeed sensing and indicating equipment (helicopter and V/STOL).

**Lasso** Large-aperture space surveillance (optical) (Darpa).

**last, LAST**

- 1 Low-altitude supersonic target.
- 2 Light-appliquéd armour systems technology.

**last-chance area** Parking spot near military runway for final check of armament status, seat pins, etc.

**last-chance filter or screen** Final point for removal of foreign particles before oil [rarely, fuel] enters engine.

**Laste** Low-altitude safety and target enhancement.

**last form** Large-scale tooling for rapid manufacturing (acronym).

**LASW** Littoral ASW; FNC adds future naval capabilities (US).

**Lat, lat** Latitude.

**Latar** Laser-augmented target acquisition and recognition.

**Latas** Laser TAS system.

**LATCC** London Air Traffic Control Centre (West Drayton, UK).

## **latching indicator**

**latching indicator** Instrument giving visual indication of security of door locks and pressure seals.

**late-arming switch** Sub-circuit in aircraft weapon-control system, enabling arming of weapons or firing circuits to be left until moment of firing.

**latency** 1 Delay in response of flight-simulator motion platform.

2 Delay between gathering intelligence and using it.

3 Time lag between satcom transmission and reception.

**latent heat** Absorbed or emitted when material changes physical state.

**lateral axis** Transverse OY axis, axis of pitch rotation.

**lateral clinometer** See *cross-level*.

**lateral-control criterion** Helix angle, described by wingtip in max-rate aileron roll:  $p b / 2V$  where  $p$  is roll rate,  $b$  span and  $V$  airspeed.

**lateral-control departure parameter** One method of studying loss or reversal of control in roll, for adverse yaw or other reason.

**lateral datum** The transverse line passing through c.g. = lateral axis.

**lateral deviation** Error in radio D/F caused by reflections or refractions.

**lateral divergence** Traditionally, a combination of roll, yaw and sideslip which precedes a spin, or accelerating spiral descent.

**lateral force** Forces acting parallel to line joining wingtips.

**lateral gain** Width of fresh ground covered by each photo-reconnaissance run over area.

**lateral qualities** Behaviour in roll.

**lateral oscillation** One involving periodic roll, invariably with yaw and sideslip.

**lateral-rotor helicopter** Main lifting rotors side-by-side.

**lateral separation** Distance between parallel tracks of aircraft at same FL.

**lateral stability** Stability in roll (secondarily, yaw and sideslip), measured by studying phugoid oscillation (stick free or fixed) following roll disturbance.

**lateral translation** Manoeuvre possible with direct-force-control aircraft in which lateral velocity is commanded without change in heading.

**lateral velocity** Speed component, usually relative to surrounding air, along line parallel to OY axis.

**lateral tell** Communication of air surveillance and air target data sideways to other units along front.

**late turn** One initiated at or after fix passage at waypoint.

**Latex** Laser assoocié à une tourelle expérimentale (F).

**Latis** Lightweight airborne thermal imaging system.

**Latisha** Laser analysis and testing for intelligence, surveillance and hybrid applications (USAF).

**latitude band** Between two parallels of latitude around Earth.

**latitude nut** Screwed in or out on directional gyro (DI) to correct drift due to Earth rotation N or S of Equator.

**LATN** Low-altitude tactical navigation area.

**latr** Compass locator.

**LATS** 1 Launcher automatic test set (Varo).

2 Large-aperture tracking system.

**lattice fin** A misnomer, not a fin but a powered control surface featuring a rectilinear criss-cross of flat surfaces.

Also called trellis control.

## **layered defence**

**launch** In addition to obvious, also take-off of manned combat mission.

**launch bar** Towing link between catapult and nose leg.

**launch complex** Entire ground facilities for launch of large space vehicle, probably including facilities for integration.

**launch control centre** Manned room in launch complex from which countdown and launch, and possibly whole mission, are monitored and controlled.

**launch cost** 1 Sum charged for placing customer's payload in desired orbit.

2 Nominal sum estimated, but not necessarily available, for design, development, construction and test of new major aircraft or engine; usually to certification in country of origin.

**launch cycle** Typically 105 min, average time between launch and recovery for carrier aircraft; AEW/ASW can be launched for a double cycle.

**launcher** 1 Interface unit between aircraft and externally or internally carried store, not necessarily with propulsion.

2 Container of tubes for firing unguided rockets, carried as external store or as retractable box.

3 Pad or other structure for land- or ship-based missile, space vehicle, RPV or other unmanned free-flight device.

**launch escape** Ability of human crew to escape from slow-acceleration ballistic vehicle during countdown or in first seconds of flight, thus \*\* tower, \*\* motors, \*\* signal.

**launch opportunity** Period in which all factors, including launch window, local weather and serviceability of all participating systems, is favourable.

**launch pad** Platform with GSE for launch of ballistic vehicle; normally a fixed installation.

**launch reliability** Percentage of planned missions on which combat aircraft took off on time.

**launch time** Actual time for start of mission, esp. for large vehicle or ICBM, or strategic bomber already on runway with NW on board.

**launch vehicle** Vehicle providing propulsion for space payload or, rarely, atmospheric free-flight device; may be winged or ballistic but must lift off from Earth and impart nearly all impulse required.

**launch window** Exactly defined period during which relative positions and velocities of Earth and other bodies are such that a particular interplanetary mission can be launched, may last minutes to days, and may be a unique opportunity or repeated at intervals.

**LAV** Least absolute value.

**LAW** Light anti-tank (or anti-armour) weapon.

**LAWMS** Lashenden Air Warfare Museum (UK).

**LAWRS** Limited aviation weather reporting station.

**LAWS** 1 Light aircraft warning system (UK Met. Office).

2 Lightweight aerial warning system (US).

**LAX** 1 Limited-area automatic extraction.

2 Single noise event; more precisely  $L_{AX}$ ; see *noise*.

**lay** 1 Adjust aim of weapon in azimuth, elevation or both (obs.).

2 Spread aerial smokescreen.

3 Calculate or project course (obs.).

**laydown** Release free-fall bombs in level flight at low altitude.

**layer** Either of two ionised shells around Earth, called E and F, which see.

**layered defence** 1 System for protecting fixed-base

ICBMs by providing separate sensor/weapon systems for interception of hostile RVs at different altitudes.

**2** More generally, any air defence system designed to assign different types of weapon to threats approaching in different height bands.

**lay off** To redraw engineering part to full scale (has other meanings concerned with aiming).

**layoff** Off-loading temporarily surplus employees (US).

**layout** **1** Gross spatial arrangement of parts of aircraft (see *configuration* [1]).

**2** Arrangement of above-floor payload accommodation, eg one-class \*.

**3** Arrangement of drawings on sheet of paper; hence \* draughtsman.

**4** Geometrically correct drawing of sheet-metal part allowing for all bends, setbacks and joggles.

**lay-up** **1** Basic assembly of parts for FRC structure before bonding under pressure and possibly heat.

**2** To withdraw aircraft from service for modification or rebuild.

**lazy eight** Flight manoeuvre in which nose describes figure 8, upper half above horizon and lower half below.

**LB** **1** Light bomber.

**2** Glider, bomb-carrying (USN, 1941–45).

**3** Light bombardment aircraft category, USAAC 1924–32.

**4** Laser beam.

**5** Free balloon.

**lb** Pound[s] mass, from Latin libra; as the plural is librae it is nonsense to write lbs.

**lb<sub>b</sub>** Beam cantilevered overhang.

**LB film** Langmuir-Blodgett.

**LBA** **1** Luftfahrt Bundesamt [office of civil aviation; D-38020 Braunschweig] (G).

**2** Local boarding application, host boarding gate control.

**LBC** Linear block (digital) code.

**LBCM** Locator back-course marker.

**lbf** Pounds force.

**LBG** Left back-up generator.

**LBH** Light battlefield helicopter.

**LBI** **1** Low-band interrogator.

**2** Long-baseline interferometry.

**LBJ** Low-band jammer; A adds antenna, T transmitter.

**LBL** **1** Left buttock line.

**2** Länder-Behörden der Luftfahrt (G).

**LBNL** Lawrence Berkeley National Laboratory, CA.

**LBO** Leveraged buyout.

**LBPR** Low (under 1.5) bypass ratio.

**LBR** **1** Local base rescue.

**2** Low bit rate.

**3** See next.

**LBRG, lbrg** Laser beam-riding guidance.

**LBSA** Low-band structural array.

**LBSD** **1** Land-based strategic deterrent, to replace existing ICBMs by 2018 (USAF).

**2** Laser-based strategic deterrent [concept].

**LBSS** Low-band subsystem.

**lb st** Pound[s] force, static thrust.

**LBTI** Long-burning target indicator.

**LBV** Lower bevel gearbox.

**LBVDS** Lightweight broadband variable-depth sonar.

**LBW** **1** Laser-beam welding.

**2** Learn by wire.

**LC** **1** Cargo aircraft, cold-weather operation (USAF, USN).

**2** Local call, or control (FAA).

**3** Inductance/capacitance.

**4** Letter contract.

**5** Least-cost.

**6** Liquid crystal.

**7** Light-case.

**8** Load centre.

**LCA** **1** Light combat aircraft.

**2** Large civil aircraft.

**3** Layered component architecture.

**LCAAS** Low-cost autonomous attack system.

**LCAC** Landing craft, air-cushion.

**LCAS** Light close air support.

**LCB** **1** Line of constant bearing.

**2** Liquid-cooled brake.

**3** Lowest compliant bidder (NATO).

**LCC** **1** Life-cycle cost.

**2** Launch-control centre.

**3** Linear cutting cord (canopy).

**4** Load-carrying composite.

**5** Leadless ceramic chip-carrier.

**6** Lateral-control criterion.

**7** Loran-C chart.

**8** Local command centre.

**9** Low-cost carrier[s].

**LCCA** Lateral-control central actuator[s].

**LCCC** Launch-control-centre computer.

**LCCDU** Liquid-crystal crew display unit.

**LCCG** Low-cost core guidance.

**LCCI** London Chamber of Commerce and Industry [air-transport section, London EC4R 1AP] (UK).

**LCCMD** Low-cost cruise-missile defense (Darpa).

**LCCP** Launch-control [SAM] computer program.

**LCD** Liquid-crystal display.

**LCDB** Low collateral damage bomb.

**LCDP** Lateral-control departure parameter.

**L-CES** Limited-capability Earth station.

**LCF** **1** Low-cycle fatigue; C adds counter, D damage, M meter.

**2** Launch-control facility.

**3** Link control field.

**LC<sub>50</sub>** CBW measure, lethal concentration in atmosphere required to kill 50% of exposed population.

**LCFPD** Liquid-crystal flat-panel display.

**LCG** **1** Load classification group (I–VII, corresponding to LCN 120 – ≥10).

**2** Liquid-cooled garment.

**LCH** Light combat helicopter.

**LCH<sub>4</sub>** Liquid methane.

**LCI** **1** Low-cost inertial.

**2** Low-cost interceptor (Darpa).

**3** Logic[al] channel identifier.

**LCIF** Loss of control in flight.

**LCL** **1** Local (FAA).

**2** Lifting condensation level.

**3** Laser centreline localizer.

**LCLC** Low-cost loitering carrier [tactical weapon].

**LC/LO** Numerical percentage cost of least-cost compared with lo-observables.

**LCLU** Landing control logic unit.

**LCLV** Liquid-crystal light valve.

**LCM** **1** Laser countermeasures.

- 2 Landing craft, medium.  
 3 Late change message.  
 4 Linear chirp modulation.  
 5 Lance-cartouches modulaire.  
 6 Logic control module.  
 7 Lithium/carbon monofluoride.
- LCMS** 1 Low-cost missile system.  
 2 Local control and monitoring system.  
 3 Learning content management system.
- LCN** 1 Load classification number; scale of values for paved surfaces indicating ability to support loads without cracking or permanent deformation.  
 2 Logistics control numbers.  
 3 Local communications network.
- LCO** 1 Life-cycle-oriented.  
 2 Launch control officer.  
 3 Limit-cycle oscillation.  
 4 Low-cost operation[s].
- LCOS** Lead-computing optical sight; S adds system.
- LCoS** Liquid crystal on silicon.
- LCP** 1 Leachable chromate primer.
- LCP** 1 Launch control, or command, post.  
 3 Landing craft personnel.  
 4 Lighting control panel.  
 5 Last clicked position.
- LCPC** Laboratory for civil engineers (F).
- LCPK** Low-cost precision kill.
- LCPT** Life-cycle product team.
- LCR** Link-connection refusal.
- LCS** 1 Life-cycle cost sum, ie over whole useful life.  
 2 Liquid-crystal shutter.  
 3 Lift/cruise system.  
 4 Laser camera system.
- LCSS** 1 Land combat support system.  
 2 Laser communications spacecraft (or satellite) system.  
 3 Liquid cooling sub-system.
- LCSTB** Low-cost simulation testbed.
- LCT** 1 Longitudinal cyclic trim.  
 2 Local civil time.  
 3 Landing craft, tank (WW2).
- LCTD** Located.
- Lctr** Location (FAA).
- LCTR, Letr** Locator, suffixes M, O = middle or outer marker.
- LCTS** Low-cost targeting system.
- LCTV** Linac control and transit vehicle.
- LCU** Laser code unit.
- LCV** Landing craft vehicles [p adds personnel].
- LCWDS** Low-cost weapon-delivery system.
- LCZ, LCZR, Lczr** Localizer.
- LD** 1 Landing distance.  
 2 Lunar day.  
 3 Load device, prefix for designations of standard family of cargo containers and pallets, each of particular dimensions and with certificated permissible load.  
 4 Lower data.  
 5 Low-drag.  
 6 Lower deck.
- LD** D (daytime) weighted sound pressure level.
- L/D** Lift/drag ratio.
- LD<sub>50</sub>** CBW measure of lethal dose; that which kills 50% of exposed population.
- LDA** Localizer-type directional aid only.

- LDA, LD<sub>a</sub>** Landing distance available [H adds helicopter].
- LDB** Launch data-bus.
- LDC** 1 Less-developed countries (ICAO).  
 2 Lower-deck container.  
 3 Landsat data continuity [M adds mission].
- LDCC** 1 Leaded chip carrier.  
 2 Lower-deck cargo compartment.
- LDCM** Landsat data continuity mission.
- LDCS** Local-departure control system, complete passenger-handling for non-hosted carriers.
- LDDC** London Docklands Development Corporation (Stolport).
- LDDI** Less-developed defence industries.
- LDEF** Long-duration exposure facility (Shuttle).
- L<sub>δ</sub>, L<sub>Δ</sub>** Lift due to deflection (aeroelastic or surface rotation), thus L<sub>δT</sub> = lift of tail due to deflection.
- L<sub>Den</sub>** Noise level density, noise from all sources summed through each 24h (EC proposal).
- LDFL** Lower DFL.
- LDG, Ldg** 1 Landing gear.  
 2 Landing.
- LDGP** Low-drag general-purpose (bomb).
- LDGPS** Local-area differential GPS.
- LDHD** Low-density high demand.
- LDI** Landing direction indicator.
- LDIN** Lead-in [light system]
- LDL** Lower-deck lavatory.
- LDM** 1 Linear delta modulation.  
 2 Lift/drag meter.
- L/D<sub>max</sub>** Maximum attainable L/D.
- LDMCRC** Lower-deck mobile crew-rest container.
- LDMX** Local digital message exchange (secure terminals).
- L<sub>DN</sub>** Duration of a noise.
- LDNS** Laser (or lightweight) Doppler navigation system.
- LDO** 1 Limited-duty officer (USN).  
 2 Lease, develop, operate.
- LDOC** Long-distance operational control; F adds facility (HF radio).
- LDP** 1 Laser designator pod.  
 2 Landing decision point (helicopter operations from small platforms).
- LDPU** Link and display processing unit (ATC).
- LDR** Low data-rate.
- LDr** Landing distance required.
- L/Dr** L/D for maximum range.
- LDRF** Laser designator rangefinder.
- LDRI** Laser dynamic range imager.
- LDRU** Light-duty release unit.
- LDS** 1 Layered-defence system.  
 2 Lithium-doped silicon.  
 3 Laser detecting set.  
 4 Laser dazzle sight.
- LD/SD** Look down, shoot down.
- LD-SVR** Landing slant-visibility meter.
- LDT** 1 Lateral dispersion at touchdown (generally 10 ft/sec).  
 2 Laser detector and tracker; SCAM adds strike camera.  
 3 Local daylight time.
- LDU** 1 Lamp driver unit.  
 2 Launcher decoder unit.

**LDV** 1 Limiting descent velocity.

2 Laser Doppler velocimeter.

3 Local Defence Volunteers [1940, in 1941 became Home Guard] (UK).

**ldw** Landing weight.

**LE** 1 Leading edge; now has confusing additional meaning arising from expression '\*' of technology', signifying the very latest advances into unknown fields.

2 Life extension.

3 Link establish[ed].

**Le** Lewis number.

**LEA** Leurre [lure] électromagnétique actif (F).

**LEAA** Law-Enforcement Assistance Administration (US).

**lead** 1 Angular measurement of many variables (eg crankshaft motion between opening of exhaust valve and TDC, or AC vectors related to zero-lead reference).

2 Angular distance between sightline to moving target and direction of aim to hit it.

3 First aircraft in element, or first element in large formation.

4 Dominant member of formation aerobatic display duo or team; role is to fly sequence precisely, without looking at No 2.

5 Different pronunciation, Pb, soft ductile metal, density 11.4, MPt 334°C.

**lead aircraft** 1 Aircraft with greater flight time than any other of similar type or using similar airframe.

2 Obviously, that leading a formation or group; see *leadplane*.

**lead angle** See *lead* (2).

**lead azide** Explosive triggered by mechanical deformation, used in detonators.

**lead-computing sight** Gyro or other sight sensitive to flight manoeuvres and providing a direct aiming mark to be superimposed over the target.

**leaded fuel** Containing small percentage TEL as anti-knock additive.

**leader cable** Electrically conductive cable buried along centreline of runway and taxiway to provide ground guidance in zero visibility.

**lead-in** 1 Formerly ground facilities and features between outer marker and threshold.

2 Tube through which aerial or towed MAD bird cable enters aircraft.

**lead-in fighter** Advanced jet trainer with which pupil can practise fighter missions, with sensors and weapons.

**leading** Angular displacement ahead of normal rest position of main-rotor blade of rotory-wing aircraft.

**leading edge** 1 Front edge of wing, rotor, tail or other aerofoil. Not precisely defined and, especially when made as detachable unit, extends to rear of 0% chord.

2 Rising slope of electronic pulse, esp. one on precise timebase, as in CRT, IFF, video etc.

3 Frontier of knowledge (see comment under LE).

**leading-edge flap** Any hinged high-lift surface attached to the leading edge but not forming the leading edge itself (ie, not a droop).

**leading-edge radiator** Piston-engine radiator incorporated into wing ahead of front spar.

**leading-edge root extension** Sharp increase of wing chord at LE root, often almost flat and projecting ahead of wing profile proper, to cause strong vortex at high

AOA and enhance lift, control and manoeuvrability. In extreme (long-chord form) becomes a large strake.

**leading-edge sweep** Angle between local (or, sometimes, mean) leading edge and OY axis.

**leading panel** The FSW in an oblique [slew] wing aircraft.

**leading sweep** Curvature of propeller blade towards leading edge [rare-after 1914].

**lead/lag axis** The quasi-vertical axis at or near the root of a helicopter rotor blade about which the blade can pivot forward or lag to the rear.

**leadplane** That guiding fire tankers to the retardant drop zone, orders sequence and approach path, watches for conflicts and relays altimeter setting (USFS).

**lead pole** Connects cable to tow banner.

**lead-pursuit** Traditional air-to-air attack using fixed guns, approach from rear and aiming ahead of crossing target.

**lead-replacement petrol** UK term for piston engine gasolines in which lead is replaced by VSR additives; in 2002 not yet approved for aviation.

**LEADS, Leads** Law-enforcement agencies data system (airport com. systems).

**lead ship** Prominently marked aircraft on which large day bomber formations formed up before setting course.

**lead time** Time between (a) placing order for bought-out item, or (b) starting fabrication of major airframe part or even (c) receiving heavy plate or other raw material, and emergence of finished aircraft. Expression also, incorrectly, used for time between ordering aircraft and its delivery.

**leaf brake** Power tool for making radiused straight bends in sheet.

**leaf seal** Air or gas seal comprising a dense ring of thin foil blades, sloping in the direction of rotation, surrounding a shaft.

**leakage** Loss of aerostat gas.

**leakage drag** That due to local flows between fixed [eg, wing, tailplane] and movable parts of aircraft.

**leaky turbojet** Turbofan of very low BPR (under 0.5).

**lean** 1 Of fuel/air mixture, below stoichiometric, lacking fuel.

2 Linear distance at tip between position of backwards-leaning rotor blade (usually of gas-turbine compressor or helicopter) and position it would occupy if truly radial; the lean is sometimes along the tip-path plane and sometimes along chord line at tip.

**Lean Aerospace Initiative** Programme by the SBAC and six UK universities to adapt the best practices in lean tools and processes (Toyota) to the aerospace industry. A major difference is that, unlike the motor industry, aerospace involves a great deal of non-recurring activity.

**lean manufacturing** Keeping production line flowing with smallest possible inventory of components and work in progress, and elimination of muda [waste]. (pioneered by Toyota).

**lean mixture octane** At present this means fuel with TEL giving octane rating of 100. Essential for supercharged piston engine engines, replacements for TEL are being sought.

**Leans (the)** Vertigo.

**LEAP** 1 Lightweight exo-atmospheric projectile.

2 Leading-edge aviation propulsion.

## leapfrog

## let-down

**leapfrog** To delay one ranging pulse train from radar to avoid two targets being superimposed.

**LEAPP** Land environment air-picture provision.

**learner cost** Extra element of direct-labour cost when work is unfamiliar.

**learning curve** Fundamental curve portraying fall in manufacturing time or cost with increasing familiarity; abscissa is number of aircraft completed (often log scale) and ordinate is total direct labour cost, or total manufacturing man-hours or total manufacturing cost including raw materials and bought-out parts; usually an idealised curve not allowing for inflation.

**Leasat** Leased satellite, or space bus hired out for different payloads.

**leasing** Possession without title.

**least material condition** That in which the quantity of material in a part is minimised, e.g. maximum allowable hole diameter.

**Lecos** Light (ie optical) electronic control system.

**LEC** Locally employed civilian.

**LECP** 1 Life-extension and capabilities program (US and ARRC).

2 Low-energy charged particle.

**LED** 1 Light-emitting diode; - RHA adds recording-head assembly.

2 Leading-edge down (surface angular movement).

3 Leading-edge device(s).

4 Low endoatmospheric defence [I adds interceptor].

**LEDDM** LED (1) dot matrix.

**LEED** Low-energy electron diffraction.

**lee wave** See *rotor cloud*.

**LEF** 1 Leading-edge flap.

2 Light-emitting film.

**left-hand circuit** Rectilinear circuit (1) with turns to left, anti-clockwise seen from above. Almost universal.

**left-hand rotation** Anti-clockwise, viewed from rear.

**left/right needle** Needle pivoted at top or bottom of panel instrument giving steering indication; pilot steers to keep needle vertical.

**left seat** That of captain of aircraft; thus, \*\* time.

**left-seater** Pilot in command, usually.

**leg** 1 Main strut of landing gear.

2 Part of flight at constant heading between two waypoints.

3 Beam of radio range station, identified by particular flight as inbound \* or outbound \*.

4 The two parts of a control cable running over a pulley at each end.

**legacy carrier** US term for a long-established airline.

**legacy systems** 1 Those which a nation cannot afford to replace.

2 In general, those we use today, as distinct from the much better ones we can envisage. In the course of time everything becomes a \*.

3 Specifically, the previous version.

**legend** 1 Any fixed printed or electronic warning notice in cockpit.

2 Explanatory written matter on engineering drawing.

**leg restraint** Strong belt automatically tightened round occupant's legs as ejection seat fires.

**Lehar** Long-endurance high-altitude rotorcraft (USA).

**LEI** Lean Enterprise Institute (US).

**Leigh light** Powerful searchlight [RAF ASW aircraft 1941–45].

**LEIP** Leading-edge image process (auto map displays).

**Lelfas** Long-endurance low-frequency active surveillance (ASW).

**LEM** 1 Lunar excursion module.

2 Lean-enterprise model.

3 Linear electric motor.

4 Linear[ised] equations of motion.

**Lemac** Leading edge of mean aerodynamic chord.

**LEMF** Leading-edge manoeuvre flap.

**lemon** Aircraft seriously lacking in power, performance and/or manoeuvrability (colloq.).

**Lemonnier** Class of resonant valveless pulsejets, named for inventor.

**LEN** 1 Low-entry networking.

2 Large extension node.

**len** Length.

**Lend** Lunar-exploration neutron detector.

**length** Aeroplanes normally measured in flight attitude along OX axis with perpendiculars aligned with extremities of fixed airframe, normally including pitot or instrument booms; helicopters, must specify whether fuselage only or 'rotors turning', the latter being distance between perpendiculars to OX axis through periphery of rotor discs. Main cause of confusion is that measure is frequently taken from *Station Zero* at a location (often an arbitrary distance) in front of nose of aircraft. NATO measure is always major body \* ignoring nose probes or booms, guns, FR probes, inlet centrebodies, rudder or tailplane overhang or any other projection or rotor blade. SI unit is metre m = 3.28084 ft = 39.37008 in.

**Lens** Laser-engineered net shape.

**lenticular** Having shape resembling side elevation of double-convex lens, with two arcs of large curvature meeting at pointed ends; thus \* blade, a supersonic fan or compressor profile, and \* cloud, found at tops of waves in lee of hills.

**Lenz's law** Current induced in circuit moving relative to magnetic field will generate its own field opposing motion.

**LEO** Low Earth orbit, parameters of which depend upon satellite mass, density, lifetime and other variables.

**Leosat** Low Earth-orbiting satellite.

**LEP** 1 Light-emitting polymer.

2 Life-extension program[me].

**LEPN** Effective perceived noise level, with tone/duration correction. See *noise*.

**Leq, L<sub>eq</sub>** Energy-average sound pressure level.

**LER** 1 Leading-edge radius.

2 Long-endurance rotorcraft.

3 Laser event recorder.

**LeRC** Lewis Research Center (NASA).

**LERX, Lerx** Leading-edge root extension, pronounced 'lurks'.

**LES** 1 Leading-edge slat.

2 Large-eddy simulation.

3 Land Earth station.

4 Launch escape system.

**LESA** Lightweight electronically scanned array.

**LESM** Lightweight ESM (1).

**LESO, Leso** LES (3) operator.

**LESS** Leading-edge subsystem (Space Shuttle).

**LET** Launch and escape time (strategic bomber, cruise missile).

**let-down** Complete procedure from TOD at end of cruise through the approach to landing; term concerned

## lethal envelope

mainly with controlled adoption of successively lower flight levels rather than with the landing; thus \* procedure.

**lethal envelope** Volume, often spherical, within which parameters can be met for successful employment of particular munition.

**letter boxing** Becoming squeezed between cloud layer and rising ground.

**letter-box inlet** Large semi-rectangular air inlet along part of wing (or other) leading edge.

**letter-box slot** Fixed slot at about 8% chord, usually ahead of aileron; further aft than slot formed by open slat.

**letter of intent** Formal letter serving as notice by customer of intention to purchase, before negotiation of contract.

**LEU** Leading edge up (surface angular movement).

**leurre** Decoy [lure] (F).

**lev** Tip chord of vertical tail.

**levanter** Strong easterly wind [straits of Gibraltar].

**Leveche** Pronounced. 'levetchay', hot, dry S wind [Spain].

**level** Air intercept code: "Contact is at your angels".

**level bust** Failure by dangerous margin [usually  $\pm 300$  ft] to fly at assigned FL.

**level landing** Tail-up landing by tailwheel aeroplane; also known as a wheeler.

**levelling circuit** AC filter circuit used to smooth out variation in bias voltage.

**level of escape** Base of exosphere at which upward-moving particle has probability  $1/e$  of colliding with another on way out of atmosphere.

**level off** To pull out of dive or gentle let-down and hold height constant.

**levels of similarity** Quantified lists of differences in aerodynamics and systems between early prototypes.

**leverage** 1 Ratio between variables (eg, if  $\Delta$  DOC due to  $\Delta$  sfc is 8 times the cost of engines and spares to achieve  $\Delta$  sfc then \* of improved sfc is 8).

2 Ratio of effect of destroying target to its own intrinsic value.

**leveraged lease** Lease of aircraft on any of several forms of sliding scale.

**levered suspension** Landing gear wheel(s) carried on arm pivoted to bottom of leg such that vertical travel of wheel is greater than that of shock strut.

**LEVL** Leading-edge vortex lift.

**LEW** Large eye/wheel distance, ie pilot must allow for his height above wheels at touchdown.

**Lewis** NASA research centre for aeronautics, Cleveland, Ohio, Abb. LeRC.

**Lewis aerial** Orthogonal radar scanning sawtooth profile generated by electromechanical means to give flapping beams.

**Lewis number**  $Le = Pr$  (Prandtl)/ $Sc$  (Schmidt), used in hypersonics.

**LEWK** Loitering electronic-warfare killer (UAV).

**LEWP** Line echo wave pattern.

**LEX** Leading-edge extension (US terminology).

**Lexan** Commercially produced polycarbonate plastic, usually transparent.

**LF** 1 Load factor (structural).

2 Load factor (traffic).

3 Local forces, or landing force.

4 Launch facility.

**If., LF** Low frequency (see Appendix 2).

**If** Moment arm of fin [vertical stabilizer], from c.p. to aircraft c.g.

**L + F** Leather and fabric.

**LFA** 1 Landing fuel allowance.

2 Low, or local, flying area.

3 Luftfahrtforschungsanstalt (G).

4 Low-frequency active.

5 Lawyers' Flying Association [office London], (UK).

**LFAC** Ligne Française d'Aéronefs de Collection [aircraft preservation; office, F-75116 Paris] (F).

**LFADS** Low-frequency active dipping sonar.

**LFAS** Low-frequency active sonar.

**LFATS** Low-frequency active towed sonar.

**LFB** Lie-flat bed [seat conversion].

**LFBB** Liquid-fuel flyback booster.

**LFC** 1 Laminar flow control (see *BLC*).

2 Longitudinal friction coefficient.

3 Level of free convection.

**LFD** 1 Lamp failure detector.

2 Large freight door.

**LfE** Learning from experience.

**LFH** Lunar far horizon.

**LFI** Light tactical fighter (R).

**LFICS** Landing force integrated communications system.

**LFL** Lower flammability limit.

**LFM** 1 Low-powered fan marker.

2 Laminated, or limited, fine mesh [weather model].

3 Low-powered frequency modulation.

**LFP** Loaded flank pitch (fir-tree blade root).

**LFR** 1 Local flight regulations.

2 Low/medium-frequency radio range.

**LFRED** Liquid-fuelled ramjet engine development.

**LFRJ** Liquid-fuelled ramjet (in solid rocket case).

**LFR, LFRR** Low-frequency radio range.

**LFS** Low-flying system (UK military).

**LFSMS** Logistic force-structure management system(s).

**LFT** Live-fire testing.

**LF<sub>2</sub>** Liquid fluorine rocket propellant.

**LFV** Luftfartsverket = navigation services provider (Sweden).

**LFW** 1 Linear friction welding.

2 Large-footprint weapon.

**LFX** Limited-output full-area automatic extraction.

**LG** 1 Landing gear; also, for F-22, \* trainer (ground support item).

2 Laser gyro.

3 Landing ground.

4 Lehrgeschwader, instructional group (G).

**Lg** Landing-gear wheelbase.

**LGA** 1 Low-gain antenna.

2 Local Government Association [office, London, has two aviation groups] (UK).

**LGB** Laser-guided bomb.

**LGCIU** Landing-gear control and interface unit; typically controls LG and doors, monitors cargo door locks, senses flap/slat position and interfaces with ECAM, MRS and BITE (Dowty).

**LGDM** Laser-guided dispenser munition.

**LGE speed** Speed at which landing gear may be extended. See *landing gear*.

**LGI** Laser glide slope indicator.

**LGM** US weapon category, silo-launched missile.  
**LGOS** Landing-gear operating speed.  
**LGR** Laser guidance receiver.  
**LGS** 1 Laser gunfire simulator.  
   2 Laser gyro strapdown.  
   3 Landing guidance system.  
**LGSC** Linear glide-slope capture.  
**LGSM** Light ground-station module.  
**LGT** Landing-gear tread.  
**Igt** Light, lighting.  
**Lgtd** Lighted.  
**LGTR** Laser-guided training round.  
**LGW** Landing gross weight.  
**LGWB** Landing gear wheelbase.  
**LH** 1 Left-hand.  
   2 Light helicopter.  
**L/H** Local horizontal.  
**LHA** 1 US Navy ship category, large helicopter assault carrier.  
   2 Local hour angle.  
**LHC** 1 Light helicopter cycle (standard cycle for US turboshaft engine testing).  
   2 Left-hand circuit.  
   3 Lower-hold cargo.  
**LHe** Liquid helium.  
**LHF** Liquid-cooled, heavy fuel.  
**LHM** Laser-hardened materials.  
**LHN** Long-haul network.  
**LHOX** Low and high-pressure oxygen.  
**LHP** Lightning HIRF protection.  
**LHS** 1 Left-hand side.  
   2 Latin hyperscale sampling [alternative to Monte Carlo].  
**LH<sub>2</sub>** Liquid hydrogen.  
**LHV** 1 Fuel lower heating value, L/kgK, formerly measured in BTU/lb.  
   2 Hang-gliding (Liechtenstein).  
**LHW** Laser-homing weapon.  
**LHWR** Lightning-hazard warning radar.  
**LHX** Light helicopter, experimental.  
**LI** 1 Lane identification (early Decca).  
   2 Laser interrogator (or interrogation).  
   3 Lithium-iron [LiFe preferred].  
   4 Letter of intent.  
   5 Lift index; numerically positive, negative or zero if atmosphere stable, unstable or neutral.  
   6 Low-intensity light[s].  
**Li** Maximum weighted noise level over series of i noise events.  
**LIB** 1 Left inboard.  
   2 Loudspeaker intercom box.  
**biorhythm** Small long-period oscillation, esp. that of Moon's aspect from Earth.  
**LIC** Low-intensity conflict [A adds aircraft, S system, hence Licas].  
**licence** US = license, document authorising holder to carry out functions specified; see *rating* (3), *validation*.  
**LID** 1 Lift-improvement device (jet V/STOL).  
   2 Luftfahrt Information Dienst (DDR).  
   3 Large integrated display.  
   4 Laser irradiation detector.  
   5 Liquid-interface diffusion (bonding).  
**lidar** Light detection and ranging, laser counterpart of radar.

**Lids, LIDS** Low-impact docking system.  
**LIF** Lead-in fighter.  
**LiFe** Lithium-iron.  
**life** 1 Allowable total period of operation of hardware item.  
   2 To assign such a period; hence, a lifed part.  
**lifeboat** Transport vehicle for rescuing crew from space-craft, usually parafoil Earth landing.  
**life cycle** Essentially self-explanatory, the sequence of phases through which a product may be expected to pass. The most common \* comprises: concept – definition – design – build – test – operate – [sometimes refurbish] – scrap or retire. Also called product \*.  
**liferaft** Correct term for inflatable emergency 'dinghy'.  
**life-support system** Provides environment to sustain human life in space, including during EVA.  
**LIFM** Linear instantaneous frequency measurement.  
**Lifmop** Linear frequency-modulated pulse.  
**Lifo** Last in, first out.  
**LIFP** Low-inertia flat-plate (antenna).  
**LIFR** Low-altitude instrument flight rules.  
**LIFT** Lead-in fighter training, or team.  
**lift** 1 Total lifting force from a wing (component of resultant force along lift axis), aerostat envelope or other source excluding engine thrust. Normally, force supporting aircraft. Traditionally  $L = C_L \frac{1}{2} \rho V^2 S$ , where  $C_L$  is lift coefficient,  $\rho$  density,  $V$  velocity and  $S$  area.  
   2 Any element of such lift, acting through particular point.  
   3 Whole or part of an airborne operation, thus second \* means second force to be airlifted.  
   4 Aircraft-carrier elevator (British terminology).  
   5 Total traffic capability of fleet of transport aircraft [esp. military].  
**lift axis** Line through c.g. perpendicular to relative wind in plane of symmetry.  
**lift coefficient**  $C_L$ , dimensionless measure of lift of surface; actual lift divided by free-stream dynamic pressure  $\frac{1}{2} \rho V^2$  and surface's area  $S$ .  
**lift/cruise engine** Turbofan or turbojet with vectoring to give jet lift or thrust.  
**lift curve** Plot of lift coefficient against angle of attack ( $C_L: \alpha$ ), theoretically =  $2\pi$  per radian at low subsonic Mach numbers.  
**lift curve slope** Inclination of lift curve at any point, rate of change  $dC_L/d\alpha$ .  
**lift-dependent drag** See *lift-induced drag*.  
**lift/drag ratio, L/D** Ratio of total lift to total drag, fundamental measure of efficiency of aircraft; L is normally constant and equal to weight but drag varies approx as square of airspeed; thus L/D plot is curve with peak at one particular airspeed for each aircraft,  $L/D_{max}$ .  
**lift dumper** Flat plate, usually long span and short chord, raised by powered system (rendered operative by weight on MLG) from upper surface of wing (usually inboard and at about 60% chord) after landing to destroy lift and improve wheel-brake traction. Usually synonymous with ground spoiler.  
**lift fan** 1 Turbofan of HBPR installed only for lift thrust.  
   2 Free-running fan driven by tip turbine from external gas supply installed only for lift (note: 1 and 2 may have exit vanes to give a diagonal lift/thrust component).  
**lift-improvement device** Any aerodynamic strake, dam,

## lift index

## Lima

flap or other fixed or movable surface to assist jet VTO by reducing hot-gas reingestion, suckdown or other undesirable effects.

**lift index** Air stability expressed as positive number if stable, zero neutral and negative unstable.

**lift-induced drag** For all practical purposes, the same as lift-dependent drag or drag due to lift, the rearwards component of the total [resultant] force vector on a wing. Purists could say lift-dependent drag is the difference between drag at a given  $C_L$  and that at a datum  $C_L$ . They could also argue \* is not synonymous with trailing-vortex drag, because the latter can exist in an inviscid flow.

**lifting body** Aircraft whose chief or sole lift is generated by its body; usually hypersonic aircraft or spacecraft.

**lifting re-entry** One in which aerodynamic lift forces play a significant role.

**lift jet** Ultra-lightweight turbojet or turbofan installed only for upward thrust.

**lift-lift/cruise** Equipped with both lift jet(s) and vectored-thrust engine.

**lift motor** Engine driving vertical-axis prop/rotor on airship.

**lift off** 1 Separation of any aircraft or other flight or space vehicle from ground or (eg Space Shuttle atmospheric tests) a parent vehicle. Hence \* speed, VLOF. For aircraft, synonymous with unstick.

2 Undesirable gap between an eddy-current crack tester and the inspected surface.

**lift slope** See *lift-curve slope*.

**lift strut** Bears tensile (rarely compression) load due to wing lift.

**LIFTT** Leaders in flight-test training, includes [2002] ETPS, Epner, CCA, DUT and IAS.

**lift/thrust** Ratio of lift to thrust of vectored-thrust engine, usually varies from unity to zero over range of nozzle movement; also see *L/T*.

**lift vector** Vector drawn through point at which lift force acts, with angle showing direction (usually normal to chord or OX axis, irrespective of aircraft attitude) and length showing magnitude.

**lift wire** Bears tensile load due to lift of wing.

**LIG** 1 Laser image generator.

2 Lithium/iron gel.

**light** Visible \* extends from about  $0.4 \mu$  [red] to  $0.75 \mu$  [violet]. Velocity in vacuum =  $299,792,456 \text{ ms}^{-1}$  [ $983,571,007 \text{ ft/s}$ ].

**light aircraft** 1 Traditionally one having MTOW less than 12,500 lb (5,670 kg).

2 Pre-1957, ‘aeroplane having a.u.w. less than 1,200 lb’.

3 Since 2006 LAPL has meant maximum weight 2,000 kg (4,409 lb).

**light alloy** One whose principal constituent is aluminium; some authorities add ‘or magnesium’ but these are usually described as magnesium alloys.

**light anti-aircraft** Guns  $\leq 40 \text{ mm}$ .

**light bomber** Today meaningless, and never universally defined.

**light-case** Bomb encased in thin sheet steel for use against cities and other soft targets.

**light-emitting bar** Vertical bar of three (rarely, more) Si LEDs.

**light-emitting diode** Solid-state diode emitting visible light when stimulated by electronic input, giving quick-reacting shaped light source.

**light-emitting strip** Horizontal rectangular strip display made up of number of light-emitting bars, often used to give analog lateral-position readout.

**lightening hole** Cut-out in relatively unstressed region of structural sheet part to save weight.

**lighter than air** Buoyant in atmosphere (see *aerostat*).

**light fighter** Unusually small fighter intended chiefly for close air-combat role.

**light flight control** Easy to move, esp. when adjacent flight controls are heavy.

**light gun** Aldis lamp or other projector of visible pencil beam, usually selectable white, red or green.

**light ice** Traditionally, can be ignored for up to 1 h.

**light machine gun** Not greater than rifle calibre.

**light-microsecond** Almost exactly 300 m, 984 ft.

**lightning** Any natural electrical discharge between clouds or between cloud and ground.

**Lightning Bolt** Procedures enabling existing procurement to be streamlined, and commercially available items to be bought when appropriate (USAF).

**lightoff, light off** 1 Ignition followed by acceleration of gas turbine during starting cycle.

2 Ignition of afterburner.

**light pen** Fibre-optic device for interfacing and accessing computer via visual display.

**light pipe** Single or bundle of optical fibres.

**lightplane** See *light aircraft*.

**light propeller aircraft**  $\leq 5,700 \text{ kg MTOW}$ .

**light-round** Progression of the combustion flame from one fuel burner to the next during gas-turbine starting cycle.

**Light Series** Carrier for four 20-lb practice bombs (UK, 1922–c60).

**Light Sport Aircraft** Defined by the FAA as: 1 or 2 seats, single engine, GTOW  $<1,320 \text{ lb}$  [land] or  $1,430 \text{ lb}$  [seaplane],  $V_{\max}$  120 kt,  $V_s$  45 kt, fixed or ground-adjust propeller.

**light stick** Transparent container of two fluids which, when brought into contact, give off useful illumination.

**light turboprop** Aircraft category MTOW 7 t (15,432 lb).

**light valve** Photoconductive layer controlling areas of liquid crystal illuminated in large display.

**light water** 1 Water, as distinct from heavy water.

2 Trade name for *AFFF*.

**lightweight fighter, LWF** Despite USAF competition 1972–75, never defined.

**LIH/LIL/LIM** Light intensity high/low/medium.

**LII** 1 Light image intensifier.

2 Gromov flight research institute, at Zhukovskii (USSR, R).

**LiI** Lithium iodide.

**Li-ion** Lithium/ion.

**LIIPS** Leningrad institute for sail and communications engineers (USSR).

**like on like** Liquid rocket with streams of fuel impinging on each other from some injectors and streams of oxidant on oxidant from others.

**Lilo** Last in, last out.

**lily pad** Forward operating base (USAF, esp. PACAF).

**LIM** 1 Low-inclination mission.

2 Locator inner marker.

3 Light intensity medium.

4 Limit.

**Lima** Laser ionisation mass analyser.

## Limaçon

line-replaceable

**Limaçon** Quartic curve,  $r = a \cos \theta + b$ .

**Limar** Laser imaging and ranging.

**limb** Visible edge of heavenly body, esp. the Sun.

**limit altitudes** Angles of pitch or bank which FCS prevents being exceeded.

**limit-cycle oscillation** Sustained vibration at a fixed frequency and limited amplitude.

**limited nav aids** This usually means sextant only; electronic aids unavailable.

**limited panel** Pilot instruction with key flight instruments obliterated and external cues absent (originally meant gyro instruments obliterated, and always horizon; today depends on panel).

**limited remote communications outlet** Unmanned satellite air/ground com. facility operated as LRCO-A, VOR voice channel plus receiver, or LRCO-B, separate facility with transmit and receive capability, extending FSS service area (FAA).

**limited-route concept** Operator, captain or whoever else prepares flight-plan, is offered very limited choice of routes through a controlled airspace.

**limiter** One meaning is control device attached to transducer to prevent critical or threshold value being exceeded.

**limiter spiral** Manoeuvre in which aircraft makes g-loaded roll on AOA limit, a form of corkscrew with stick in fully back L or R corner.

**limiting load factor** See *design load factor*.

**limiting Mach number** Maximum permitted for type of aircraft, usually before onset of buffet.

**limiting runway** One whose length, altitude or temperature necessitates take-off below MTOW.

**limiting speed** 1 Maximum IAS permitted in particular aircraft configuration, eg landing gear down.

2 Speed in any flight condition in which longitudinal acceleration is zero.

**limiting velocity** Terminal velocity at specified angle to horizontal [not normal term].

**limit load** Greatest anticipated stress on structural member, unfactored, from authorized ground and flight operation.

**limit of proportionality** Tensile (rarely, other) stress at which material begins to suffer plastic deformation, acquiring permanent set.

**limits** 1 Weather minima permitted for particular pilot or flight.

2 Boundaries of flight regimes, eg IAS or g in particular configurations.

**limit switch** Subsystem, which, normally automatically, varies the authority of a control, e.g., changing the range of elevator movement available according to IAS or other parameter.

**Limntran** Limited North Atlantic regional air navigation.

**LiMnO<sub>2</sub>** Lithium manganese dioxide electric battery.

**LIMSS** Logistics information management support system [hence LIMS, management system].

**Linac** Linear accelerator for X-radiography.

**Linas** Laser-inertial nav/attack system.

**Lincs** 1 Leased-products interfacility national air space communications system; digital net connecting remote radar and Wx sites to ATC centres (FAA).

2 Long-haul interfacility com. system.

**Lindberg detector** Fire detector with sealed network of

stainless-steel tubing containing material which above set temperature emits gas, raising pressure.

**Lindholme gear** Air/sea rescue equipment dropped to survivors; the original form (1942) was packaged in 10 buoyant containers.

**line** 1 Single pipe in fluid system.

2 Single cable in electrical system.

3 Horizontal scan on raster display.

4 Cable or rope anchored to aerostat with other end free.

5 Flight-line.

6 Adjective, in revenue service with air carrier.

7 Future path of target.

8 Personal boast, from 'shooting a \*' (RAF).

**linear accelerator** In theory, any assisted-takeoff device. In practice, restricted to an "unrolled" electric motor.

**linear aerial array** Yagi or other array of dipoles on straight axis.

**linear aerospike** Rocket with two-dimensional expansive nozzle.

**linear building** One in which operations take place in sequence from one end to other.

**linear configuration** Vehicle assembled from separable stages arranged end to end in one line.

**linear friction welding** Workpieces are rubbed together to reach welding temperature, giving a perfect bond by a solid-state process not involving melting.

**linear hold** Usually, to delay landing by intercepting extended runway centreline far from airport, advising when 1,000 m from threshold.

**linear motion** See *heave, surge, sway*.

**linear optical sensor** Transducer in fibre-optic sensor system which, by splitting and reflecting laser pulses whose phase-displacement is then measured, translates mechanical movement (eg, of aileron) into a decodable output.

**linear-scale instrument** Vertical or horizontal straight-line display, either tape or video, giving quantified output.

**linear shaped charge** Explosive cord whose cross-section is that of hollow (shaped) charge, for unidirectional cutting.

**line book** Written and witnessed record of lines (8) shot by members of Mess (RAF).

**line check** Examination of crew qualified on type but proving ability to fly new route.

**line inspection** Usually vague, but generally a special check not calling for aircraft to be moved to maintenance or engineering area or enter hangar.

**lineman** Engineer, marshaller or other flight-line worker, esp. in general aviation.

**line-mounted** Usually, supported entirely by a pipe or cable, thus \* valve.

**line of position** See *position line*.

**line of reference** The intersection of the planes of reference and of symmetry.

**line oriented flight training** Training (in air or simulator) of commercial aircrew flying as a crew and using SIDs and STARs and other regular procedures, esp. on routes of pupils' airline.

**line-oriented safety audit** Collection of safety data and flight-crew performance as diagnostic tool.

**liner** Sheet or sprayed-on heat insulator in some (non-case-bonded) solid motors.

**line-replaceable** Capable of being removed from aircraft

**linescan**

parked on flight-line and replaced by different example of same item.

**linescan** IR graphics using raster display to generate picture.

**line search** 1 To examine one strip of film from straight reconnaissance run.

2 In sea reconnaissance, to search on constant heading at maximum height at which target is identifiable.

**line service** In revenue operation with air carrier.

**Linesman** British attempt at combined air defence and ATC system (see *Mediator*).

**line speed** Predicted take-off ASIR.

**line squall** Violent cold front characterised by sudden drop in temperature, rise in pressure, thunderstorms and, especially, severe vertical and other gusts.

**line up** To position aircraft on downwind end of runway, pointing along centreline.

**line vortex** One in which vorticity is concentrated in a line.

**liney** Apron marshaller (RAF, colloq.).

**linkbelt** Ammunition feed using rigid inter-round links.

**link chute** Discharges used ammunition links overboard.

**Link 11** Tactical datalink (NATO navies).

**link route** Authorised sector joining airways but not itself an airway.

**Link 16** The datalink on which JTIDS is based (NATO).

**Link's turbidity factor** See *turbidity factor*.

**Link trainer** Traditional primitive electropneumatic flight (pilot training) simulator, esp. in instrument flight, not representative of aircraft type.

**Link translator** Provides translation and forwarding between Tadil, Link 11, NATO Link 1 and other friendly communications.

**LINS, Lins** Laser/inertial navigation system.

**LION, Lion** Link interoperability network (UK MoD).

**LIP** 1 Laboratory identification prototype.

2 Limited-installation program.

3 Lithium/iron polymer; E adds electrolyte.

4 Peripheral identification line (F).

**lip** Leading edge of air inlet (other than a bodyside splitter plate).

**lip microphone** For use, pivoted to be almost touching the mouth.

**Lips, LIPS** Logical inferences per second (A12).

**liquid-cooled** Loosely, any engine cooled by liquid, including water, but preferably restricted to cooling by water/alcohol or glycol mix.

**liquid crystal** Organic liquids with elongated molecules which in electric fields arrange themselves to give controllable appearances.

**liquid-film technique** Traditional method of coating surface with volatile oil to show demarcation between laminar/turbulent boundary layer and some details of flow direction.

**liquid-fuel starter** Burning one or more liquids unlike that for main engine.

**liquid hydrogen** See *cryogenic fuels*.

**liquid inertia vibration eliminator** Heavy liquid, damps helicopter rotor vibration.

**liquid injection TVC** Use of volatile fluid pumped into one side of rocket nozzle to create shockwave and deflect jet.

**liquid oxygen** See *oxygen*.

**liquid petroleum gas** Butane, heptane and similar gaseous hydrocarbon fuels stored as liquids under high pressure. See *cryogenic fuels*.

**liquid propellant** Liquid fuel, monofuel or oxidant used in rocket.

**liquid rocket** Rocket burning one or more liquid propellants.

**Liquid Spring** Dowty shockstrut filled with liquid with deformable large molecules absorbing energy internally.

**LIR** 1 Laser intercept receiver.

2 Life-improved rotor.

**LIRA, Lira** Low-intensity (ie limited war) reconnaissance aircraft, with simple optical/IR suite.

**LIRCM** Large-aircraft IRCM.

**LIRL** Low-intensity runway light(s).

**LIRS** Laser inertial reference system.

**LIRU** Laser inertial reference unit.

**LIS** 1 Localizer inertial smoother.

2 Lightning image shelter (NASA).

3 Laser interferometer space antenna.

4 Limited instruction-set architecture.

**LISA, Lisa** Logistics Information Systems Agency.

**LISB** Low-intensity [or less-intense] sonic boom.

**LISE, Lise** Laser integrated space experiment (SDI).

**LISN** Line-impedance stabilization network.

**LiSO Cl<sub>2</sub>** Lithium thionyl chloride.

**listening out** Ready to receive broadcast transmissions on wavelength in use (US = listening watch, and predictably the latter is becoming standard).

**listening post** 1 Installation under landing or takeoff climbout paths of airport for measuring and recording noise of all traffic.

2 Installation, with or without sound-locator, giving warning of approach of possibly hostile aircraft (1917–45).

**LIT** 1 Lead-in training (US).

2 Light intratheatre transport.

**lit** Litres (SI unit).

**Lital** Medium- and high-strength Al-Li alloys (Alcan).

**Litas, LITAS** Low-intensity two-colour approach slope system.

**LITDL** Link-16 interoperable tactical data link.

**Lite** Laser illuminator targeting equipment.

**lithium** Extremely light (density 0.534) white metal, MPt 186°C, used in Al-Li alloys and as isotope Li-6 in NW.

**lithium-drift detector** Ionising-radiation detector using semiconductor doped with lithium as n-type ions.

**lithium tantalate** LiTaO<sub>3</sub> for modulating lasers.

**lithometeor** Finely divided solid particles suspended in atmosphere.

**lithosphere** Earth land mass, as distinct from atmosphere, hydrosphere.

**litre** Metric unit of volume [in SI strictly called dm<sup>3</sup>], abb. l [without full point] = 10<sup>-3</sup>m<sup>3</sup>, 10<sup>3</sup> cm<sup>3</sup> = 0.219969 Imp. gal. = 0.264172 US gal. = 61.02361 in<sup>3</sup>.

**litres per kilometre** Measure of fuel burn = 0.3541 Imp. gal., 0.4252 US gal./statute mile; reciprocals respectively 2.82406, 2.3518.

**LITS** Logistics Information Technology Strategy, or System [said to mean lost in time and space] (RAF, UK).

**litter** Stretcher (medical).

**Little F** Lt-Cdr (Flying), (RN).

**littoral warfare** Coastal, shallow water.

**LITVC** Liquid-injection thrust-vector control.

<b>LIU</b>	LAN interface unit.	<b>LLV</b>	Lower limit of video (HUD).
<b>LIV</b>	Left interconnect valve.	<b>LLW</b>	Less-lethal weapon[s].
<b>lv<sub>v</sub></b>	Root chord of vertical tail.	<b>LLWAS</b>	Low-level windshear alert system (sometimes LLWSAS).
<b>LIVE, Live</b>	Liquid inertial vibration eliminator.	<b>LLWC</b>	Low-level weather chart.
<b>live drop</b>	Release from aircraft of operative device, eg missile with propulsion and guidance and possibly warhead, as distinct from inert equivalent.	<b>LLWD</b>	Low-level weapons delivery.
<b>live engine</b>	Operative engine(s) in aircraft with one or more real or simulated failures.	<b>LLWS</b>	Low-level windshear.
<b>live flight deck</b>	Subject to motion at sea, rather than in port (aircraft carrier).	<b>LLZ</b>	Localizer.
<b>live mail</b>	Real air mail, as distinct from dummy loads.	<b>LM</b>	1 Lunar, or landing, module. 2 Last-minute (cargo). 3 Laser machining. 4 Little movement. 5 Locator, middle. 6 Laser module. 7 Line maintenance. 8 Linear motor. 9 Loitoring munition[s].
<b>live nut</b>	Driven by rotary power unit along thread to give [usually irreversible] linear output.	<b>L/M</b>	1 Ratio of direct labour to material cost. 2 List of materials.
<b>livrels</b>	Pounds (lb) avoidropous (F).	<b>lm</b>	Lumen.
<b>lizards</b>	Short lengths of rope, often with pulleyblock on free end, for ground-handling kite- or barrage balloon.	<b>LMAE</b>	Lunar module ascent engine.
<b>LJAO</b>	London Joint Area Organization.	<b>LMAL</b>	Langley Memorial Aeronautical Laboratory (NACA), became NASA LaRC.
<b>LJDAM</b>	Laser joint direct attack munition.	<b>LMAR</b>	Lightweight multiband airborne radar, or radio.
<b>LJS</b>	Laser jamming system.	<b>LMARS</b>	London Military Area Radar Service.
<b>LK</b>	Product support (G).	<b>L<sub>max</sub></b>	Peak [maximum A-weighted] sound level.
<b>LKLY</b>	Likely.	<b>LMC</b>	1 A last-minute check-in. 2 Life-monitoring computer. 3 Least material condition.
<b>LKN</b>	Last known position [rarely, <i>LKP</i> ].	<b>LMD</b>	1 Laboratoire Météorologique Dynamique (F). 2 Lithium manganese dioxide.
<b>LKR</b>	Low-kiloton range.	<b>LMDE</b>	Lunar module descent engine.
<b>LKS</b>	Lakes.	<b>LME</b>	1 Line maintenance engineer. 2 Link management entity.
<b>LKV</b>	LuchtvaartKundige Vereeniging (SA).	<b>LMF</b>	1 Liquid methane (or methanol) fuel. 2 Lacking moral fibre (RAF, 1939–45).
<b>LL</b>	1 Low-level. 2 Limit load, 3 Flying laboratory, ie research aircraft (USSR, R). 4 Low-lead [fuel]. 5 Long lead [time]. 6 Legislative liaison (USAF).	<b>L/MF</b>	Low/medium frequency.
<b>L<sub>L</sub></b>	Loudness level (Stevens) in phons.	<b>LMG</b>	1 Liquid methane gas. 2 Light machine gun.
<b>L-L</b>	Line to line (AC voltage).	<b>LMI</b>	1 Logical management interface. 2 Logistics management information.
<b>L/L</b>	Latitude and longitude.	<b>LMIT</b>	Laser materials interaction testing.
<b>LLAD</b>	Low-level air defence; S adds system.	<b>LML</b>	Lightweight multiple launcher.
<b>Llanbedr</b>	Airfield on Welsh coast serving Aberporth with targets (RAE, now Qinetiq).	<b>LMLF</b>	Limit manoeuvre load factor.
<b>LLAPI</b>	Low-level air-picture, or air-defence picture, interface.	<b>LM/LO</b>	Liquid methane, liquid oxygen.
<b>LLC</b>	1 Lift-lift/cruise. 2 Logic link control.	<b>LMM</b>	1 Compass locator at middle marker. 2 Linear multistep method.
<b>LLDF</b>	Low-level discomfort factor.	<b>LMN</b>	Local Mach number.
<b>LLDIN</b>	Long-lead-in light system, can cross major city.	<b>LMO</b>	Lean-mixture octane [rating].
<b>LLF</b>	1 Low-level fan of reconnaissance cameras. 2 Long-lead funding.	<b>LMP</b>	1 Lunar module pilot. 2 Left middle plug. 3 Linear-motor profiler [machine tool]. 4 Load maintenance panel.
<b>LLGB</b>	Launch-and-leave guided bomb.	<b>LMRS</b>	London Military Radar Services.
<b>LLH</b>	Light liaison helicopter.	<b>LMS</b>	1 Least mean square. 2 Land mobile service.
<b>LLHK</b>	Low-level height keeper.		3 Local maintenance system (navaid). 4 Light monitor and switch. 5 Learning management system [on-line]. 6 Line-maintenance service[s].
<b>LLLGB</b>	Low-level laser-guided bomb.	<b>LMSJ</b>	Lightweight modular support jammer.
<b>LLLT</b>	Low-light-level television.	<b>LMSS</b>	1 Light mission support system (RAF). 2 Land mobile satellite service.
<b>LLM</b>	1 Long-lead [time] material. 2 Launcher loading module.		
<b>LLMS</b>	Liquid-level measurement system.		
<b>LLNL</b>	Lawrence Livermore National Laboratory, California.		
<b>LLP</b>	1 Low-level parachute. 2 Left lower plug [all similar entries = avionics boxes]. 3 Limited-liability partnership. 4 Life-limited, or limited-life, part[s].		
<b>LLS</b>	Lightning location system.		
<b>LLT</b>	Long lead time.		
<b>LLTOW</b>	Landing limiting (or limited) takeoff weight.		
<b>LLTV</b>	Low-light television.		

**LMST**

**LMST** Lightweight multiband satellite terminal.

**LMT** 1 Local mean time.

2 Locally manufactured tools, made to exact specification of an OEM.

3 Limit.

**LMTR** Laser marker and target ranger.

**LMU** Line monitor unit.

**LN** Glider, training (USN, 1941–45).

**L<sub>N</sub>** 1 N (night) weighted sound pressure level.

2 Confusingly, also the noise level exceeded for  $N\%$  of each 24 h.

**L-N** Line to neutral (AC volts).

**I<sub>N</sub>** Horizontal distance from nose of body to c.g..

**I<sub>n</sub>** Horizontal distance from NLG ground contact to c.g..

**LN<sub>2</sub>** Liquid nitrogen.

**LNA** Low-noise amplifier [DPL adds diplexer].

**LNAV, L-Nav** Lateral navigation.

**LNC** Loran [not necessarily Loran-C] chart.

**LNDG** Landing.

**LNG** 1 Liquefied natural gas.

2 Long.

**LNH** Lunar near horizon.

**LNO** 1 Limited nuclear option.

2 Liaison officer.

**LNP, L<sub>NP</sub>** Noise pollution level, equal to  $L_{eq} + 2.56$  dB standard deviation.

**LNSF** Light Night Striking Force.

**LNTF** Langley National Transonic Facility (US).

**LNTWA** Low-noise travelling-wave amplifier.

**LO** 1 Low observables.

2 Local oscillator.

3 Compass locator at outer marker, also LOM.

4 Longitude.

5 Low band.

6 See next.

**lo** 1 Low level, variously interpreted as 60 m and 200 ft; minimum practical safe height for transonic attack.

2 Minimum safe height to avoid obstructions, generally proportional to speed.

**L/O** 1 Lift-off.

2 Light off.

**l.o.** Local oscillator.

**LOA** 1 Letter of offer and acceptance; sometimes rendered as 'letter of agreement'.

2 Launch on assessment.

3 Letter of authorization.

4 Line of attack.

**LOAD, Load** Low-altitude defence [of ICBMs].

**load cell** 1 Fluid-filled device for generating large forces accurately, eg in weighing large aircraft.

2 Capsule containing strain gauge or other force transducer used, eg, in weighing aircraft.

**Load classification number** *LCN*.

**loadeo** Loading of explosive ordnance, structured procedures also used as basis for inter-unit competition (USAF).

**loader** Loads computer main memory, esp. from transit tape.

**load factor** 1 Vertical acceleration in g.

2 Stress applied to structural part as multiple of that in 1 g flight (not necessarily same definition as 1).

3 Ratio of failing load to assumed 1 g load in component.

**4** Number of passenger seats occupied as percentage of those available.

**5** Revenue ton-miles (or tonne-km) performed as percentage of RTM available.

**6** Percentage of engine's maximum power needed for aircraft to fly (pre-1914).

**load history** Crucially, a record of the number of times a particular load [stress, or vertical acceleration] has been exceeded by particular part.

**loading** 1 Total aircraft mass divided by wing area (wing \*), span (span \*), or total installed power (power \*).

2 Volume fraction of composite (FRC) material occupied by strong fibres.

**loading bridge** See *jetway*.

**loading chart** Permanent guidance chart or diagram displaying correct locations for airborne loads in transport aircraft, esp. cargo.

**loading coil** Inserted inductance, eg to increase electrical length of aerial [antenna] system.

**loading diagram** 1 Standard graphical plot of forces in structural part or assembly.

2 Document with detailed plan of cargo floor and underfloor holds on which responsible official marks positions and masses of all cargo and final c.g. position.

**loading loop** Graphical plot of transport aircraft weights against % SMC or MAC or distance from datum with fuel and payload forming closed figures.

**loading up** Rich extinction of idling piston engine.

**load manifest** Detailed inventory of cargo on commercial or military flight. See *load sheet*.

**loadmaster** Member of military transport flight crew in charge of loading and unloading, and para-dropping etc if undertaken (but not of paratroops).

**loadmeter** Ammeter, especially on light helicopter.

**loadout** Total mission load (US).

**loadpath** Sequence of structural elements carrying a load. Thus in F-22 \* with missile-bay doors open is different from normal.

**load programmer** Person in charge of structural fatigue test.

**load ring** Rigid hoop to which balloon net and basket suspension are attached.

**LOADS, Loads** Low-altitude air defence system.

**load sheet** Load manifest prepared for each flight by transport aircraft, also showing distribution of fuel load and c.g. position.

**load spreader** Rigid pallet for distributing dense loads over larger floor area.

**load threshold** Notional maximum movements per hour ATC can accept.

**load waterline** Waterline of marine aircraft at MTO weight.

**LOAL** Lock-on after launch.

**LOAS** Line operations assessment support.

**LO-Axi** Low observable axisymmetric [N adds nozzle].

**LOB** 1 Left outboard.

2 Launch operations building.

3 Line of bearing.

**lobe** 1 One of two, four or more sub-beams that form directional radar beam from aerial [antenna] with reflector.

2 One of the (usually symmetrical) plan systems of regions of most intense noise from jet engine.

3 Eccentric profile of cam.

**lobe nozzle** Jet-engine nozzle with mixing promoted by long multi-lobe periphery, resembling petals.

**lobe switching** Radio D/F by time-variant switching of aerial [antenna] radiation pattern.

**LOBL** Lock-on before launch.

**Lobstar** Low-band structural array, principally for [radar] foliage penetration (AFRL).

**LOC** 1 Line of communication.

2 Letter[s] of credit.

3 Logistics operations centre.

4 Limited operational capability.

5 Level of capability.

6 Location, locator (ICAO).

7 Local-operations console.

8 Limiting oxygen content, minimum to sustain combustion.

9 Loss of control; IF adds in-flight.

10 See next.

**loc** Localizer.

**LOCAAS, Locaas** 1 Lo-observable comprehensive autonomous attack system.

2 Low-cost anti-armour submunition (USA).

3 Low-cost autonomous attack system (USN).

**local-area augmentation** System, also called scheme, for use of GPS guidance as principal blind landing aid, replacing ILS (FAA).

**local area network** Bus, ring, PABX (telecommunications) or other transmission links for communication and EDP within an office, factory or other establishment.

**local camber** Distance measured perpendicular to chord line from chord line to camber line.

**local elastic instability** Small region of buckling in otherwise almost undistorted structure.

**local hour angle, LHA** Hour angle of observed body measured relative to observer's meridian.

**localizer** ILS aerial [antenna] and beam giving directional [azimuth] guidance.

**localizer course** Locus of points in any horizontal plane at which DDM is zero.

**localizer needle** Directional steering needle on ILS display.

**localizer protected area** No aircraft or vehicles permitted to enter.

**local Mach number** Actual Mach number at a point just outside boundary layer of aircraft or other vehicle. See local-surface airspeed.

**local magnetic effects** Those peculiar to a region (eg ore deposits) which distort terrestrial field.

**local mean time, LMT** Angle at celestial pole between local meridian and that of mean Sun; time elapsed since mean Sun's transit of observer's anti-meridian.

**local meridian** That passing through a particular place.

**local oscillator** Radio circuit generating RF with which received waves are combined.

**local stress concentration** Intensification caused by shape of stressed part (eg at end of a crack).

**local-surface airspeed** TAS+ $V_L$  where  $V_L$  is increment. [usually positive] induced by body's shape.

**local thickness** In an aerofoil, distance between lower and upper surface measured prependicular to camber line [some authorities insist to chord line].

**local traffic** Visible from tower.

**local velocity** Relative speed of fluid flow over small area of body, essentially = local-surface airspeed.

**local vertical** Line from centre of Earth through a particular place.

**Locap** Lo combat air patrol.

**Locat** Low-cost aerial target, or trainer.

**Locate** Loran/Omega course and tracking equipment.

**location bearings** Ball or tapered-roller bearings which determine the axial position of a shaft.

**location indicator** Identification code [usually four letters] of aeronautical fixed station (ICAO).

**locator** 1 L/MF NDB used as fix for final approach.

2 Portable radio beacon 121.5/243 MHz, carried on person or in parachute harness, sometimes with voice facility.

**LOC-BC, loc-BC** Localizer backcourse.

**LOCC** Launch, or lander, operations control centre.

**LOC'D** Low-cost dispenser.

**LOCE** 1 Limited operational capability [for] Europe, see next.

2 Linked operations and intelligence centres, Europe

3 Large optical communications experiment.

**LOC-I** See LOCIF.

**Locid** Location identifier.

**LOCIF** Loss of control in flight [also LOC-I].

**LOC inertia smoothing** Extra AFCS function, usually customer option, added in FCCs to alleviate effect of ILS localizer noise. Typically Setting 1 smoothes approach and provides survival after LOC failure below 100 ft/30 m; Setting 2 reduces minima on Cat II or III ILS.

**Lockclad** Conventional 7×7 control cable covered with swaged aluminium envelope.

**locked** 1 Gun bolt or breech block mechanically locked to barrel at moment of firing.

2 Flight controls mechanically locked to prevent damage by wind when parked; must be unlocked for flight.

3 Overbalanced flight-control surface driven to limit of deflection and not (or not readily) recoverable.

4 Carrier flight deck is for any reason not usable for flying.

**locked-in-condition** Aircraft in dangerous flight condition (eg superstall) with airflow over controls inadequate for recovery to be possible.

**locking pin** Various, especially inserted in MLG/NLG to prevent retraction on ground.

**locking wire** Fatigue-resistant wire pulled through ad hoc holes in series of nuts or other rotary fasteners and finally tightened and twisted off with inspector's stamp on soft metal seal at free ends.

**Lock number** Value [usually about 8] for ratio of inertia to aerodynamic forces in helicopter rotor, symbol  $\gamma$ .

**lock nut** One that cannot loosen once tightened.

**lock-on** 1 Operating mode of many radars and other sensor systems in which pencil beam, having searched and found a target, thereafter remains pointing at that target.

2 When DME receives replies to 50+ per cent of interrogations.

**lock time** Time from release of gun sear to firing of primer or detonator.

**lock up** Lock on. Used esp. in airborne self-test of radar against other member of formation.

**lock washer** Tightened under nut, prevents nut working loose (by biting into nut or by a tab manually turned up beside a flat on the nut).

**lockwiring** Preventing rotation of nuts or bolts by

**loclad**

threading fatigue-free wire through their heads to apply torque opposing movement.

**loclad** Low-cost low-altitude dispenser.

**Locom** Low-cost manufacturing [AMS adds of advanced metal structures].

**LOC1** First level of capability (ACCS).

**locopod** Low-cost powered off-boresight dispenser.

**LOCR** Low-observables combat readiness (USAF).

**Locus** Laser obstacle-cable unmasking system (helo).

**locus** Path traced out by moving object, esp. one rotating in complex repeated orbit, eg tip of helicopter rotor blade.

**Locusp** Low-cost uncooled sensor prototype.

**LOD** Light-off detector.

**LODA** Letter of deviation authority (FAA).

**Lodals** Long Odals.

**LODE** Large optics demo experiment.

**LOE** 1 Level of effort.  
2 Loft- and line-oriented evaluation.

**LOEC, LO ExCom** Low-observables Executive Committee, decides release of knowledge to partners/customers (US).

**Lo-Erode** Concrete with surface reinforced with Meltex 19-11 stainless-steel fibres.

**LOF** 1 Lift-off.  
2 Line of flight.

**Lofaads** Lo-altitude forward-area air defense system (USA).

**Lofar** Low-frequency omnidirectional acoustic frequency analysis and recording (ASW).

**Lo-Flyte** Low-observable flight-test experimental.

**LOFT** Line-oriented flight training.

**loft bombing** Low-level bomb delivery, also called toss bombing, etc (see *low-angle*\*).

**loft floor** Floor on which lofting is carried out.

**lofting** Plotting full-size exact shapes of airframe, from which master templates, jigs, tooling, forging and stamping dies and other large parts can be constructed and NC tapes prepared.

**LOG** Liquid oxygen/gasoline.

**Log, log** Logarithm[ic].

**log** Large ground-burning target marker (RAF, WW2).

**LOGAIR** Air Logistics Command (USAF).

**Logair** Logistics air network.

**logarithmic decrement** Natural log of ratio of two successive amplitudes in damped harmonic or other oscillatory response.

**logbook** Master history of member of aircrew, aircraft or other important functioning system in which are recorded times, events and occurrences.

**Logholdair** Air logistics message (NATO).

**logic** Electronic circuits and subcircuits constructed to obey mathematical laws.

**Logmars** Logistics applications of [bar code] marking and reading symbols.

**Logo** Limitation of government obligation.

**Logspark** Logistic(al) park, housing 7 days' fuel, weapons and maintenance supplies, serving several STOVL hides.

**LOH** Light observation helicopter.

**Lohmannising** Metal dipped in amalgamating salt, pickled and then plated with two or more protective alloy coatings.

**LOI** 1 Lunar orbit insertion.

**long lead time**

2 Letter of intent to purchase.

**loiter** 1 To fly for maximum endurance.  
2 To fly a standing patrol.

**loiter plate** Place where helicopters can practise hovering down to ground level (RAF).

**loitering missile** Missile which, after launch, can stand off in the proximity of targets for several hours before either being guided to a target or self-destructed by programmed default.

**Lola** Low-level [windshear] alert.

**Lolex** Low-level extraction of parachute-retarded cargo.

**LO/LO** Log-on/log-off.

**LOM** 1 Compass locator at outer marker.  
2 Localizer outer marker.

**Lomads** Low-altitude missile air-defence system.

**Lombard** Original design of 'bonedome', 1947.

**Lomcovak** Unlimited flight manoeuvre in which aircraft tumbles about transverse axis whilst travelling sideways at near-zero airspeed [often mis-spelt Lomcevak].

**LOMEZ** Low-altitude missile engagement zone.

**LOMS** Line operations management, or monitoring, system.

**LON** Longitude (FAA).

**Lone Ranger** Detachments by single aircraft throughout non-Communist world (RAF 1959→).

**long, Long** Longitude.

**long-dated** Long lead time, ie must be ordered months to years in advance of aircraft completion.

**longeron** Principal longitudinal structural members in fuselage, nacelle, airship, etc.

**longitudinal axis** OX axis, from nose to tail; roll axis.

**longitudinal bulkhead** Major full-depth web in plane of OX axis.

**longitudinal dihedral** Angular difference between incidence of wing and of horizontal tail (latter normally being less).

**longitudinal divergence** Oscillation in pitch of increasing magnitude, leading to dive or stall.

**longitudinal force coefficient** Component of resultant wing force resolved along chord;  $C_x = C_D \cos \alpha - C_L \sin \alpha$ .

**longitudinal oscillation** Vibration along longitudinal axis (chiefly in ballistic rocket vehicles); also known as pogo effect.

**longitudinal plane** Any plane of which OX axis is a part.

**longitudinal separation** Minimum distance or time between aircraft cleared to same track at same FL.

**longitudinal short-period** One of the five classic modes of aeroplane motion: near-constant airspeed, heavily damped by wing and tailplane/canard.

**longitudinal stability** Ability to recover automatically to level flight after sharp dive or climb command; generally, all stabilities in plane of symmetry. Static \* is defined as tendency to return to trimmed airspeed and AOA following any mild disturbance, throttle fixed throughout.

**longitudinal velocity** "The component velocity along the longitudinal axis relative to the air", (B.S., 1940). This need not be synonymous with true airspeed.

**longitudinal wave** One devoid of lateral components (eg sound).

**long lead time** Must be ordered months to years before aircraft completion; sum of contractual delays for item,

## long-range

delays in delivery (heavy forging may be years), processing time at sub-contractor or in plant, and time from when finished part joins aircraft to completion of aircraft.

**long-range** No valid modern definition except DoD \* bomber operational radius over 2,500 nm.

**long-range operations** Philosophy possible with modern aircraft, where reliability is near-perfect. It ignores number of engines, and aims to achieve autonomous operation, with crew [two pilots] able to correct any fault or mishap.

**long-wave** 1 In the case of radio/radar, usually means wavelength over 1 km, but not a normal aerospace term.

2 In the case of IR, wavelength 8–14  $\mu$ .

**Lons, LONS** Local on-line network system.

**look angle** Angular limits of vision of EO or IR seeker.

**look-down angle** Limiting inclination of main beam in AWACS-type aircraft, strongly dependent on aerial [antenna] geometry.

**look-down shoot-down** Ability to destroy low-level hostile aircraft from high altitude against land or clutter background.

**loom** Tightly laced bundle of electric cables, instrumentation leads or other flexible wires.

**loop** Flight manoeuvre in which aircraft rotates nose-up through 360° whilst keeping lateral axis horizontal; many variations but normal loop restores level flight on original heading but at slightly higher altitude. See inverted \*, outside \*, bunt.

**loop aerial** Conductive coil in vertical plane rotating about vertical axis to give bearing to ground radio station; a D/F loop [US = loop antenna].

**loop detector** Conductive loop buried in runway or taxiway to sense passage of aircraft and activate a display or airfield lights.

**loop heat pipe** In spacecraft, keeps vapour and cooled liquid separate by circulation through porous wick.

**Loose Deuce** Pair of tactical aircraft in varying loose formation c300 m (1,000 ft) apart.

**LOP** 1 Line of position [or positioning].

2 Loss of power.

**LOPC** 1 Lander operations planning center.

2 Loss-of-power control.

**lopro** Low probe; military aircraft mission.

**LOR** 1 Lunar orbital rendezvous.

2 Launch off RWR target data.

**Lora, LORA** 1 Level of repair analysis.

2 Low-frequency radar.

**Loraas** Long-range airborne ASW system.

**Lorac** Long-range accuracy, also called Loran-C or Cytac; Loran derivative.

**Lorads** Long-range radar and display system [now Lorads II].

**Lorag** Loads research advisory group.

**Loran** Long-range navigation, early [1941] but much developed hyperbolic navaid, using various onboard systems to translate time difference of reception of pulse-type transmissions from two or more fixed ground stations. In 1980 Loran-A [1,850/1,900/1,950 kHz] was replaced by Loran-C [100–110 kHz].

**LORAS, Loras** Linear omnidirectional resolving airspeed system.

**Lord, LORD** Laser obstacle ranging and display, for helicopters.

## low approach

**Lord mount** Large family of patented anti-vibration mounts, usually metal/rubber.

**Lorentz force, FL** That on charged particle moving in magnetic field,  $= q(VB)$  where  $q$  is particle charge,  $V$  velocity and  $B$  magnetic induction (flux density).

**Lorentz system** Pioneer beam-approach landing system.

**Lores, LORES** Low-resolution.

**LORO** Lobe-on receive only.

**Loroc** 1 Long-range optical camera.

2 Long-range offboard chaff.

**Lorop** Long-range oblique [or optical] photography [S adds system].

**Lorv** Low-observable re-entry vehicle, characterized by reduced radar cross-section.

**LOS** 1 Line of sight; I adds indicator.

2 Loss of signal.

3 Linear optical sensor.

4 Line-oriented simulation.

5 Level of service.

**LOSA** Line Oriented, or Operations, Safety Audit (U. of Texas).

**losas** Low-cost Scout acoustic system.

**Losat** Line of sight, anti-tank.

**LOSC** Launch operations support contract.

**Loschmidt number** Number of molecules of ideal gas per unit volume,  $= 2.687 \times 10^{19}$  per  $\text{cm}^3$ .

**Loss** Large-object salvage system.

**lost-wax** Technique for casting intricate precision shapes, derived from Benvenuto Cellini c1550 but modified for modern refractory alloys. See *investment casting*.

**LOT** Life of type [E adds extension].

**lot** A particular meaning is one batch of production missiles.

**LOTA** Low-level training area.

**Lotaws** Laser obstacle terrain-avoidance warning system.

**LOTC** Loss-of-thrust control.

**LOTE, Lotex** Life-of-type extension.

**LO<sub>2</sub>** Liquid oxygen.

**lounge** Waiting area at airport for departure passengers between processing and gates.

**louvre** Fixed or controllable aperture for cooling or ventilating airflow.

**LOV** Loss of vision due to opaque frames and other obstructions.

**Lova** Low-vulnerability ammunition.

**LOW** Launch on warning.

**low** Geographical region of low atmospheric pressure.

**low airburst** Fallout safe height of NW burst for maximum effect on surface target.

**low altitude** US military traditional, 500/2,000 ft; today see *lo* (J).

**low-altitude airway** <18,000 ft [5,486 m] [see *low route*] (FAA).

**low-altitude airway departure route** Provides operators with method to access under-utilized LAA (1) when upper airspace constrained, asking www.fly.faa.gov for procedures.

**low-altitude bombing system** Early weapon-aiming electronics for tossing nuclear weapons in low attack, the high bomb trajectory giving aircraft time to escape explosion.

**low-angle loft bombing** Free-fall loft bombing where release angle is within 35° of horizontal.

**low approach** Premeditated overshoot.

**low bidder** Manufacturer offering lowest price in industry competition.

**low blower** See *low supercharger gear*.

**low blown** Piston engine supercharged for maximum powers at low altitudes at expense of poor performance at height.

**low boss** VSV inner bearing.

**low cloud** Cumulus, cumulonimbus, stratocumulus, stratus and nimbostratus; base generally below 1,800 m, 5,900 ft.

**low-cycle fatigue** Fatigue caused by changes in material stress resulting from changes in speed of rotating machines; from idling to take-off power and back to cruise rpm could represent single completed cycle.

**low density, high demand** Assets [e.g. aircraft] available only in small numbers but needed in all theatres.

**low Earth orbit** Below 2,000 km (1,243 miles), see *low orbit*.

**lower airspace** No single definition; FAA usually below 14,500 ft AMSL, but see next.

**lower airspace radar advisory service** Provided on request to local (say, within 50 km, 30 miles) uncontrolled traffic from 3,000 ft up to FL95 (CAA, UK).

**lower-deck container** ULD shaped to fit underfloor space, either full- or half-width.

**Lower DFL** Lowest divisional flight level, expected to be FL100.

**lower heating value** Net calorific value of fuel.

**lower-level gearbox** In a large turbofan, this transmits the drive from the angled input shaft to the accessory gearbox.

**lower rotating ventral door** Chief pivoted member forming underside of D (or 2-D) nozzle.

**lower sideband** Difference in frequency between modulation signal and AM carrier.

**Lowest** Light occupant weight ejection-seat test.

**low flying** Flight at minimum safe (sometimes unsafe) altitude for training or sport.

**low-flying area** Geographical region within which low flying is authorized for training.

**low frequency** Generally defined as 30–300 kHz.

**low gate** Mechanical stop on piston-engine throttle box beyond which further opening inadvisable below rated height or other altitude limit.

**low inclination mission** Satellite inclination less than 30° to Equator (eg 28.6°).

**low-lead** Petrol [US, gasoline] containing typically 2 ml/gal, 1.66 ml/US gal, of TEL.

**low-level discomfort factor** Usually measured as number of vertical accelerations exceeding specified level (0.5 g) experienced by occupants per minute.

**low-level parachute** Rapid automatic opening for precision delivery of fragile loads.

**low-light TV** Vidicon tube with multiplier tubes giving useful picture in near-darkness.

**low-light-level TV** Generally used for same EO devices as preceding entry.

**low loader** Ground vehicle designed for attaching load, e.g., cruise missile or NW, under carrier aircraft.

**low/mid wing** Mounted about one-third way up body.

**low oblique** Photography from lo altitude at oblique angles to either side, not vertical or ahead.

**low observables** Stealth.

**low orbit** Nominally, period 90 min or less.

**low-pass filter** Designed to cut off all signals above given frequency.

**low pitch** See *coarse pitch*.

**low-pressure compressor** The first compressor downstream of the inlet [or fan, if fitted] in an engine with two or more shafts.

**low-pressure fuel pump** That mounted in or on the fuel tank.

**low route** Area-navigation routes not dependent on navaid-based airways, for low-level traffic, MAA (3) 4,000 ft AMSL (FAA).

**low rudder** In tight turn, or other occasion with wings near-vertical, depressing pedal nearest ground to lower nose.

**low silhouette** Squat aircraft, esp. in frontal aspect, easy to hide on battlefield (usually anti-tank helicopter).

**low situational awareness** Criticism of combat pilot, failure to correlate several kinds of simultaneous input.

**low-speed aerodynamics** Not defined; below 100 ft/s has been suggested.

**low-speed aircraft** Several attempted definitions; UK CAA and FAR.91 do not define.

**low-speed stall** Normal 1 g stall.

**low supercharger gear** Lower of two gears in two-speed supercharger drive.

**low tow** Towing a glider, especially over a long distance, at an altitude lower than the tug.

**low vacuum** Pressure below 101.247 kPa (760 torr) and above some lower level usually agreed as 3.33 kPa (26 torr).

**low-velocity drop** Parachute or other drop with velocity below 30 ft/s (DoD, NATO).

**low-visibility operations** Not defined; usually taken as 0.3 n.m. RNP.

**low-visibility procedures** Adopted by airport controllers in visual control room [vary according to airport and RVR].

**low wing** Mounted low on body, usually so that undersurfaces approximately coincide.

**lox** Liquid oxygen.

**loxodrome** See *rhumb line*.

**loxogen** Liquid oxygen (arch.).

**loz** Liquid ozone.

**LP** 1 Low pressure; in an axial compressor or turbine a suffix number indicates the stage, thus: LP4.

2 Licensing panel.

3 Low-pass filter (often 1.p.).

4 Liquid propellant.

5 Launch platform.

6 Low-power.

7 Linear polarization.

8 Lightweight protocol.

9 Log Periodic.

10 Landing point.

**Lp** Sound pressure level, usually measured over  $\frac{1}{3}$ -octave or at a discrete frequency.

**Ip** Rolling moment coefficient due to rolling.

**LPA** 1 Laboratoire de Physique de l'Atmosphère (F).

2 Linear power amplifier.

**LPAR** Large phased-array radar (Soviet ABM).

**LPATS** Lightning position and tracking system.

**LPB** 1 Loss Prevention Bulletin; each issue lists over 20,000 stolen airline ticket numbers (IATA).

2 Low-pressure [shaft] bearing.

**LPBA** Lawyer Pilots' Bar Association [office, Washington, DC] (US).

**LPC** 1 Luftfahrt Presse-Club (G).

2 LP compressor; a suffix number indicates a particular stage, thus: LPC6.

3 Linear predictive coding.

4 Less paper in the cockpit.

**LPCA** LP compressor bleed actuator.

**LPCR** Low-power colour radar.

**LPD** 1 Labelled plan display.

2 Low-prf pulse Doppler.

3 Log periodic dipole antenna, or array.

4 Low probability of detection.

**LPDA** Light propeller-driven aircraft.

**LPDS** Landing platform docking ship (USN).

**LPDT** Low-power distress transmitter.

**LPDU** Link-protocol data unit.

**LPET** Low-pressure elevated temperature glasscloth.

**LPFI** Logiky perspektive frontovoy istrebitel [light-weight future fighter] (R).

**LPFT** Low-pressure fuel turbopump.

**LPG** Liquid, or liquefied, petroleum gas.

**LPH** Landing platform, helicopter ship (USN).

**LPHUD** Low-profile HUD.

**LPI** 1 Low probability of interception.

2 Liquid-penetrant inspection.

**LPIR** LPI radar, multi-beam broadband coded waveform with very small sidelobes.

**LPL** Linear polarized laser.

**LPLC, LPLC** Lift plus lift/cruise.

**LPM** 1 Looks per minute.

2 Landing path monitor.

**l.p.m.** Litres per minute.

**LPN** LPN maximum value.

**LPN** Perceived noise level.

**LPN** Average peak outdoor LPN at individual's residence.

**LPNVGs** Low-profile night-vision goggles.

**LPO** 1 Lunar parking orbit.

2 Lithium phospho-olivine.

3 Launch-panel operator.

**LPOT** Low-pressure oxidiser turbopump.

**LPOX** Low-pressure oxygen available.

**LPP** 1 Launch-point prediction.

2 Lean premixed/prevapourised.

**LPPO** Long-period pitch oscillation.

**LPPS** Low-pressure plasma spray.

**LPRE** Low pulse-repetition frequency.

**LPRP** Lunar precursor and robotic program (MSFC).

**LPS** Launch processing system.

**LPSC** Liquid Propulsion Systems Centre (Mahendragiri, ISRO).

**LPT** LP turbine; a suffix number indicates a particular stage, thus: LPT4.

**LPTSW** Linearly polarized transverse shear wave[s].

**LPTV** Low-profile transfer vehicle [for pax].

**LPU** 1 Logical program unit.

2 Line processor, or processing, unit.

**LPX** Extraction of shaft power from LP spool/shaft.

**LQA** Link quality analysis.

**LQG** Linear quadratic Gaussian.

**LQR** Linear quadratic regulator.

**LQT** Linear quadratic tracker.

**LR** 1 Long range.

2 Launch reliability of aircraft.

3 Line-replaceable.

4 Lead radial (VOR).

5 Prefix: the last message I received was . . .

6 Glider transport (USN, 1941–45).

**L/R** Launch, retrieve.

**lr** Rolling moment coefficient due to yaw.

**LRA** 1 Line-replaceable assembly.

2 Landing-rights airport.

3 Laser retroreflector array.

4 Low-range radar altimeter.

**LRAACA** Long-range air anti-submarine capability aircraft.

**LRAAS** Long-range airborne ASW system.

**LRAD** Long-range atmospheric defense (MDA6)

**LRALT** Long-range air-launch[ed] target.

**LRAM** Long-range aviation missile (USA, USAF).

**LRAS** Low-range airspeed system; ASI for V/STOL, helicopters.

**LRAT** Large radar array technology.

**LRB** Liquid-rocket booster (J).

**LRBA** Laboratoire des Recherches Balistiques et Aérodynamiques, Vernon (F).

**LRBL** Least-risk bomb location.

**LRBM** Long-range ballistic missile (2,500 nm, 2,880 miles).

**LCR** 1 Long-range cruise.

2 Logistics Readiness Center (USAF).

3 Light reflective capacitor.

4 Line-replaceable component[s].

**LCRA** Long-range combat aircraft.

**LCRO** 1 Limited remote communications outlet.

2 Lead range control officer.

**LCRSOW** Long-range conventional stand-off weapon.

**LCRU** Landing rollout control unit.

**LDR** 1 Labelled radar display.

2 Laser ranger/designator.

3 Liquid runway deicer, usually glycol or PAF.

**LRE** 1 Launch and recovery element (UAV).

2 List of radioactive and hazardous elements.

**LRF** Laser rangefinder; D adds designator.

**LRG** 1 Long-range.

2 Laser rate gyro.

**LRGB** Long-range glide bomb.

**LRI** 1 Long-range interceptor.

2 Air-traffic and airport administration (Hungary).

3 Line-replaceable item.

4 Liquid-resin injection.

**LRINF** Long-range intermediate nuclear force(s).

**LRIP** Low-rate initial production.

**LRIST** Long-range IR search and track.

**LRL** 1 Lunar Receiving Laboratory.

2 Lightweight rocket launcher.

**LRLE** Long-range, long-endurance [MoD] (UK).

**LRLS** Laser radar landing system.

**LRM** 1 Long-range air-to-air missile.

2 Launching/reeling machine (towed MAD).

3 Line-replaceable module.

**LRMP** Long-range maritime patrol.

**LRMTR** Laser ranger and marked-target receiver.

**LRMTS** Laser ranger and marked-target seeker.

**LRN** Long-range navigation.

**LRNF** Low-Reynolds-number flight.

**LRNS** Long-range navigation system.

**LRO** Lunar reconnaissance orbiter; C adds camera (NASA).

**LROPS, L-Rops** Long-range operations.

**LRP** Lead-replacement petrol.

**LRPA** Long-range patrol aircraft.

**LRQA** Lloyd's Register Quality Assurance [office, Croydon] (UK).

**LRR** 1 Long-range [surveillance] radar.  
2 Launch readiness review (KSC).

**LRRA** Low-range radar altimeter.

**LRRR** Laser ranging retro-reflector.

**LRS** 1 Load relief system.  
2 Laser reference system.  
3 Long-range strike.

**LRSI** Low-temperature reusable surface insulation (usually 99% pure silica-fibre felted tiles).

**LRSO** Long-range stand-off; M adds missile.

**LR<sup>3</sup>** Laser ranging retro-reflector.

**LRTS** Long-range tactical surveillance.

**LRU** Line-replaceable unit.

**LRV** 1 Lunar rover vehicle.  
2 Launch and recovery vehicle.

**LRVD** Lower rotating ventral door.

**LS** 1 Loudspeaker.  
2 Landmarks subsystem.  
3 Lavatory service vehicle.  
4 Prefix: the last message I sent . . .  
5 Lecture series.  
6 Loiter speed.  
7 Left side.  
8 Legacy software.  
9 Landing site.

**LSA** 1 Logistics support analysis [R adds records].  
2 Local-surface airspeed.  
3 Low situational awareness.  
4 Low-sidelobe antenna.  
5 Light sport aircraft.  
6 Lowest safe altitude.

**LSAB** London Society of Air-Britain.

**LSAC** Logistics supply analysis centre.

**LSALS** Lost survivor and asset locating system, detects chemical plume in ocean from crashed aircraft.

**LSALT** See LSA6.

**LSAM** Lunar-surface access module.

**LSAR** Logistics support analysis records.

**LSAS** Longitudinal-stability augmentation system.

**LSAT** Logistic shelter, air-transportable.

**LSB** 1 Lower sideband.  
2 Least significant bit.  
3 Learned Society Board (RAeS).

**LSC** Logistics support costs.

**LSD** 1 Large-screen display.  
2 Least significant digit  
3 Lithium sulphur dioxide.

**LSEV** Less-stealthy export version.

**LSF** Load-sheet fuel.

**LSFFAR** Low-speed folding-fin aircraft rocket.

**LS-FR** Low-speed frame relay; AD adds access device, SAD service access device.

**LSH** Light-support helicopter.

**LSI** 1 Large-scale integration (microelectronics).  
2 Lead system[s]-integrator.  
3 Large systems integrator.

**LSIC** Large-scale integrated circuit.

**LSIRR** Limb-scanning IR radiometer.

**LSJ** Lifesaving jacket.

**LSJSPO** Lethal Strike Joint Systems Project Office (DoD).

**LSK** 1 Line-select key.  
2 Luftstreitkräfte, East German [DDR] air force 1949–90.

**LSL** Landing ship, logistic.

**LSLT** Line-of-sight link terminal (UAV).

**LSM** Linear synchronous motor.

**LSMU** Laser-communications space measurement unit.

**LSN** Local sub-network.

**LSO** 1 Landing safety officer (manages aircraft-carrier projector sight).  
2 Landing signals officer; T adds trainer.  
3 Limited strategic option.

**LSP** 1 Large-screen projection.  
2 Logistics support plan.  
3 Longitudinal short-period.  
4 Link state PDU [protocol data unit].  
5 Locus of subvehicle points.  
6 Laser shock peening.

**LSQ** Line squall.

**LSR** Loose snow on runway.

**LSRS** Littoral surveillance radar system.

**LSS** 1 Local speed of sound.  
2 Large space structure.  
3 Lighting sensor system.  
4 Land survey system [at crash site].  
5 Linear-scanning seeker.  
6 Laboratory-system specification (stealth).

**LSSAS** Longitudinal static-stability augmentation system.

**LSSM** 1 Local scientific survey module.  
2 Large-scale shared memory.

**LSSS** Lightweight SHF satcom system.

**LSST** 1 Lightweight secure Satcom terminal.  
2 Laser spot seeker/tracker.

**LST** 1 Laser spot tracker.  
2 Lightweight satellite terminal.  
3 Lavatory servicing trailer.  
4 Local sidereal [or standard] time.  
5 Local Solar Time [on planet].

**LSTAT** Life support for trauma and transport.

**LSU** 1 Lavatory servicing unit.  
2 Legacy software upgrade.

**LSV** 1 Laser speckle velocimetry.  
2 Lavatory servicing vehicle.

**LT** 1 Low-pressure turbine.  
2 Low temperature.  
3 Lithium tantalate.  
4 Turn left after takeoff.  
5 Local time.  
6 Launch time.  
7 Laplace transform.  
8 Linear token.

**L/T** Ratio of lift to thrust in jet-lift aircraft hovering or moving slowly in ground effect; subscripts, v ground vortex, h hover suckdown, w jet wake and f fountain.

**LT** Tail moment arm; sometimes now called tail length, and written l<sub>t</sub> or l<sub>T</sub>.

**lt** Light, lighted.

**I.t.** Low tension (electrical).

**LTA** 1 Lighter than air.  
 2 The Lighter-Than-Air Society [Akron, OH] (US).  
**LTC** 1 Light transport aircraft.  
 2 Light tactical aircraft.  
 3 Long-term agreement.  
 4 Limited, or Lunar Module, test article.  
**LTAC** Light tactical airlift capability.  
**LT&E** Logistics testing and evaluation.  
**LTAS** See *The LTAS*.  
**LTB** Aircraft maintenance facility (G).  
**LTBT** Limited Test-Ban Treaty.  
**LTC** 1 Long-term costing, or contract.  
 2 Lithium thionyl chloride (electric battery).  
 3 Limited Type Certificate.  
 4 Lowest two-way channel.  
**LTCC** Low-temperature co-fired ceramic.  
**LTD** Laser target designator.  
**Ltd** Limited company (UK).  
**LTDP** Long-term defence plan (NATO).  
**LTD/R** Laser target designator/ranger.  
**LTDS** Laser target designator set.  
**LTE** 1 Loss of tail-rotor effectiveness.  
 2 Landline telephony.  
 3 Laser-tracker equipment, of aircraft in checking ILS.  
**LTF** Learn[ing] to fly.  
**LTFRS** Lantirn TFR system.  
**LTG** Lightning [CA adds cloud-to air, CC cloud-to-cloud, CCCG cloud/cloud/ground, CG cloud-to-ground, CW cloud-to-water, IC in clouds].  
**Lt Ho** Lighthouse.  
**LTI** Linear and time-invariant.  
**LTIT** Low [-pressure] turbine inlet temperature.  
**LTKh** Flying qualities (ICAO).  
**LTL, ltl** 1 Little.  
 2 Lateral.  
**LTM** 1 Load ton-mile.  
 2 Laser target marker.  
 3 Landsat thematic mapper.  
 4 Livestock transportation manual.  
**LTMA** London terminal control area.  
**LTMP** Low-temperature microgravity physics; F adds facility (ISS4).  
**LTMR** Laser target marker and receiver.  
**LTO** 1 Landing and takeoff, especially a standard cycle (ICAO).  
 2 See *LTOs*.  
**LTOF** Low-temperature optical facility.  
**LTOs** Letters to owners/operators (CAA).  
**LTP** 1 Laboratorio de Tecnología de la Propulsión (Spain).  
 2 Longitudinal touchdown point.  
 3 Left top plug.  
**LTPA** Long-term partnering agreement.  
**LTPB** Linear-token passing bus.  
**LTPG** Long-term planning guidelines (NATO).  
**LTPN** Tone-corrected perceived noise level, now judged of doubtful value, to account for intense tones, eg due to rotating fan and compressor blades.  
**LTPT** 1 Low-turbulence pressure tunnel.  
 2 Linear-token-passing topology.  
**LTR** 1 Loop transfer recovery (EDP methodology).  
 2 Later.  
 3 Linear-token ring.  
**LTR|S|** Improper abb. litre[s].

**LTS** 1 Load and trim sheet.  
 2 Landing threshold speed.  
 3 Lantirn targeting system.  
 4 Lights.  
 5 Link translator system.  
 6 See *Litas*.  
**LTSA** Long-term service agreement.  
**LTSS** Long-term software support [P adds programme].  
**LTT** 1 Landline teletypewriter.  
 2 Lead tin telluride.  
**LTU** Laser transceiver unit.  
**LTV** Load threshold value.  
**Lt V** Light vessel.  
**L<sup>3</sup>TV** Low-light-level TV.  
**LTWA** Long trailing wire aerial, or antenna.  
**LWTWA** Linear, or linearized, travelling-wave tube amplifier.  
**LU** Logic(al) unit.  
**LUA** Launch under attack.  
**rubber line** Reference index, usually parallel to aircraft longitudinal axis, eg on compass, denoting aircraft heading.  
**Lubbock burner** Pioneer [1940] atomising burner for turbojets, devised by Isaac Lubbock; featured a sliding piston which controlled inlet ports to a swirl chamber.  
**lube** Lubricating oil (US, colloq.).  
**lubricating oil** In general, piston engines still use mainly mineral oils and gas turbines ester-based "synthetics", over 1,000 national and international [e.g., NATO] specifications are in current use.  
**Lucero** Ground beacon keyed to 1.5 m AI or ASV radars, 1942-57.  
**Lucid** Software package for processing image data from all forms of visual sensor.  
**Lucite** Resin produced from methyl methacrylate, widely used for transparent plastics.  
**LUF** Lowest usable frequency.  
**Lufbery circle** Military ring formation in which all aircraft fly gentle turn following that in front.  
**Luftfartsverket** CAA (Norway), met. services (Sweden).  
**LUH** Light utility helicopter.  
**luhf** Lowest usable high frequency.  
**lumen** SI unit of luminous flux;  $lm = cd \cdot sr$  (candela steradian).  
**luminance** Brightness; intrinsic luminous intensity; illuminance on unit surface normal to radiation divided by subtended solid angle  $L = cd \cdot m^{-2}$ .  
**luminescence** Non-thermal emission of light, ie not incandescence but electro-\*, phosphorescence, chemi-\* and photo-\* (fluorescence).  
**luminous flux** Light emitted in solid angle of 1 steradian by point source of luminous intensity 1 cd, symbol  $\Phi$ , unit lumen; thus  $lm = cd \cdot sr$ .  
**luminous intensity** Luminous energy per unit solid angle per second; unit candela, cd. A basic SI unit.  
**lunar boot** Astronaut footwear tailored to surface of Moon.  
**lunar orbit** Orbit round the Moon.  
**lunar orbital rendezvous** Lunar exploration by descent stage detached from larger spacecraft left in lunar orbit and which is rejoined for return to Earth.  
**Luneberg lens** Device, often spherical, designed for maximum reflectivity of radar energy back along incident

path, tailored to wavelength; an enhancing corner reflector.

**lusec** Lumen-second, quantity of luminous energy.

**LUT** 1 Local-user-terminal [SAR satellites].  
2 Limited user test.

3 Launch[er] umbilical tower.

**lux** SI unit of illuminance;  $I_x = \text{lm/m}^2$ .

**LV** 1 Local vertical.  
2 Lower [sideband] voice.  
3 Low volume (crop spraying).  
4 Light and variable.  
5 Launch vehicle.

**lv** Moment arm of vertical tail, usually measured from 25% MAC.

**L/V** 1 Local vertical.  
2 Lead/vinyl.

**lv** Rolling moment coefficient due to sideslip.

**L+V** Leather and vinyl.

**LVA** 1 Large vertical aperture (radar).  
2 Log video amplifier.

**LVAT** Layered voice analysis technology.

**LVB** Luftverkeersbeveiliging, ATC authority (Netherlands).

**LVD** Low-velocity detection.

**LVDT** 1 Linear voltage differential transducer.  
2 Linear variable differential (or displacement) transducer, a precise indicator of position.

**LVE** Leave, leaving.

**LVER** Low-voltage electromagnetic riveter.

**LVFE** Long variable-flap ejector (supersonic nozzle).

**LVFR** Low-visibility flight rules.

**LVIS** Low-voltage ignition system.

**LVL** Level.

**LVLCH** Change in FL.

**LVNL** Civil ATC (Netherlands).

**LVO** Low-visibility operations.

**LVOR** Low-altitude VOR.

**LVP** Low-visibility procedures.

**LVPS** Low-voltage power supply.

**LVT** Low-volume terminal (MIDS/JTIDS).

**LVTO** Low-visibility take off.

**LW** 1 Littoral warfare.

2 Landing weight [needs explanation].

3 Long-wave.

**Lw** Sound power level; usually measured in 1/3-octave bands and can be measured in dB or W.

**lw** Long wave.

**lw** Longitudinal distance between aeroplane centre of gravity and centre of lift.

**LWA** Laser warning analyser.

**LWABTJ** Lightweight afterburning turbojet.

**LWAD** Littoral warfare advanced development.

**LWBT** Total lift of wing/body/tail.

**LWC** 1 Light-water concentrate (firefighting foam).  
2 Liquid-water content.

**LWCCU** Lightweight common control unit.

**LWD** Lowered.

**LWF** Light-weight fighter.

**LWIR** Long-wavelength IR.

**LWL** Load waterline.

**LWLD** Lightweight laser designator.

**LWMMT** Low water mark mean tides.

**LWP** Light window pintle.

**LWR** 1 Luftwaffenring eV (G).  
2 Laser warning receiver.

3 Lower, or lowering.

**LWS** Laser warning system.

**LWSS** Lightweight sound system [helo sonar].

**LWTR** Licence with type rating.

**Ix** See *lux*.

**Lyapunov equations** Linear quadratic equations containing solutions to LQR, typically including  $\dot{g} \equiv A^T P + P A_c$ .

**Lychgate** Multimedia data system linking RAF, MoD and other services (UK).

**Lyman-Alpha** Radiation emitted by hydrogen at 12.16 pm (1,216 Å), penetrates Earth atmosphere to base of D-region (90 km, 55 miles).

**LYR** Layer.

**LYRD** Layered.

**LYRS** Layers.

**LZ** Landing zone (assault in land battle).

**LZE** Luminous-zone emissivity (flare, IRCM).

**LZS** Aeronautical association (Slovenia).

# M

- M** 1 Prefix mega,  $\times 10^6$ .  
 2 Mass, except BS decrees m.  
 3 Magnetic heading/course/bearing.  
 4 Mach number [also  $M_n$ ].  
 5 Prefix minus (wind component).  
 6 Maxwell.  
 7 Dynamics, moment, esp. in pitch, with numerous suffixes.  
 8 Meteorological (JETDS).  
 9 Mutual inductance; unit henry.  
 10 Molecular weight.  
 11 Structural bending moment, and generalized symbol for moment.  
 12 Mandatory (NASA).  
 13 Aircraft type designation: equipped to launch guided missiles (USN suffix 1955–62, prefix 1962–68).  
 14 Telecom code: ‘IFR aircraft has Tacan and transponder with no code capability’ (FAA and others).  
 15 Mean anomaly of orbit.  
 16 Most ambiguously, thousand (ASA).  
 17 Prefix maximum.  
 18 Main.  
 19 Maintain.  
 20 Maritime air.  
 21 Measured.  
 22 Moderate.  
 23 Multi-mission (US role prefix).  
 24 MATZ penetration service [or (M)].  
 25 Missing.  
 26 Master station (Loran).  
 27 Magnetization intensity; magnetic polarization.  
 28 Medium-intensity [airfield lighting].  
 29 Aircraft category: tilting-wing/engine aircraft (FAI).
- M\*** Critical Mach number.
- M<sub>∞</sub>** Free-stream Mach number.
- (M)** 1 Torque, turning moment, also T.  
 2 See 24 above.
- m** 1 Metre[s].  
 2 Prefix milli,  $\times 10^{-3}$ .  
 3 Superplasticity.  
 4 Modular ratio.  
 5 Bypass ratio (USSR, R).  
 6 Mass, esp. of electron.  
 7 Minute[s].  
 8 Overlap fraction of helicopter tandem or side-by-side rotors.  
 9 Maximum camber of helicopter rotor blade.  
 10 Mach-number factor.  
 11 Confusingly, now being used for moment, especially in pitch.  
 $\dot{m}$  Mass flow rate; also  $\dot{m} = \text{kg s}^{-1}$ . Sometimes written  $\dot{m}$ .  
**m/** Internet-based modules providing toolbox for: airborne, techlog and jobcard.  
**̃m** 2-D section moment [pitching moment per unit span, nose-up positive].
- M1C** Cargo container half width of wide-body main deck.
- m<sup>2</sup>** Square metres.

- M<sup>2</sup>F<sup>2</sup>** Multi-mode fire and forget.
- M2M** Machine to machine [architecture].
- M3P** Mini-mutes modification program.
- M3R** Mobile multifunctional modular radar.
- M-band** EM radiation, 5–3 mm, 60–100 GHz.
- M-carcinotron** Backward-wave oscillator in which high power is possible by electron beam travelling between slow-wave structure and negative sole plate.
- M-day** Day on which mobilization is to begin.
- M-display** Has horizontal timebase along which target blip moves; operator moves second blip to line up on target by control graduated to indicate target range.
- M-generator** Main generator (Gripen).
- M-marker** 1 Middle marker.  
 2 Low power NDB.
- M-stoff** Methanol (G).
- M-wave** EM millimetric wavelengths.
- M-wing** Wing studied for low supersonic speeds with inner portions swept forward, outers swept back.
- MA** 1 Mission abort.  
 2 Naval aviation (USSR, R).  
 3 Mobilization augmentee (US).  
 4 Minor airfield[s].  
 5 Meteorological authority (ICAO).  
 6 Missed approach.  
 7 Marker analysis.
- M<sub>A</sub>** Generalised term for a resultant aerodynamic moment.
- M/A** Mach/airspeed.
- mA** Millampere[s].
- ma, Ma** Mass flow (airflow); eg that passing through engine.
- MAA** 1 Maximum authorized IFR altitude.  
 2 Monitoring angle of attack.  
 3 Missed-approach action.  
 4 Mission-area analysis.  
 5 Manufacturers’ Aircraft Association [initially provided aircraft from a pool, 1917]; [office, New York] (US).  
 6 Midlands Aerospace Alliance [trade assoc.; office, Thirsk, Yorks].  
 7 Museo de Aeronáutica y Astronáutica (Spain).  
 8 MidEast Aviation Academy, Amman (Jordan).
- MAAC** Medical Air Ambulance Company (USA).
- MAAF** Mediterranean Allied Air Force (1942–45).
- MAAG** Military Assistance Advisory Group (US).
- MAAH** Minimum asymmetric approach height.
- MAAM** Mid-Atlantic Air Museum (Reading, PA).
- MAAP** Master air attack plan; TK adds tool kit.
- MAAS** 1 Military air accident summary.  
 2 Mobile aircraft arresting system.
- MAATS** Military automated air-traffic system (Canada).
- MAAWLR** Miniature autonomous attack weapon, long-range.
- MAB** 1 Modular-array basing (ICBM).  
 2 Malaysia Airports Behrad (37 airports).
- MABCC** Military Airspace Booking and Co-ordination Centre [Swanwick] (UK).

**MABES** Manufacturing agent-based emulation system.

**MAC** 1 Mean aerodynamic chord,  $\bar{c}$ .  
2 Military Airlift Command (USAF).  
3 Maintenance Analysis Center (FAA).  
4 Maintenance allocation chart.  
5 Master air control (UK, CAA).  
6 Medium-access controller.  
7 Multi-activity contract.  
8 Air defence command (Spain).  
9 Message act cancelled, or cancellation.  
10 Multiple all-up round canister, converts SSBN to fire cruise missiles.  
11 Mid-air collision.  
12 Mediterranean Air Command (US/UK, WW2).  
13 Metal augmented charge (warhead).  
14 Media access control [protocol].

**Mac** Pitching moment of aircraft about aerodynamic centre.

**MACA** Military assistance to civil authorities (US).

**Macas** Mid-air collision-avoidance system.

**MACC** 1 Military area control centre.  
2 Multi-application control computer.  
3 Modified Air Control Center.  
4 Modular air command and control.

**MACCS** Marine air command and control system (DoD).

**Mace, MACE** 1 Minimum-area crutchless ejector.  
2 Multinational alliance for criminal emergencies.  
3 Multiple adaptive combat environment [for BVR training].  
4 Multistatic ASW capability enhancement.

**MACF** Missed-approach control failure.

**Mach** Mach number.

**Mach angle** Angle between weak (ie point-source) shockwave and freestream flow; theoretically  $90^\circ$  at Mach 1, thereafter  $\alpha = \sin^{-1} \frac{1}{M}$ .

**Mach-buster** Anyone who has flown faster than sound, esp. in pre-Concorde era when accomplishment had element of exclusivity.

**Mach cone** Conical shock front from point source moving at supersonic speed relative to surrounding fluid; locus of Mach lines. Semi-vertex angle  $\theta$  is given by  $\text{cosec } \theta = M$ , where M is free-stream Mach number.

**Mach disc** Visible disc at point of minimum diameter between jet shock and tail shock in supersonic jet, ie between adjacent shock diamonds.

**Mach front** Mach stem.

**Mach hold** Autopilot of AFCS mode holding Mach number at preset value.

**machine** Flying machine, normally aeroplane (colloq., arch.).

**machine gun** Magazine-fed automatic weapon using rifle ammunition.

**machine language** Normally compatible with particular computer but unintelligible to humans.

**machine screw** For pre-threaded holes and/or nuts, loosely = bolt.

**machine to machine** Basis of future tactical air operations for netcentric warfare, supported by MAAP [machine means those that provide information and take decisions] (USAF).

**machining centre** Major group of (usually NC) machine tools performing large number of operations on work-

piece held either stationary or under positive control throughout.

**Mach intersection** Junction of two or more shockwaves.

**Mach-limited** Boundaries of flight performance set by restriction on permissible Mach number, not by thrust or other limitation, esp. \* ceiling.

**Mach line** 1 Weak (infinitesimal amplitude) shockwave.  
2 Line on surface of body (ignoring boundary layer) at which accelerating free-stream flow reaches relative Mach 1.  
3 Some authorities are confusingly using this term to mean weak shockwaves in supersonic flight.

**Mach lock** See *Mach hold*.

**Machmeter** Instrument giving near-instantaneous readout of Mach number.

**Mach NO/YES** Air-intercept code: 'I have reached maximum speed and am not/am closing on target'.

**Mach number** Ratio of true airspeed to speed of sound in surrounding fluid (which varies as square root of absolute temperature). Symbol  $M = V/a$ .

**Mach-number factor**  $1 - M^2$ ; in supersonic flight  $M^2 - 1$ .

**Mach reflection** Attenuated shockwave reflected from solid surface, eg walls of tunnel or Earth's surface. Reflection and some other effects approximate laws of optics.

**Mach stem** Shock front (Mach front) formed by fusion of incident and ground-reflected blast waves from explosion, esp. from NW.

**Mach trim coupler** Electronic subsystem of Mach trim system, which through analog (to 1970) or digital computational chain controls aircraft pitch-trim servo as function of Mach number; also contains switching, logic, monitoring and Bite.

**Mach trimmer** Electronic/mechanical system for relieving pilot of task of correcting progressive deficiency in aircraft pitch trim and longitudinal stability at high Mach numbers; sensitive to Mach number and vertical acceleration and automatically feeds primary pitch-trim demand to keep aircraft level or in desired attitude while leaving pilot authority to feed manual trim. In US called pitch trim compensator.

**Mach tuck** Uncommanded, and possibly violent, nose-down pitching moment at high [usually just subsonic] Mach numbers.

**MAC I** Model Aeronautics Council of Ireland.

**MACIMS** Military Airlift Command integrated management system.

**Mack** Future AFSOC multirole proposal: MX Combat Talon replacement, AX gunship, CX airlifter, KX tanker (USAF).

**mackerel sky** Large area of high cloud giving dappled or banded effect (alto-cu or cirro-cu).

**Maclaurin series** Special case of Taylor series where  $f(x)$  and all derivatives remain finite at  $x=0$ .

**Macman** McDonnell anthropometric computerized man.

**Macom, MACOM** Air-combat command (Spanish air force, EdeA).

**MACR** Missing Air Crew Report[s] (USAAF, USAF).

**Macro** Block of software capable of repeated use.

**macro level** Preliminary design of software.

**macroscopic** Generally, large enough to be visible to naked eye.

**MACS** 1 Marine air control squadron (DoD).

- 2** Multiple-applications control system.  
**3** Mobile approach control system.  
**4** Modular airborne computer system (Gripen).  
**5** Military Aeronautical Communications Service.
- Mac-ship** Merchant aircraft carrier, merchant ship with flight deck [but nothing else] added (RN, 1942–44).
- MAD** *1* Magnetic-anomaly detection, or detector.  
*2* Magnetic-azimuth detector.  
*3* Mutual, or massive, assured destruction.  
*4* Maintenance access door.  
*5* Mass air delivery (attack weapons).  
*6* Multiwavelength anomalous diffraction.
- Madap** Maastricht automatic data-processing (Eurocontrol).
- madapolam** Fabric woven from long-staple cotton, originally from Madapollam (single 1 originally erroneous).
- Madar** Maintenance [or malfunction] analysis, detection and recording.
- MADC** Miniature, or micro, air-data computer.
- Maddls** Mirror-assisted dummy deck landings.
- MADF** Missile assembly/disassembly facility.
- Madge** *1* Microwave aircraft digital guidance equipment.  
*2* Malaysian air-defence ground environment.  
*3* Mascot design generator, enables software tools to be integrated.
- MADL** Multifunction advanced data-link.
- MADLS** Mobile air-defence launching system.
- MADM** Modified atmosphere density model.
- MADME, Madmel** Management and distribution system for more electric aircraft.
- M-ADS, Mads** *1* Modified automatic dependent surveillance.  
*2* Modified air-defense system.
- MAE** *1* Mean area of effectiveness.  
*2* Medium-altitude endurance (UAV).  
*3* Modular avionics emulator.
- MAEO** *1* Master air electronics officer (RAF).  
*2* Medium-altitude electro-optics., or optical
- Maestro** *1* Modular avionics enhancement system targeted for retrofit operations.  
*2* Strong NW wind [Adriatic].
- Mae West** Inflatable aircrew lifejacket tied round upper torso (WW2).
- MAF** *1* Mixed-amine fuel.  
*2* Marine amphibious force.  
*3* Michoud Assembly Facility (NASA, New Orleans).  
*4* Missionary Aviation Fellowship (A, PNG, UK), helped form (5).  
*5* Mission Aviation Fellowship (Int., numerous branches worldwide); [European office Ashford, Kent TN23 1HA] (Int.).  
*6* Military air forces (R).  
*7* Museum of Army Flying [Middle Wallop, Hants. SO20 8DY] (UK).
- MAFC** Micro-adaptive flow control.
- Maffs** Modular airborne, or aerial, firefighting systems.
- Mafis** *1* Mobile automated field instrumentation system, or fingerprint identification system (Lockheed Martin).  
*2* Multi-application fuzing initiation system.
- Maflir** Modified advanced forward-looking infra-red.
- MAFT** Major [or main] airframe fatigue test.
- MAG** *1* Military assistance, or advisory, group.  
*2* Marine air group.  
*3* Mobile arresting gear.  
*4* Machine gun.  
*5* Micromachined accelerometer gyro.
- mag** *1* Magnetic (FAA), or Mag (CAA).  
*2* Magneto (eg \* drop).  
*3* Magazine (camera) (NASA).
- mag-amp** Magnetic amplifier.
- Magat** Military assistance grant-aid training.
- Mag Brg** Magnetic bearing [heading].
- Magcom** Guidance technique similar to Tercom but using variations in terrestrial magnetic field.
- mag drop** Reduction in rpm when either ignition source of dual-ignition piston engine is switched off; always checked before take-off to confirm both sources operative (from magneto rpm-drop).
- Magerd** MRCA AGE Requirement Document.
- Magfet** Magnetic Mosfet.
- Maggs** Modular advanced-graphics generation system, for simulator external visuals.
- Magic** *1* Microprocessor application of graphics with interactive communications (USAF).  
*2* Multiple-action global interactive control (Thomson-CSF).  
*3* Multiple-aircraft GPS integrated command and control (Herley-Vega).
- magic eye** Tuning system using miniature CRT with radial illumination around sector whose size varies with strength of received signal; important in pre-crystal tuning era; also called magic-T.
- Magics** Modular architecture for graphics and image console, or control, system.
- Magiic** Pronounced magic, Mobile Army Ground Imagery Interpretation Center (USA).
- Magis** Marine (or mobile) air/ground intelligence system.
- maglev** Magnetic levitation.
- Magnaflux** Non-destructive test for magnetic material using magnetic field and fluorescent ink; trade name.
- Magnamite** Family of CFRP composites (Hercules Inc.).
- magnesium** Mg, low-density (1.74) white metal, MPt 649°C, used pure and as alloy (Elektron, Dowmetal etc) for structural parts and incendiary bombs.
- Magnesyn** Patented remote-indicating system using induction between permanent-magnet rotor and saturable coil.
- Magnet** Multi-modal approach for GNSS 1 in European transport, implemented in two (A, B) concurrent forms (Euret).
- Mag Net** Mobile arresting gear using fast-erecting net to catch aircraft lacking serviceable tailhook.
- magnetically anchored rate damper** One in which gyro spin axis is restrained magnetically.
- magnetic amplifier** Various arrangements of saturable reactors such that small control current governs large output load/power/voltage.
- magnetic anomaly** Local irregularity in terrestrial magnetic field caused by presence of magnetic material such as submerged submarine or ore deposit.
- magnetic azimuth detector** Essentially, a compass.
- magnetic bearing** Direction of a fixed object measured clockwise from magnetic north.
- magnetic chip detector** See *chip detector*.

**magnetic compass** Traditional compass indicating local horizontal direction of Earth's magnetic field.

**magnetic core** Doughnut-shaped ferrite ring storing either 1 or 0 in either of two stable magnetic states.

**magnetic course** Course (heading) indicated by simple magnetic compass after correction for deviation.

**magnetic crack detection** *Magnetic particle.*

**magnetic crotchet** Sudden change in numerical values of Earth's field usually ascribed to alteration in conductivity of ionosphere.

**magnetic damping** Use of eddy currents or other induced magnetic field to oppose oscillatory or vibratory motion.

**magnetic declination** Horizontal angle between terrestrial field and true N, ie between magnetic and geographic meridians; also known as variation.

**magnetic deviation** Errors in magnetic compass indication caused by local disturbance to field, esp. by 'iron' in aircraft.

**magnetic dip** Angle between local terrestrial field and local horizontal.

**magnetic disc** Computer storage in magnetic-oxide coating on surface of high-speed rotating disc.

**magnetic drag cup** Aluminium or copper cup surrounding rotating core in simple tachometer, rotated by generated eddy current.

**magnetic equator** Line joining points where angle of dip is zero.

**magnetic field intensity** Magnetizing force exerted on unit pole; also called field strength, symbol H, units Atm<sup>-1</sup> [ampere-turns per metre].

**magnetic flux** Product of area and of field intensity perpendicular to it (in effect number of lines of force); kg.m<sup>2</sup>s<sup>-2</sup>A<sup>-1</sup>=Vs; symbol Φ, unit is weber Wb.

**magnetic flux density** Measure of magnetic induction; kg.s<sup>-2</sup>A<sup>-1</sup>=Vs.m<sup>-2</sup>; symbol B, unit is tesla T = Wb/m<sup>2</sup>.

**magnetic induction** Induced magnetism in magnetic material, see previous entry.

**magnetic inspection** Many NDT methods which attempt to detect imperfections in magnetic-metal parts by the anomalies they cause in strong fields.

**magnetic meridian** Direction of horizontal component of terrestrial field near surface.

**magnetic north** North as indicated by the magnetic meridian.

**magnetic orange pipe** Brightly painted magnetized iron pipe filled with Styrofoam for aerial sweeping of mag-influence mines in shallow water.

**magnetic particle inspection** NDT for ferrous parts which when magnetized form N/S poles across cracks rendered visible by iron oxide powder viewed under UV.

**magnetic permeability** See *permeability*.

**magnetic plug** Removable *chip detector*.

**magnetic RAM** Any variety of RAM (2) which relies on magnetic materials such as very finely divided sintered nickel zinc ferrite, applied in layers on outside of aircraft skin; see *iron ball*.

**magnetic refrigerator** Cryogenic cooler (eg for IR materials) operating by magneto-caloric repeated magnetization and demagnetization of suitable materials.

**magnetic storm** Transient major disturbance in Earth's field.

**magnetic surface wave** Travels across substrate, esp. ferromagnetic garnet.

**magnetic tachometer** Most common speed-measuring

system in aero engines measures frequency signal from magnetic and electrical interaction between toothed wheel and fixed sensor.

**magnetic tape** Storage system in which information is recorded on and read off long strip coated with magnetic oxide.

**magnetic track** Angle between track and magnetic N.

**magnetic turning error** Northerly turning error.

**magnetic variation** Angle between magnetic meridian and true north, varies throughout globe and with time; thus used as ± correction to °M to give °T.

**magnetizing force** Field strength, symbol H.

**magneto-aerodynamics** Aerodynamics at high hypersonic speed and near-vacuum conditions, where magnetic and aerodynamic forces are similar.

**magneto drop** See *mag drop*.

**magnetohydrodynamics, MHD** Science of inter-action between magnetic fields and electrically conductive fluids, especially plasmas.

**magnetometer** Instrument for measuring magnetic field intensity and direction.

**magnetometer navaid** Precision position-fixing system based upon measurement of local terrestrial field, eg MAHRS.

**magnetomotive force** Product of flux and reluctance (resistance), work needed to move unit pole against field; symbols F or M but unit ampere A.

**magnetopause** Outer boundary of geomagnetic cavity.

**magnetosphere** Region around Earth, from T-layer at 350 km to about 15 Earth radii, where magnetic field and ionised gas are dominant.

**magnetostriiction** Change in dimensions when magnetic material is magnetized; most pronounced in nickel.

**magnetron** Pioneer resonant-cavity generator of high-power microwaves, with spinning electron beam deflected by transverse field.

**magnitude** Apparent brightness of stars, planets, on scale of relative luminosity where × 100 brightness reduces magnitude by 5; hence brightest bodies have negative \*.

**Magnum** Missile[s] launched [at surface target].

**Magnus effect** Force produced perpendicular to airflow past spinning body; basis of Flettner rotor and swerving golfball.

**MAGR** Miniature, or miniaturised, airborne GPS receiver.

**MAGS** 1 Miniaturized airborne GPS receiver [MAGR has also been used for this].

2 Mode-S airport ground system.

**Magsat** Magnetic-field [measurement] satellite.

**MAGTF** Marine air/ground task force (USMC).

**MAHA** Mid-Atlantic Helicopter Association.

**MAHL** Maximum aircraft hook load (ASCC).

**mahogany bomber** Non-agile fighter [colloq.].

**MAHP** Missed-approach holding point.

**MAHR** Microflex attitude and heading reference for light combat aeroplanes and helicopters, using strapdown three-axes magnetometer [S adds system, U unit].

**MAHWP** Missed-approach holding waypoint.

**MAI** 1 Moscow Aviation Institute.

2 Mach/airspeed indicator.

**Maica** Modelling and analysis of the impact of changes in ATM (7).

**Maid/Miles** Magnetic anti-intrusion detector/magnetic intrusion line sensor.

**MAIM** Méthodes Avancées en Ingénierie Méchanique (F 2003, focused on aerospace).

**main airfield** Permanent peacetime military airbase offering at least potential for all facilities.

**main bangs** Transmitted pulses in radar (colloq.).

**main beam** Principal beam from a radar; usually all others are unwanted.

**main-beam clutter** Caused by main beam intersecting the ground.

**main-beam killing** ECCM technique in which, while continuing to operate side lobes, main radar beam is suddenly cut off.

**main bearing** Supports main rotating assembly in gas turbine, crankshaft in piston engine.

**main bridle** Steel cable with eye at each end for mooring aircraft on water.

**main float** Central float in three-float seaplane.

**mainframe** Central computer in large or geographically dispersed EDP (1) system.

**Main Gate** Crucial point of supposed no return in large programme, esp. in defence procurement; it may come years after the start of prototype testing (UK).

**main gear** Main landing gear.

**main landing gear** Each or all units of landing gear supporting nearly all weight of aircraft; other units are nosewheel, or tailwheel, or lateral outriggers.

**main line** 1 Mooring line (airship).

2 Data highway, excluding side branches attached at nodes.

3 Cable from electric generator to aircraft electrical system.

**main lobe** That on axis of transmitting dish antenna.

**main parachute** Canopy supporting load, as distinct from drogues, extraction chute, etc.

**mainplane** Wing, as distinct from tailplane or canard.

**main rotor** Helicopter rotor providing lift and propulsion.

**main runway** Airfield's principal runway, normally in use (usually longest).

**main spar** Principal spar of wing, having modulus greater than others.

**mainstage** 1 In multistage rocket vehicle, that stage having greatest thrust, excepting short-duration boosters (see [3]).

2 In single-stage vehicle, main propulsion as distinct from verniers, roll-control and other motors.

3 In smaller, or non-ballistic vehicles, sustainer propulsion after separation of boost motor(s).

4 In large ballistic vehicle, period during which first-stage propulsion is delivering 90% or more of maximum thrust.

**main step** Principal discontinuity in planing bottom of hull or float to assist unstick, usually near c.g.

**mainstream** The principal flow through a gas turbine, ignoring cooling and pressurizing flows and bleeds.

**maint** Maintenance.

**maintenance** Work required, scheduled and otherwise, to keep aircraft serviceable, other than repair. Term normally refers to minor tasks on flightline, but can also include major operations normally called overhaul.

**maintenance access terminal** Major connection through

which engineers can interrogate systems and perform Bite checks.

**maintenance burden** Usually total maintenance cost, calculated as 1.8 times total maintenance labour cost.

**maintenance data panel** Electroluminescent or liquid-crystal display which collates, logs and displays any faults detected on avionics data bus.

**maintenance dock** Large structure fixed inside hangar with hinged or separable sections which can be closed tightly around large aircraft undergoing maintenance, providing staircases to platforms at different levels equipped with electric power and, usually, hydraulic and pneumatic power and water supply. Some are configured for particular type of aircraft.

**maintenance lift** Maintenance platform.

**maintenance platform** Mobile platform with scissors elevation to maximum height up to c10 m (c33 ft); some provide electric and other supplies.

**maintenance recorder** Wire or tape recorder for flight time, engine operation and variable number of other parameters.

**maintenance reserve** Money set aside by a lessee to pay the lessor a regular amount, usually per month, calculated from hours flown [and other factors] in the previous month. The intention is to cover deterioration and over-haul costs during a long lease.

**Maintenance Review Board** Establishes maintenance schedule for Transport Category aircraft.

**maintenance schedule** Prearranged plan for all maintenance required through life of item [but subject to revision].

**maintenance status** Non-operating condition deliberately imposed.

**Maintenance Steering Group** Globally defined analysis of minimum standard of scheduled maintenance required by engines and systems [ATA] (Int.).

**maintenance unit** Military formation at fixed airbase able to store, modify, overhaul, flight-test and scrap aircraft.

**main transverse** Major frame of rigid airship joining all longitudinals.

**main undercarriage** Main landing gear.

**mainwheel** Wheel of main landing gear.

**Mair** Maritime air (NATO).

**MAISO** Military Aeronautical Information Services Office[r] (NATS AIS).

**MAJCOM** Major command (USAF).

**Majic** Multi-sensor aerospace ground joint ISR interoperability [or intelligence] coalition.

**major** Large [especially international-route] airline, to which passengers are brought by regionals (US).

**major aircraft review** Search for items that can be cancelled (UK).

**major axis** Principal axis through solid body, usually along largest dimension or chief moment of inertia; where possible, axis of symmetry.

**majority rule** Philosophy whereby two or more operative channels (eg AFCS) always 'out-vote' single failed channel.

**majority voting system** Redundant system wherein outputs of three or more active channels are summed and output is fed back to each channel. When failure of one channel occurs, feedback causes all unfailed channels to

## major join

act to offset failure; hence immediate shut-off of failure is not necessary.

**major join** Erection of aircraft, esp. mating fuselage to wing.

**MAK** 1 Interstate aviation committee (R, CIS).

2 Maximal Arbeitsplatz Konzentration, standard for air pollution (Int.).

**mAk** Maritime Arctic air mass, colder than surface.

**make v buy** The fundamental decision whether to make a part or subcontract it to a low-cost [third-world] supplier.

**MAL** Maximum allowable, hence \*TOGW.

**Malch, MALCH** Multiple-access laser communications head (LEO satellite)

**Mald, MALD** Miniature air-launched decoy; -J adds jammer.

**MALDT** Mean administrative and logistics delay time.

**MALE** Medium-altitude long-endurance.

**MALF** Mostly aloft, precipitation not reaching ground.

**M-Alfens** Messaging automated low-flying flight planning enquiry and notification system [now MFMIS].

**MALJ** Miniature air-launched jammer.

**Mallory** See *mercury battery*.

**MALM** Master Air Loadmaster.

**MALS** Medium-intensity approach light system; F adds sequenced flashing, R adds with runway-alignment lights.

**Malta** Microprocessor aircraft landing training aid.

**MALV** Miniature air-launched vehicle, unrelated to MALD/MALJ.

**MAM** Mission adapter module.

**Mamba** Mobile artillery-monitoring battlefield radar.

**Mamis** Mandatory aircraft modifications and inspections summary (FAA).

**mammatus** Cumuliform cloud with pendulous bulged undersurface.

**Mammut** Luftwaffe surveillance radar, 1944.

**MAMS** Mobile air movements squadron (RAF).

**MAMT** Multi-axial, or -axis, materials technology.

**MAN** Military Aviation Notice.

**manacle** Mounting in form of calipers surrounding and gripping circular section hardware, eg generator.

**Manchester coding** See *biplane coding*.

**Manclos** Manual command to line of sight.

**M&A** Mergers and acquisitions.

**mandatory** To be complied with, often as AOG modification.

**Mandatory Permit Directive** Grounds the aircraft (CAA).

**M&ES** Magnetic and electromagnetic silencing.

**M&O** 1 Maintenance and overhaul.

2 Maintenance and Operations.

**M&R** Maintenance and repair.

**Mandrel** High-power radar jammer (RAF, 1943).

**mandrel** Centrebody, usually circular section, around which tubular or female part is hand-forged, extruded or formed.

**M&S** 1 Marred and scarred (US category).

2 Modelling and simulation.

**manetom** Pinch-fit coupling for female part tightened by bolt around (usually smooth-surface) pin, eg crankshaft web or big end.

**manganese** Mn, hard silver-white metal, density 7.3, Mpt 1,244°C, important as alloying element in tough

## manoeuvring envelope

corrosion-resistant steels and with light alloys, brasses and bronzes.

**manganese bronze** Golden alloy, resistant to marine corrosion, sometimes used for compressor blading (DTD.197).

**Manicom** Manned information and communication facility.

**manicured** Beautifully kept [grass airfield].

**manifest** List of all passengers and cargo for one flight.

**manifold** Fluid pipe system distributing from single input to multiple outputs or vice versa (thus piston engine inlet \*, exhaust \*).

**manifold pressure** Pressure in inlet manifold of piston engine, normally local atmospheric plus boost (US traditionally inches Hg).

**manipulator** 1 Mechnaical device resembling enlarged and more powerful human arm for positioning items in space.

2 Flat-plate aerofoil projections through aircraft boundary layer to cause major re-energization.

**manning the rail** Crew of warship, esp. carrier, line main-deck periphery on entering/leaving harbour.

**manoeuvrability** Measure of the maximum rate of change of magnitude and direction of the velocity vector. US maneuverability.

**manoeuvrable re-entry vehicle** One which is capable of performing accurate preplanned flight manoeuvres during re-entry (DoD).

**manoeuvre, maneuver** Any deliberate departure from straight-level flight or existing space trajectory.

**manoeuvre ceiling** Maximum height at which aircraft, at given weight, can sustain specified load factor after onset of buffet; highest point of each buffet-boundary line.

**manoeuvre diagram** Usually means V-n diagram or manoeuvring envelope.

**manoeuvre flap** Usually small forward-hinged plate depressed under power from underside of inner wing at 20–40% chord to cause powerful nose-up trim change.

**manoeuvre enhancement** Capability of a direct-force-control aircraft to achieve more rapid normal acceleration (upon pilot selection), typically by use of symmetric wing flaps for immediate increase in lift to eliminate difference between g ( $A_n$ ) commanded and achieved.

**manoeuvre induced error** Instrument error, usually pressure, gyro or magnetic, caused by flight manoeuvre.

**manoeuvre load factor** Load factor (2).

**manoeuvre margins** Two distances (stick-fixed and free) measured as % SMC from manoeuvre points to c.g. position.

**manoeuvre motion** Real or simulated motion of cockpit resulting from pilot's control input, unlike disturbance motion.

**manoeuvre point** Point around which aircraft rotates about all axes. Stick-fixed \*\* is c.g. position at which stick movement per g is zero; stick-free \*\* is c.g. position at which stick force per g is zero.

**manoeuvring area** Area of airfield used for takeoffs, landings and associated manoeuvres (NATO).

**manoeuvring ballistic re-entry vehicle** For practical purposes synonymous with manoeuvrable re-entry vehicle.

**manoeuvring control force** Stick force per g.

**manoeuvring envelope** Basic design envelope in which permissible speed (EAS) is plotted against load factor.

## manoeuvring factor

From the origin the positive stall line extends to design limit load factor, thence to  $V_D$ , back to limit negative load factor at  $V_c$  and thence horizontally to intersect the negative stall line.

**manoeuvring factor** See *load factor (1)*.

**manoeuvring speed** True airspeed at which the V-n diagram changes from the positive stall line to the positive load-factor limit [i.e., top left corner,  $V_M = \sqrt{V_{sN_{pil}}}$ ].

**manometer** Linked twin or single vertical fluid tubes giving indication of pressure piped from remote source.

**manometer bank** Large array of manometers side-by-side.

**manometric lock** Autopilot function for capturing and holding constant pressure-based flight parameters, esp. IAS, altitude, vertical speed, M.

**Manot** Missing-aircraft notice.

**manpack** General term for astronaut/cosmonaut load carriers, designed according to local (eg lunar) gravity.

**Manpads** Man-portable air-defense system (USA).

**manprint** Manpower personnel integration.

**man-rated** Sufficiently reliable to form part of manned spacecraft or launcher.

**MANS, Mans** Missile and nudet surveillance.

**man space** Assumed to include individual equipment and currently defined as 250 lb/13.5 cu ft (DoD).

**Manta** 1 Multi-axis no-tail aircraft.

2 Manpads threat avoidance.

**Mantea** Management of surface traffic at European airports (Euret).

**Mantech** Manufacturing technology (AFSC).

**man-tended free-flyer** Autonomous space laboratory accessible to astronauts but not normally manned.

**manual** Performed by hands, thus \* control, \* flying = hand-flying aircraft fitted with autopilot or AFCS.

**manual D/F** Obtaining bearing by hand-rotation of loop and visual or aural judgement of signal.

**manual feedback** Force experienced at pilot from manual FCS, or (rarely) other system.

**manual override** Condition in which pilot physically overcomes AFCS through cable and/or linkage connections and exerts flight control in excess of AFCS authority or in opposition to AFCS command.

**manual reversion** Ability to switch from autopilot or AFCS to hand-flying (can be automatic in event of AFCS failure) wherein pilot's forces are transmitted to control surfaces.

**manufactured head** Rivet head preformed when rivet made.

**Manvis** Map and aviator's night-vision system (helicopters).

**many** Air intercept code: more than eight (DoD).

**MAO** Mature aircraft objective.

**MAOCC** Mobile air operation[s] co-ordination centre.

**MAOT** Mobile air operations team (British Army).

**MAP** 1 Ministry of Aircraft Production (UK, 1940–April 1946).

2 Military Assistance Program (DoD).

3 Machine assembly program.

4 Missed-approach point, or procedure.

5 Ministry of Aviation Industry (USSR, R).

6 Manufacturing automation protocol.

7 Manifold absolute (or air) pressure.

8 Multiple aim point (USAF).

9 Municipal airport (US).

## marginal weather

10 Maximum a priori probability.

11 Modular airborne processor.

12 Military Airport Program (FAA).

13 Mode-annunciator panel.

**map** Two-dimensional plot of two [sometimes several] parameters, usually based on X and Y axes, generally = graphical plot.

**MAPA** Malaysian Airlines' Pilots' Association.

**Maple Flag** Canadian Red Flag.

**map-matching** Navigation (usually of RPV or missile) by auto-correlation of terrain with stored strip of film; based on appearance, unlike Tercom.

**Mapp** Methyl acetylene-propadiene/propane (FAE).

**M/App** Missed-approach procedure.

**mapping radar** Producing pictorial display showing Earth's surface in detail (usually in sector ahead, sometimes PPI 360° all round aircraft).

**map reading** Navigating by comparing terrain with map, generally called contact flying.

**MAPS, Maps** 1 Mobile aerial port squadron (MAC).

2 Measurement of air pollution sensor (Shuttle), also rendered as measurement of atmospheric pollution from satellites.

3 Mission analysis and planning system, several models (USAF).

4 Military-aircraft planning system.

5 Meteorological and aeronautical presentation system (1976).

**Mapse** Minimal APSE (Ada programming support environment).

**MAPSS** Modular airborne patrol surveillance system.

**MAPt** Missed-approach point.

**MAPTFH** Mission aborts per thousand flight hours.

**MAR** 1 March (ICAO).

2 At sea (ICAO).

3 Multiple- (or multi-function) array radar.

4 Mission abort rate.

5 Minimally attended radar.

6 Military Aircraft Release (UK).

7 Major aircraft review.

8 Multi-access receiver.

9 Multiple-access recorder.

10 Mobile access router [satcoms].

**MARA, Mara** Modular architecture for real-time applications.

**maraging steel** High-alloy (Ni, Co, Mo) steels aged in martensitic condition for maximum tensile strength.

**MARAIMED** Maritime Air Forces, Mediterranean (NATO).

**Maras, MARAS** Middle airspace radar advisory service.

**MARC** Multi-access remote-control.

**MARCS, Marcs** Military Airlift [Command] reaction communication system.

**MARE** Miniature analog recording avionics.

**Marendaz flap** Split flap hinged under wing entirely forward of TE.

**Mareng tank** Flexible fuel cell (from Martin Engineering, US).

**mare's tail sky** Cirrus.

**marginal performance** Barely able to comply with airworthiness requirements, or to fly safely.

**marginal weather** Only just good enough for safe or legal flight, actual conditions depending on whether flight is

## margin of lift

## MASC

IFR or VFR. DoD definition: ‘Sufficiently adverse to military operation so [sic] as to require imposition of procedural limitation’.

**margin of lift** 1 Aerostat buoyancy (gross lift) minus mass.

2 Various meaningless definitions for aerodynamics.

**margin of safety** Percentage of ratio by which ultimate failing load of component exceeds design limit load.

**maria** Flat areas on Moon once thought to be seas.

**Marie** Martian radiation environment experiment.

**marine aircraft** Designed to operate from water. Hence, marine aerodrome or airport.

**marine distress signal** Pyrotechnic fired after unpremeditated alighting.

**maritime aircraft** Designed to operate over sea areas.

**maritime PDNES** PDNES having extremely short pulses to reduce sea-clutter.

**maritime SAR** Region within which USCG exercises SAR co-ordination function (FAA).

**MARK** Material accountability and robotic kitting system (DoD).

**Mark** Air-control agency code for commanded point of weapon release, usually preceded by word ‘Standby’ (DoD).

**mark** 1 Abb. Mk, British word meaning version or subtype to distinguish each variant of a basic aircraft design, whether produced in series or not. See \* number.

2 Verb, to illuminate a target by flares, TIs, markers or laser.

**marked target** One illuminated by (2) above to enable it to be attacked visually or by laser-homing weapons.

**marker** 1 Distinctive visual (usually pyrotechnic), electronic or other device dropped on surface location.

2 Visual or electronic navigation aid indicating a fixed position, see \* beacon.

3 Aircraft detailed to mark a target by air-dropped stores or to designate it by laser.

**marker beacon** Any beacon (course-indicating, fan, outer, middle, inner) giving substantially vertical radiation, usually at 75 MHz, which gives aural and visual signal in cockpit (see *outer* \*, *middle* \* etc.).

**marker template** One having profile of common stringer or similar standard section, for marking end-cuts and cut-outs.

**market** 1 The world total of available potential customers.

2 To promote one’s product in (1).

**marketable range or radius** Maximum sector distance sold to customers by air carrier; eg Dash-7 \* 400 miles, while ‘operational range’ is 700 miles.

**marking panel** Sheet of material displayed by ground troops for signalling to friendly aircraft.

**marking team** Troops dropped into tactical area to establish navaids and possibly other electronic facilities.

**marking up** Putting bright paint line round each airframe crack or blemish.

**mark number** Suffix numeral identifying each *mark*; Roman to 1946, Arabic subsequently (UK).

**Markov analysis** A logical and rigorous technique to ascertain the airworthiness of systems having multi-channel architecture with numerous inter-related functioning parts and monitors.

**Marmon clamp** Patented ring joint for pipe sections, with wedge action.

**MARRES** Manual radar-reconnaissance exploitation system.

**marrying up** Offering up major airframe or other large items in erection of aircraft or space launcher, esp. when likelihood of imperfect fit.

**Mars** 1 Mid-air recovery (USN), or retrieval (USAF) system.

2 Military affiliate radio system (DoD).

3 Multi-access retrieval system.

4 Modular airborne recorder series, or system.

5 Minimally attended radar station.

6 Meteorological and AIS (1) retrieval system.

7 Multi-applications recording, or reproducer, system.

8 Military Archive and Research Services (UK).

9 Mobile automatic reporting station.

10 Modular adaptable radar simulator.

11 Medium-altitude reconnaissance system.

12 Mission-assessment recording system.

13 Multimission airborne reconnaissance and surveillance.

**Marsa** Military accepts responsibility for separation of aircraft (DoD/FAA).

**marshal** 1 Person giving visual and/or aural signals to sporting aircraft or sailplanes to ensure line-up in correct take-off sequence.

2 See *Air Marshal, Sky marshal*.

**marshaller** Person on apron or flightline giving visual signals or radio guidance to aircraft on ground, eg directions where to park; hence, \* frequency, \* van.

**marshalling point** Place on airfield where aircraft come under control of a marshal (sporting, out-bound) or marshaller (inbound).

**marshalling wand** Combined black flag and illuminated wand normally used one in each hand by marshaller.

**MARSS** 1 Microwave airborne radiometer and scanning system.

2 Multi-mission airborne reconnaissance and surveillance system (USA).

**MarSTC** Maritime Strike Carrier [capability or mission] (UK).

**MART, Mart** 1 Modular air/ground remote terminal.

2 Mini-avion de Reconnaissance Télécommandé = RPV (F).

3 Mean active repair time.

**Martacs** Maritime tactics.

**martensite** Family of rapidly quenched [hence hard but brittle] steels.

**Martha** Maillage anti-aérien des radars tactiques contre hélicoptères et avions.

**Martlesham** Martlesham Heath, pre-1939 centre of military aircraft test and evaluation in UK, hence \* figures (= indisputable).

**MARV, Marv** Manoeuvrable, or manoeuvring [maneuvering], re-entry vehicle.

**MAS** 1 Military Agency for Standardization (NATO).

2 Military area services.

3 Military assistance sales (DoD).

4 Middle airspace service.

5 Micro autonomous system.

6 Morphing aircraft structure.

**MASA** Multi-arm spiral array.

**MASC** Maritime airborne surveillance and control; also renedered as maritime air surveillance capability.

**mascon**

**mascon** One of the mass concentrations scattered over lunar surface which distort orbits near the Moon.

**MASDC** Military Aircraft Storage and Disposition Center (USAF Davis-Monthan AFB).

**MASE** 1 Multi-axis seat ejection.

2 Modular airspace synthetic environment [air defence].

**maser** Microwave amplification by stimulated emission of radiation, devices which pump electrons to higher energies and build up amplification of EM signals at microwave frequencies (see *laser*).

**MASF** 1 Mobile aeromedical staging flight[s].

2 Military assistance service fund (DoD).

**MASH, Mash** 1 Mobile Army Surgical Hospital (USA).

2 Mobile avionics screening handler.

**MASI, Masi** Mach/ASI.

**Masint** Measuring [or measurements] and signals [or signatures] intelligence.

**masking** 1 Layer protecting substrate against applied process, eg metal foil or special paper when painting aircraft, or hi-resist. surface pattern when doping or etching microelectronic chip.

2 Deliberate use of additional emitters to hide or conceal true purpose of particular EM radiation.

3 Hiding battlefield helicopter behind natural cover.

4 Time taken for (3), typically  $\leq 2$  s.

**mask** Face mask for (a) protecting skin in open cockpit, (b) supplying oxygen, and/or (c) incorporating microphone.

**Masonite** Commercial formulation of compressed fibreboard, moulded to shape with accurate glassy finish on at least one surface.

**MASP** Minimum aviation systems performance, A adds avionics, S standards or specification.

**MASR** Multiple antenna surveillance radar.

**MASS, Mass** 1 Marine air support squadron (DoD).

2 Mission avionics sensor synergism (data fusion).

3 Military approach and surveillance system.

4 Maritime air surveillance sortie.

5 Magnetic-array sensor system.

6 Multi-ammunition soft-kill system.

7 Military airborne surveillance system.

**mass** Applied force on body divided by resulting acceleration; in practice gravitational attraction of body related to standard kilogramme.

**mass axis** Line joining c.g. of all elements of part, esp. wing.

**mass balance** Mass attached to flight-control surface, typically ahead of hinge axis, to reduce or eliminate inertial coupling with airframe flutter modes.

**mass flow** 1 Quantity of fluid passing through closed system per unit time.

2 Specifically, mass of air passing through an engine or any of its components per second. Generally  $W\sqrt{T/P} = \rho AV$ . One conversion is:  $1 \text{ lb/h} = 1.25998 \times 10^{-4} \text{ kg s}^{-1}$ ; reciprocal,  $7.93663 \times 10^3$ .

**mass fraction** See *mass ratio* (1).

**mass injected pre-compressor cooled** Propulsion for initial part of Rascal, turbojet[s] with injection of water plus liquid air or LO<sub>2</sub>.

**massive ordnance** Conventional warhead weighing 9,072 kg (20,000 lb) or more (DoD).

**master diversion airfield**

**massive ordnance penetrator** Giant bomb, designed to defeat deeply buried structures.

**mass law** Transmission of sound through a solid wall is very approximately inversely proportional to both frequency and mass per unit area.

**mass parameter** Ratio of aircraft density [mass divided by wing area and mean chord] to air density multiplied by 2 and divided by lift slope; if necessary corrected for Mach number.

**mass per unit area**  $1 \text{ kg m}^{-2} = 3.27705 \text{ oz ft}^{-2}$ ;  $1 \text{ lb ft}^{-2} = 4.88243 \text{ kg m}^{-2}$ .

**mass per unit length**  $1 \text{ kg m}^{-1} = 0.05600 \text{ lb in}^{-1}$ ;  $1 \text{ lb in}^{-1} = 17.8580 \text{ kg m}^{-1}$ .

**mass-properties engineering** Discipline dealing with weight, balance, moment of inertia, centre of gravity, stability and mission dynamics.

**mass ratio** 1 Mass of vehicle, normally ballistic rocket, at liftoff divided by mass at all-burnt or other later condition.

2 Rarely and ambiguously, mass of propellants as fraction of total liftoff.

**mass spectrograph** Instrument for converting molecules to ions and then separating these to determine exact isotopic weights.

**mass taper** Rate of, or graphical plot of, reduction of cross-section-percentage material density from root to tip of blade (eg helicopter rotor), latter usually being externally untapered.

**mass values** For average passengers [except charters]: male 88 kg, female 70, child 35.

**MAST** 1 Military anti-shock trousers; pressurized, astronaut garb.

2 Military assistance to safety and traffic.

3 Married airmen sharing together (USAF).

4 Multimission airborne surveillance technology (USAF).

5 Multiple aircraft simulation terminal.

6 Maintenance, analysis, safety and training.

**mast** 1 Tube projecting from underside of aircraft so that liquid can drain well away from airframe.

2 Rigid pillar for avionics antenna (aerial).

3 Rigid mooring structure for airship.

4 Pillar above centre of helicopter rotor for MMS (2).

**Mastacs** Manoeuvrability-augmentation system for tactical air combat simulation (USN).

**Master** Military aircraft satcom[s] terminal.

**Master air attack plan** Basis of netcentric warfare, automatically supported to eliminate human error or oversight (USAF).

**Master Bomber** Experienced crew-member tasked with staying over target throughout attack issuing instructions on [eg] which markers to use and which to avoid (RAF, WW2).

**master caption panel** Flight-deck panel giving initial warning information and/or indication of AFCS mode, navigation mode etc.

**master caution signal** Indication that at least one caution signal has been activated.

**master connecting rod** See *master rod*.

**master contour template** Full-size flat template showing all mould-line contours, rib contours or other related shapes to common reference.

**master diversion airfield** Large and well-equipped airfield able to handle all kinds of aircraft whose home

## master engine

## MAU

bases are shut by weather or enemy action, and promulgated as such.

**master engine** When all engines of a multi-engined aircraft are synchronized, that to which the other engines are slaved.

**master oscillator** That defining timebase and waveform for radio or radar.

**Master Pilot** 1 Formerly, highest grade of commercial B-licence [5 + years and other requirements] (UK).

2 Highest rank in unpopular ‘aircrew’ system [1947–53] (RAF).

**master rating** In certain air forces, highest level of aircrew proficiency in each trade.

**master rod** Connecting rod with big end and with attachments for all other rods in same plane.

**master router template** Flat template, usually same size as metal sheet or slab, used to locate pilot and pin holes and set up sheet for routing or skin-milling by non-NC control.

**master station** Various meanings, esp. that housing timebase and emitting original signals in R-Nav hyperbolic systems, other stations being slaves keyed to it.

**master switch** Makes or breaks generator *main line*, must be ON to start engine[s].

**Master systems bench** Ground installation duplicating complete avionics and flight-deck display systems.

**master template** Reference for any form, usually two-dimensional, in manufacture; used to make jigs and tooling.

**Mastif** Multiple-axis spin-test inertia facility.

**Mastiff** Modular automated system to IFF.

**mast-mounted sight** Group of sensors, typically optical, FLIR, laser, mounted on anti-vibration mast above helicopter rotor hub to allow crew to see targets without exposing helicopter.

**MASU** 1 Multiple acceleration sensor unit.

2 Military Aviation Storage Unit (DARA Fleetlands, UK).

3 Mobile Aircraft Support Unit (RN).

**MAT** 1 Modification approval test.

2 Moscow aviation technical high school.

3 Modular advanced test (Raytheon).

4 Maintenance-access terminal.

**mat** 1 Flexible membrane laid on unprepared ground for limited number of V/StOL operations.

2 Area paved with quick-assembled metal mesh or planking.

3 Floating support towed by ship for recovery of marine aircraft.

**Matac, MATAC** Tactical air command (Spanish air force, EdeA).

**MATC** Mobile ATC (1).

**Matcals** Marine (or Mobile) air-traffic control and all-weather landing system (USMC).

**Match** Manned [or medium] anti-submarine troop- [or torpedo-] carrying helicopter.

**matched pole-zero** For approximate conversion of a continuous transfer function into a discrete one by mapping both poles and finite zeros into the z-plane.

**match fitness** Physiological ability of pilot to pull extreme accelerations in close-combat training.

**matching** 1 Any prolonged process of developing dynamic parts to work properly together; eg inlet/

engine/propelling nozzle over wide range of Mach numbers.

2 Achieving maximum energy transfer between electric circuits or devices by equalizing impedances and resistive/reactive components.

**Matcon** Mobile air-traffic control unit (civil).

**Matcu** Marine air-traffic control unit (USMC).

**MATDSS** Maritime aircraft tactical decision support system.

**Mate** 1 Modular automatic test equipment (Grumman).

2 Modular Autodin terminal equipment (Astronautics Corp.).

3 Man-portable aerial terrain explorer.

**Mateo** Maritime air telecommunications organization (UK).

**materiel** US term for hardware, logistic supplies, esp. military (but specif. excluding ships and naval aircraft); accent is on last syllable.

**Matias** Magyar air-traffic integrated and automated system (Hungary).

**mating** Offering up major portions of aircraft and joining together; the mass-production equivalent of marrying up. Thus \*jig.

**Matlab** Software code widely used in aerospace.

**MATO, Mato** Military air-traffic operations (UK).

**MATP** Military-aircraft tractor positioner, for confined spaces.

**Matra, MATRA** Air-transport command (Spanish air force, EdeA).

**Matrix** Multi-service automatic target-recognition imagery exploitation.

**matrix** 1 Computer memory core of rectilinear array configuration, eg 2-D ferrite three-wire type.

2 Crystalline grain structure of metal.

3 Skeletal basis on which structure is formed, esp. by moulding.

4 Any 2-D rectilinear logic network.

**MATS** 1 Military Air Transport Service (USAF/USN 1 June 1948, on 1 June 1966 became MAC).

2 Multi-altitude transponder system.

3 Manufacturing assembly tracking system.

4 Military-aircraft target system.

5 Miniature aerial target system.

**MATSS** 1 Mobile aerostat [not aerostat] tracking and surveillance system.

2 Maritime aerostat tracking and surveillance system.

**MATT** Multimission advanced tactical terminal (US Services).

**matte** Non-reflective, external finish (usually paint) tending to diffuse EM radiation incident on it.

**MATTS** Multiple airborne target trajectory system.

**maturation** US term for growth of maturity, arguably = ageing.

**maturity** Vague condition after impressive number of flight hours in which major problems naively thought unlikely. Supposed methods exist for quantifying degree of \* for both new and derived equipment.

**maturity factor** GDP growth × yield growth ÷ traffic growth.

**MATV** Multi-axis thrust vectoring.

**MATZ** Military air (or airfield or airport) traffic zone.

**MAU** 1 Marine amphibious unit (USMC).

2 Million accounting units (EC).

## Mauve AIC

3 Modular avionics unit[s].

**Mauve AIC** Gives details of temporary airspace restrictions caused by special activity.

**MAUW** Maximum all-up weight (tantological).

**MAV** 1 Micro air vehicle.

2 Mars ascent vehicle.

3 Multirole autonomous vehicle.

**MAVACTD** Micro air-vehicle advanced concept technology demonstration.

**Mavar** Parametric amplifier (from mixed amplification by variable reactance).

**Mavus** Maritime VTOL UAV system.

**MAW** 1 Mission-adaptive wing.

2 Missile approach warning, defensive system linked to RWR giving definite warning of a locked-on missile's approach.

3 Military Airlift Wing (USAF).

4 Marine Air Wing (USMC).

**MAWP** Missed-approach waypoint.

**MAWS** 1 Modular automated weather system.

2 Missile approach, or attack, or advance, warning system.

**MAWTS** Marine Aviation Weapons and Tactics Squadron.

**max** Maximum; CLB, CRZ add climb, cruise.

**Maxaret** Pioneer (Dunlop) anti-skid system for wheel brakes.

**max chat** Maximum power (colloq.).

**max-des** Maximum rate of descent mode.

**maxed out** 1 Total overload of brain of jet pilot in combat.

2 Electronic processor with no available capacity.

3 Nation unable to commit any more armed force to trouble spot.

**maxi** Top RPV class, on basis of weight, altitude and speed; all are high-altitude jets.

**Maxi decoy** ECM payload, originally bronze model aircraft with radar cross-section identical to attack aircraft.

**maximum authorized altitude** Highest altitude on airway jet route or any other direct route for which MEA (1) is designated in FAR.95 at which navaid reception is assured (FAA).

**maximum boom-free speed** Mach limit at high altitude to avoid shock reaching ground, variable with atmosphere in region of M 1.12.

**maximum chamber pressure** Peak pressure in complete firing cycle of solid-propellant motor, symbol  $P_c$  max.

**maximum  $C_L$**  Value at peak of curve where  $dC_L/dx=0$ , hence \* angle of attack.

**maximum climb thrust** For most jet engines, achieved by advancing throttle to obtain a predetermined EPR.

**maximum cold thrust** Highest thrust without using (available) afterburner.

**maximum contingency** Highest output turboshaft (rarely, other type of engine) can deliver or is authorized to deliver, usually for 2½ min. following failure of other engine of multi-engine aircraft; usually requires subsequent inspection.

**maximum continuous** Thrust or rpm limit available for unlimited period, usually using rich mixture if piston engine and all augmentation for gas turbine; often available for certification or emergency only.

**maximum cruise rating** Highest power without augmen-

## maximum power altitude

tation or [piston engine] rich mixture; often this is highest available for normal continuous operation.

**maximum cruise thrust** Same as max climb procedure.

**maximum cruising speed** Highest speed permitted (usually in flight manual) for sustained operation; normally expressed as EAS or CAS, occasionally only as Mach.

**maximum demonstrated** Precise limit [of whatever parameter] available to test pilot when aircraft is being certificated.

**maximum diving speed** Highest speed demonstrated in certification (see  $V_{DF}$ ).

**maximum effort** Using every aircraft that can be made serviceable, though usually without addition to list of allowable deficiencies.

**maximum elevation figure** Published height AMSL [in US in ft] of highest point in local area or other prescribed region.

**maximum except takeoff** Highest available piston engine power other than takeoff rating.

**maximum expected operating pressure** Peak (or 1.1 times peak) of pressure throughout burn of solid motor.

**maximum gross weight** US term =  $MTOW$ .

**maximum landing weight** MLW, certified value above which fuel must be jettisoned or burned off if landing becomes urgently necessary and possible structural damage is to be avoided.

**maximum likelihood** A standard method of deriving stability and control plus cost function [difference between measured and estimated response, summed over time].

**maximum loaded weight** To avoid confusion, now generally replaced by MRW.

**maximum material condition** That in which a feature of size contains the maximum permissible amount of material, e.g. a hole on the minimum permitted diameter.

**maximum mean camber** Maximum camber of median line of wing sections from root to tip.

**maximum net weight** Allowable payload of baggage trolley or other surface vehicle = maximum gross minus tare.

**maximum on ground** Overall size of 'spot' on ground needed for landing, unloading and take-off of airlifter, probably in haste (under enemy fire). Most studies demand so many MOG Spots that STOVL capability is essential.

**maximum operating Mach number** Self-explanatory, but still less than  $M_{NE}$ .

**maximum payload** Limit for transport as defined in certification. For cargo aircraft usually same as *maximum structural payload*; for all-pax configuration, usually established by seat configuration at much lower value.

**maximum performance takeoff** That in which energy transfer is at highest possible rate, usually limited by sliding of locked tyres and avoidance of striking tail on runway or exceeding gear-down EAS.

**maximum power** For propulsion engine, power under ISA/SL conditions with engine operating at authorized limits of rpm, pressures and temperatures. See previous 'maximum' entries.

**maximum power altitude** Lowest altitude at which full throttle is permissible (some definitions add: at maximum rpm for level flight); for supercharged piston engine,

**maximum q**

highest altitude at which maximum boost pressure can be maintained.

**maximum q** Highest dynamic pressure attainable; for given aircraft, function of dive limits, atmospheric pressure and structural strength.

**maximum ramp weight** The highest of all certified weight, = MTOW/MTWA plus fuel allowance for start-up and taxi.

**maximum reading accelerometer** Records maximum reached.

**maximum rpm** In shaft-drive engines, invariably a transient overspeed condition permitted by lag in propeller or engine-speed control system.

**maximum speed** Highest TAS attainable in level flight, at best altitude.

**maximum structural payload** Combined weight [or capacity] of pax, baggage and cargo certificated to be carried on main deck and in belly holds.

**maximum takeoff rating** In jet engine, achieved by selecting water [if available] and advancing throttle to give TO EPR.

**maximum takeoff weight** See *MTOW*.

**maximum turn rate** That giving maximum number of deg/s rate of change of heading, ie rotation of longitudinal axis; unrelated to change in trajectory.

**maximum undistorted output** Peak signal strength consistent with intelligible speech in early radio.

**maximum usable frequency** Highest for shortwave communications between fixed points using ionospheric reflection (time-variant).

**maximum vertical speed, V<sub>m</sub>** Rare flight limitation demonstrated in VTOL aircraft, including civil-certified helicopters.

**maximum weight** See *MTOW, MLW, MZFW* etc.

**maximum weak mixture** Highest power normally available from piston engine throughout flight; rich-mixture ratings can reduce engine life and aircraft range.

**maximum zero-fuel weight** The maximum weight certificated with no usable fuel, probably less than MTOW minus usable fuel because wing fuel relieves the wing bending moment. Put another way, adding fuel may allow payload to be increased above that at MZFW.

**Maxpac** Multi-axis pintle attitude control.

**Maxwell** Non-Si unit of magnetic flux (conceptualised as "single line" of flux), =  $10^{-8}$  Wb.

**Mayday** International call for urgent assistance, from French "m'aidez!" Hence, to declare a \*, to go \*; usually sent on 121.5 MHz.

**MB** 1 Magnetic bearing.

2 Marker beacon.

3 Mercury bromide (laser).

4 Megabits.

5 Multimedia broadband.

6 Manchester biphase.

7 Very incorrectly, millibars.

**Mb** Mbyte (megabyte), one million bytes.

**mb** Millibar[s].

**ṁ<sub>b</sub>** 1 Mass flow through turbofan bypass duct.

2 Mass of a bird.

**MBA** Main battle area.

**MBAR, M-bar** Multi-beam acquisition radar.

**MBAT** Multibeam array transmitter.

**MBC** 1 Main-beam clutter.

2 Microbiological corrosion.

3 Military Budget Committee.

4 Missile boresight correlator.

5 Maritime Battle Center (NWDC).

**MBCS** Manoeuvre-boost control system; senses aircraft response and adjusts flight controls for fastest completion of demand.

**MBD** Molecular-beam deposition.

**MBDOE** Million barrels per day oil equivalent.

**MBE** 1 Molecular-beam epitaxy.

2 Multiple-bit error.

**MBEC** Maximum best-economy, or economical, cruise, or cruising; P adds power [piston engines].

**M<sub>b</sub>** Aerodynamic flapping moment of helicopter rotor blade.

**MBF** Multi-body freighter.

**MBFR** Mutual and balanced force reductions.

**MBFS** Maximum boom-free speed.

**MBIL** Multi-beam illuminator [BC/FC].

**Mbit** Megabit =  $2^{20}$  = 1,048,576 bits; /S adds per second.

**MBITR** Multi-band inter/intra team radio.

**MBK** Missing, believed killed.

**MBM** Magnetic bubble memory.

**MBMMR** Multi-band multi-mode radio.

**MBO** Management by objectives.

**MBOH** Minimum break-off height.

**MPB** 1 Maximum takeoff regime (USSR, Cyrillic characters actually represent MVR).

2 Minimum burner pressure; V adds valve.

**MBPS, MBPs, MBs** Megabits/second.

**Mbps** Megabytes/second.

**MBR** Marker-beacon receiver.

**MBRGW** MBRW (adds redundant 'gross').

**MBRV** Manoeuvrable ballistic re-entry vehicle.

**MBRW** Maximum brake-release weight, at start of takeoff run.

**MBS** 1 Millibars (on alphanumeric readout).

2 Mobile base system (ISS robotic interface).

3 Modular bomb set, for making IEDs for training.

4 Mean blade speed.

5 Mossbauer spectrometer.

**mbl/s, mb/sec** Megabits per second.

**MBsat** Multimedia broadband satellite(s).

**MBSU** Main-bus switching unit.

**MBTH** Material by the hour.

**MBX** Management by exception.

**Mbytes** Megabytes, =  $2^{20}$  = 1,048,576 bytes.

**MBZ** Mandatory broadcast zone.

**MC** 1 Marine Corps (USMC).

2 Medium-case, or capacity (bomb).

3 Magnetic course.

4 Multi-combiner (HUD).

5 Maximum certificated (altitude).

6 Manufacturing cost.

7 Mission-capable.

8 Motion cueing.

9 Master change.

10 Military characteristics (of NW).

11 Materials consortium.

12 Main, or mission, or monitoring, or multifunction, computer.

13 Megacycles (incorrect usage).

**M<sub>c</sub>** 1 Design cruise Mach number.

2 Couple causing bending.

**m/c** 1 Machined.

- 2** Machine, colloquial = aeroplane.  
**m.c.** Moving-coil.  
 **$\dot{m}_c$**  Mass flow through core of turbofan.  
**MCA** *1* Ministry of Civil Aviation.  
**2** Minimum crossing altitude.  
**3** Military/civil action.  
**4** ISA in Cyrillic (R) characters, actually reading MSA.  
**5** Military C. of A.  
**6** Minimum controllable airspeed.  
**7** Maritime and Coastguard Agency (UK).  
**8** Maintenance-centre analyser (a HUMS).  
**9** Major component assembly [hall].  
**MCAD** Mechanical computer-aided design.  
**MCAGC** Marine Corps Air/Ground Combat Center.  
**MC&G** Mapping, Charting and Geodesy (USAF).  
**MCAP, M-Cap** Manned/unmanned common architecture program [UAV] (USA).  
**MCAS** Marine Corps Air Station (USMC).  
**MCASD** Military/civil air-safety day (RAF).  
**MCASMP** Marine Corps aviation simulator master plan (USMC).  
**MCB** *1* Microwave circuit board.  
*2* Multilateral Co-ordination Board (ISS4).  
**MCBF** Mean cycles between failures.  
**MCC** *1* Mission control center (NASA).  
*2* Midcourse correction.  
*3* Meteorological communications centre.  
*4* Mobile command centre.  
*5* Main combustion chamber.  
*6* Mission-control console.  
*7* Mission crew commander.  
*8* Manual control centre.  
*9* Multi-crew co-operation.  
*10* Mission computer cluster.  
*11* Maintenance control computer, or centre.  
*12* Management command and control.  
*13* Main communications control; P adds panel.  
*14* Manual control and counter.  
*15* Maritime command and control.  
*16* Mobile computer core.  
*17* Military climb corridor.  
**MCCA, MC<sup>2</sup>A** Multi-sensor command and control [aircraft] (USAF).  
**MCCC, MC<sup>2</sup>C** Multi-sensor command and control constellation (USAF).  
**MCC-H** Mission Control Center – Houston (NASA).  
**MCCIS** Maritime command and control information system (NATO).  
**MCCS** Multi-function command and control system.  
**MCD** *1* Magnetic chip-detector.  
*2* Marine Craft Detachment (RAF).  
*3* Multi-colour display.  
**MCDL** Mini common datalink.  
**MCDP** Maintenance control and display panel.  
**M<sub>CDR</sub>** Critical drag-rise Mach number.  
**MCDU** Multi-function, or multipurpose, controller / display [or control and display] unit; in cockpit, enables line maintenance to identify faulty LRU and replace without documentation.  
**MCDW** Minimum-collateral-damage weapon.  
**MCE** *1* Mission, or modular, control element, or module control equipment.  
*2* Microcircuit engineering; P adds program (NASA).  
*3* Military communications electronics; B adds board, WG working Group (US).  
**MCEP** Maneuver-criteria evaluation program (US).  
**MCF** *1* Manoeuvring control force.  
*2* Military computer family.  
*3* Milled carbon fibre.  
**mcf** Thousands (not millions) of cubic feet.  
**MC/FD** Modular chaff/flare dispenser.  
**MCG** *1* MLS calibration generator.  
*2* Millimetre-wave contrast guidance.  
*3* Maintenance-cost guarantee; P adds plan.  
**MCG** Pitching moment about c.g.  
**McGee tube** High-speed photo image tube, samples ‘sausage’ of electrons slice by slice.  
**MCGS** Microwave command-guidance system.  
**MCI** Moving-coil instrument, or indicator.  
**MCID** *1* Manufacturing change in design.  
*2* Modular common inlet duct.  
**MCK** Mission control keyboard.  
**McKinnon Wood bubble** Shape of plot of pressure distribution on upper surface of wing upstream of shockwave at subsonic M exceeding Merit.  
**MCL** *1* Microcomputer compiler language.  
*2* Minimum cruising level.  
**MCLOS** Manual command to line of sight.  
**MCLPM** Mixed conventional loads pattern management.  
**MCM** *1* Mine countermeasures [F adds Force].  
*2* 1,000 circular mils.  
*3* Multi-chip module.  
**M<sub>CM</sub>** Pitching moment about centre of mass [c.g.].  
**MCMP** Modular countermeasures pod.  
**MCN** Manufacturing contract, or control, number.  
**MCNDC** Missile capture network defense command (US).  
**MCO** *1* Confusingly used to mean maximum continuous thrust.  
*2* Mars climate orbiter.  
*3* Mode-coupled oscillation.  
**MICO** Methane/castor oil.  
**MCOP** Multilateral Crew Operations Panel (ISS crews).  
**MCops** Millions of computer operations per second.  
**MCOS** Multicomputing operating system.  
**MCP** *1* Maximum continuous power.  
*2* Maximum climb power.  
*3* Multi- or micro-channel plate (image intensifier).  
*4* Mode [or maintenance] control panel.  
*5* Military construction program (USAF).  
*6* Missile control panel.  
*7* Modular countermeasures pod.  
**MCPH** Maintenance cost per hour.  
**MCPL** Multi-crew pilot license [the correct abbreviation is MPL].  
**MCR** *1* Maximum cruising rate.  
*2* Maximum control range.  
*3* Mission capable [or completion] rate.  
*4* Modular-cabin crew rest.  
**Merit** Critical Mach number.  
**Merit D** Merit at which subsonic  $C_D$  rises by 0.002 at constant angle of attack.  
**MCRC** Mobile control and reporting centre.  
**MCS** *1* Minimum control speed.  
*2* Miniature control system (ATC).

- 3 Missile control system, on fighter.  
 4 Mixed-class seating.  
 5 Material [or materiel] certification statement (FAA).  
 6 Modular cooling system.  
 7 Main-computer, or mission-control, software.  
 8 Manoeuvre[s] control system.  
 9 Multifunctional control surface.  
 10 Mission communications system.  
 11 Mixture control system.  
 12 Mobility Capabilities Study (DoD).  
 13 Mission control station, or segment.  
 14 Monte Carlo simulation.
- McIs** Megacycles per second, = MHz.  
**MCSB** Mission-control station backup (USAF).  
**MCSR** Mission-completion success rate.  
**MCT** 1 Mercury cadmium telluride; UK = CMT.  
 2 Maximum continuous thrust.  
 3 Confusingly, military combat thrust.  
 4 Mobile cable test[er], of wiring.  
 5 MOS (1)-controlled thyristor.
- MCTA** 1 Militarily-critical technology agreement, signed by all SDI contractors.  
 2 Military control area.  
**MCTL** Militarily-critical technologies list (US).  
**MCTOW** Maximum certificated takeoff weight.  
**MC2A, MC<sup>2</sup>A** Multirole command and control aircraft; X adds Experimental.  
**MC2C, MC<sup>2</sup>C** Multimission, or multisensor, command and control constellation (USAF).  
**MCTZ** Military control zone.  
**MCU** 1 Matrix-character unit (display symbols).  
 2 Management-control unit (flight-data recorder).  
 3 Modular-concept unit, = ½-ATR.  
 4 Marine Craft Unit (RAF).  
 5 Mission-computer upgrade.  
 6 Multifunction, or modular, or mission, or master, or missile, or mobile, or monitor, or autothrottle motor, control unit.  
**MCUA** Multiservice common-use architecture [streamlines airport data, voice and video nets].  
**M<sup>3</sup>A** ‘M-cubed’, see MMMA.  
**MCV** Mobile containment vessel, for explosions ≈15 kg TNT.  
**MCW** 1 Modulated carrier-, or continuous-, wave; A2 emission.  
 2 Mid-cruise weight.  
**MCWB** Multi-channel wideband.  
**MCWL** Marine Corps Warfighting Laboratory (USMC).  
**MCXO** Microprocessor-controlled crystal oscillator.  
**MD** 1 Manoeuvre-demand (control loop).  
 2 Military District.  
 3 Or m.d., managing director.  
 4 Methylidichloroarsine (CW).  
 5 Missile defence.  
**M/D** Miscellaneous data (display).  
**M<sub>d</sub>** Design Mach number.  
**md** Mass flow of dry gas.  
**MDA** 1 Minimum descent altitude; sometimes rendered as minimum decision altitude.  
 2 Master diversion airfield.  
 3 Multiple docking adapter.  
 4 Multilayer dielectric absorber (stealth).  
 5 Metal deactivator.
- 6 Missile Defense Agency (US, formed 2002 to manage GMD).  
 7 Multidisciplinary analysis.  
 8 Maritime Domain Awareness [2007–, USN for DoD] (US).  
**MDAP** 1 Mutual Defense Assistance Program (US, NATO, June 1952).  
 2 Major defense-acquisition program (US).  
**MDAS** Multifunction defense avionics system.  
**MDAU** Modular data analysis unit.  
**MDB** Multiplex data bus.  
**MDBIC** Missile defense/battle-integration center (USA).  
**MDBR** Multifunction dextrous boro-robot.  
**MDC** 1 Minimum-displacement [i.e., force-sensing] control[er].  
 2 Main display console.  
 3 Maintenance Data Centre (RAF).  
 4 Miniature [also micro, which is smaller] detonating, or detonation, chord [previously cord].  
 5 Motor-driven compressor.  
 6 Multiple drone control.  
 7 Main-deck cargo (V adds volume).  
 8 Maintenance diagnostic computer.  
**MD-Cad** Multidisciplinary concept assessment and design.  
**MDCRS** Meteorological data collection and reporting system, or service.  
**MDD** 1 Meteorological data distribution.  
 2 Mission data debrief.  
 3 Master dimension definition.  
**M<sub>DD</sub>** See *drag-divergence Mach number*.  
**MDDS** MDD(2) software.  
**MDDU** Multipurpose disk-drive unit [-O adds on-board, for BITE, CMC etc].  
**MDE** 1 Manual, or mission, data entry.  
 2 Major defense equipment; AEA adds airborne electronic attack.  
 3 Mission data edit [display].  
**M<sub>DET</sub>** Mach number at which shockwave is just detached.  
**MDEWS** Modular digital EW suite.  
**MDF** 1 MF D/F station (ICAO).  
 2 Mission degradation factor (USAF).  
 3 Mission data file.  
**M<sub>DF</sub>** Maximum demonstrated diving flight Mach number.  
**MDFDR** Multiple dislocated flight-data recorder; S adds system.  
**MDFN** Molybdenum-disulphide-filled nylon.  
**MDFY** Modify.  
**MDG** Map display generator.  
**MDGT** Pronounced midget, mission data [or mission debriefing] ground terminal.  
**MDH** Minimum descent height.  
**MDI** 1 Miss-distance indicator; hence MDIS = \* system.  
 2 Multifunction display indicator.  
**M<sub>DIV</sub>** Drag-divergence Mach number, which see  
**MDL** 1 Mission data-loader.  
 2 Multipurpose data-link.  
 3 Minimum description length.  
**MDLC** Manoeuvring direct-lift control.  
**MDLRS** Mission-data loading and recording system.

<b>MDLT</b>	Mobile data-link terminal.
<b>MDM</b>	Multiplexer-demultiplexer.
<b>MDNS</b>	Managed data network services.
<b>MDNT</b>	Missile Defense National Team (US).
<b>MDO</b>	Multidisciplinary design organization, or optimization.
<b>MDOF</b>	Multiple degrees of freedom.
<b>MDP</b>	1 Motor-driven pump. 2 Maintenance data panel (1553B data-bus). 3 Maximum dry power. 4 Modular display processor. 5 Multi-designation protocol. 6 Material deficiency report.
<b>MDPC</b>	Mission and display processing computer.
<b>MDPS</b>	Metric data-processing system.
<b>MDPU</b>	Modular data-processing unit.
<b>MDR</b>	1 Mandatory defect reporting. 2 Magnetic-field dependent resistor. 3 Medium data-rate. 4 Micro-data recorder, linking surveillance radars with computers. 5 Mission data recorder. 6 Material deficiency report.
<b>M<sub>DR</sub></b>	Drag-rise Mach number.
<b>MDRC</b>	Material Development and Readiness Command (USA).
<b>MDRI</b>	Multipurpose display repeater indicator.
<b>MD/RWW</b>	Map display and report-writing workstation, part of GIES.
<b>MDS</b>	1 Minimum discernible, or detectable, signal. 2 Metal-dielectric semiconductor. 3 Matériels de servitude, ie GSE (F). 4 Mission/design/series, basic system of designators of military aircraft (US). 5 Multilevel database system. 6 Measurement and debriefing station, or system [Tacts]. 7 Manned destructive suppression. 8 Miss-distance sensor. 9 Medium-distance [EO] sensor. 10 Maintenance data station. 11 Mission distribution system. 12 Meteorological data system. 13 Modular dispenser system. 14 Mid-course defense segment [see GMDS]. 15 Mobile data service. 16 Multi-static dependent surveillance, synonymous with multilateration. 17 Master dimension surface.
<b>MDT</b>	1 Maintenance display terminal. 2 Mission-data tools, or terminal. 3 Mountain daylight time (US). 4 Moderate.
<b>MDTC/P</b>	Mega-data-transfer cartridge, with processor.
<b>MDTS</b>	1 Mission data-transfer system. 2 Megabit digital troposcatter subsystem.
<b>MDU</b>	1 Microwave distribution unit. 2 Mine distributing unit.
<b>MDV</b>	Minimum detection velocity.
<b>MDWP</b>	Mutual Defense Weapons Program.
<b>MD/WT</b>	Marine division/wing team (DoD).
<b>ME</b>	1 Manoeuvre enhancement mode. 2 Multi-engine, or main engine. 3 Mission-essential.

<b>4</b>	Maintenance error.
<b>M€</b>	Millions of Euros.
<b>M<sub>e</sub></b>	Merkel number.
<b>mE</b>	Maritime equatorial air.
<b>m<sub>e</sub></b>	Electron rest-mass.
<b>MEA</b>	1 Minimum en-route IFR altitude. 2 Maintenance engineering analysis. 3 More-electric aircraft.
<b>meacon</b>	To mislead enemy by receiving and instantly rebroadcasting radio-beacon signals from false positions.
<b>Meads</b>	1 MEA (2) data system. 2 Medium extended air-defense system (USA, G, I).
<b>mean aerodynamic chord</b>	Chord of imaginary wing of constant section having same force vectors under all conditions as those of actual wing, symbol $\bar{c}$ (in practice usually very close to mean chord $c$ ).
<b>mean blade width ratio</b>	Ratio of mean chord (width) of propeller blade to diameter.
<b>mean chord</b>	Gross wing area divided by span, symbol $\bar{c}$ .
<b>mean day</b>	Time between successive transits of mean Sun.
<b>mean effective pressure</b>	Mean pressure acting on piston during power stroke in Otto, diesel, two-stroke, Stirling and most other reciprocating IC engines.
<b>mean fleet performance</b>	Mean (sometimes average) flight performance (sometimes other parameters, eg engine IFSD rate) of entire airline fleet of one aircraft type.
<b>mean free path</b>	1 Mean distance point could move in straight line without collision with surrounding fluid molecule; greater than mean distance between fluid molecules. 2 Mean distance a sound wave travels in an enclosed space before being reflected.
<b>mean geometric pitch</b>	Mean of geometric pitches of all elements from root to tip of propeller blade, symbol Pg.
<b>mean line</b>	In a two-dimensional aerofoil profile, locus of points equidistant between nearest points of upper and lower surface from LE to TE.
<b>mean line of advance</b>	Planned future track of centre of ships in convoy.
<b>mean point of contact</b>	Point whose co-ordinates are arithmetic means of co-ordinates of impacts of all weapons launched against same aiming point.
<b>mean sea level</b>	Average height of sea surface, usually calculated from hourly tide readings (in US, measured over 19-year period).
<b>means of compliance</b>	Methods and techniques formally demonstrated by manufacturer seeking certification of product from licensing authority.
<b>mean solar day</b>	Period between transits of mean Sun, 24 h 3 min 56.555 s of mean sidereal time (see <i>sidereal</i> ).
<b>mean square value</b>	Arithmetic mean of squares of all values; * error equals sum of squares of errors divided by their number.
<b>mean time between failures</b>	For specified time interval, total operating time of population of materiel divided by total number of failures within population (USAF).
<b>mean time to repair</b>	For specified time interval, summation of active repair times divided by total number of malfunctions (USAF).
<b>MEAP</b>	More-electric aircraft project (DSB).
<b>Mearts, M-EARTS</b>	Micro en-route automated radar tracking system.

## MEARW

**MEARW** Multi-engined advanced rotary-wing (school, RAF Shawbury).

**MEAS** Mechanical engineering aircraft squadron (RAF).

**measured performance** That measured on one occasion under specified conditions; usually slightly higher than gross performance.

**measured thrust** That measured on one occasion under specified conditions, usually by force transducers on testbed (see *installed/net/gross thrust*).

**measured thrust coefficient** For solid-propellant rocket, thrust-versus-time integral over action-time interval divided by product of average throat area and integral of chamber pressure versus time over action-time interval; symbol  $C_f$ .

**meatball** 1 Colloquial American for any guidance reference; thus, on the \*, to hack the \*.

2 Accurately flown final approach.

3 Carrier optical landing aid as seen by correctly aligned pilot.

4 Fresnel lens.

**MEB** 1 Main electronics box.

2 Marine Expeditionary Brigade.

3 Modular expendable block (countermeasures).

**Mebul, MEBUL** Multiple engine build-up list.

**MEC** 1 Main, or mechanical, engine control.

2 Main equipment centre.

3 Modular electronics concept.

4 Master Executive Council (ALPA).

5 Modular exploitation capability [to achieve interoperability for all ISTAR] (MoD, UK).

**MECA** Missile electronics and computer assembly.

**Mecaplex** Registered acrylic plastic sheet similar to Plexiglas.

**mechanical** See \* horsepower.

**mechanical de-icing** Using distortion (eg rubber boot), centrifugal force or other physical method to dislodge ice.

**mechanical efficiency** Work delivered by a machine as percentage of work put in, difference being mainly frictional losses.

**mechanical equivalent of heat** See *joule*.

**mechanical horsepower** Shaft horsepower.

**Meco** Main-engine cutoff (large rocket vehicle).

**MECU** Main-engine control unit.

**MECV** Mobile explosive containment vessel.

**MED** 1 Multifunction electronic display [S adds system, or subsystem].

2 Maximum-entropy discrimination.

3 Medium.

4 Medical.

5 Mediterranean regional area.

**Med** Medium.

**MEDA** 1 Military emergency diversion airfield.

2 Maintenance error decision aid.

**Medcat** Medium-altitude CAT.

**Medevac** Military airlift of sick or wounded.

**median lethal dose** That over whole body which would be fatal to 50% of subjects.

**median line** Line through aerofoil profile at all places equidistant from nearest points on upper and lower surfaces, = mean line.

**median selection** Automatic choice of mean and rejection of extreme values; can also mean majority voting.

## MEHT

**Mediator** Unsuccessful grand design for UK ATC (1) system embracing all air traffic.

**medium aircraft** Meaningless, but in 1998 the 737 was cited as an example. An ICAO document once said, 7,000–136,000 kg MTOW.

**medium altitude** Between 2,000 ft and 35,000 ft (DoD).

**medium-altitude level bombing** Release between 8,000 ft and 15,000 ft (DoD).

**medium-angle loft bombing** Release at 35° to 75° from horizontal.

**medium bird** For impact or ingestion certification, one weighing 1.5 lb, 0.68 kg.

**medium bomber** Former category defined quite differently by different air forces, either by bomb load or range, and so developed 1920–50 as to make numerical values meaningless.

**medium cloud, CM** Cloud types prefixed by alto-; according to BSI with average height 8,000 ft to 20,000 ft (2,438–6,096 m).

**medium Earth orbit** Between LEO and synchronous.

**medium frequency** EM radiation with superimposed carrier at 300 kHz–3 MHz.

**medium-range ballistic missile** Operational range 600 to 1,500 nm (1,112–2,780 km); see *mid-range* \*\* (DoD).

**medium-range transport** Full-payload range 1,500 to 3,500 nm (2,780–6,486 km).

**medium-scale integration** Normally taken to mean 50–500 circuits or gates per chip.

**medium-scale map** From 1:75,000 to 1:600,000 (DoD, IADB).

**medium turn** Most authorities define as bank angle 25° to 45°.

**medium-wave** Rare in modern radio/radar; in IR means wavelength 3–5  $\mu$ .

**MEDS, Meds** Multifunctional electronic display subsystem, new (2002) guidance for Shuttle Orbiters and STA (6).

**Medusa** Multifunction electro-optics for defense of US aircraft (AFRL).

**MEE** More electric engine.

**MEECN** Minimum essential emergency communications network.

**MEF** 1 Minimum essential facilities.

2 Marine Expeditionary Force.

3 Maximum elevation figure[s].

**MEFC** Manual emergency fuel control.

**MEG** Motionless electromagnetic generator.

**mega** 1 Prefix,  $\times 10^6$ ; symbol M, thus MW = megawatt[s]; a omitted in megohm[s].

2 In EDP =  $2^{20} = 1,048,576$ .

**megacycles** Megahertz.

**Megafloat** Technology for floating offshore airports.

**megahertz**  $10^6$  cycles per second, MHz.

**megajet** Jet aeroplane of over  $10^6$  lb MTOW.

**megaline**  $10^6$  maxwells, =  $10^{-2}$  Wb.

**megaton, MT** Explosive power equivalent to nominal 1,000,000 short tons of TNT.

**M/EGB** Metal and end-grain balsa.

**MEGG** Merging.

**megger** Universal electrical continuity and resistance tester (colloq., arch.).

**megohm** Ohm  $\times 10^6$ , symbol MΩ.

**MEHT** 1 Minimum, or mean, eye-height over threshold.

2 Multiple-event hard target.

## MEHTF

**MEHTF** Multiple-event hard-target fuze.

**MEI** 1 Multi-engine instrument rating.

2 Minimum-equipment item.

3 Maintenance engineering inspection.

4 Maintenance-error investigation.

5 Missile ECM improvement.

6 More-Electric Initiative.

**MEIS** Modular engine instrument system.

**MEISR** Minimum essential improvement in system reliability.

**Meissner effect** Use of powerful superconducting electric fields to levitate hardware, such as a rotating shaft, without physical contact.

**MEIT** Multi-element integrated test.

**MEK** Methyl ethyl ketone solvent.

**MEL** 1 Multi-engine licence, or landplane.

2 Minimum equipment list, list of ME (3) items.

3 Missile ejector launcher.

**MELC** Main electrical load center (centre).

**mélée** Confused close combat by numerous aircraft, opposite of one-on-one.

**MELHS** Mobile electroluminescent helipad [lighting] system.

**Melin** Multi-engine lead-in [training] (RAF).

**Melios** Minimum eyesafe laser IR observation.

**MELS** Multi-engine land and sea.

**MEM** 1 Module exchange magazine.

2 Multiple evaluation method.

3 Maintenance engineering management.

**member** Portion of structure bearing load.

**memorandum of understanding** Diplomatic agreement signed at ministerial level between governments agreed on collaborative programme, usually in advance of actual engineering.

**MEMS** 1 Maintenance-error management system (CAA, 2000-).

2 Module-exchange mechanism system.

**Mems** Microelectromechanical systems, now with such prefixes as bio-, fluidic, optical, refractory and RF.

**MENS** Mission element need statement (DoD).

**menu** Range of variable inputs from human operator to EDP, fire-control system, display or other electronic system; files, codes, information, modes, formats, etc.

**MEO** 1 Mass in Earth orbit.

2 Medium Earth orbit.

3 Mission equipment operator.

**MEOP** Maximum expected operating pressure (solid motors).

**MEOTBF** Mean engine operating time between failures.

**MEP** 1 Multi-engine pilot.

2 Mission equipment passage, or package.

3 Marine environmental protection.

4 Management engineering program(me).

5 Member of European Parliament.

6 Mean effective pressure.

7 Mars exploration program[me].

8 Manufacturing Extension Partnership.

**Mephisto** Multiple-effect penetrator high [or hard] sophisticated target optimized.

**MEPT** Multi-engine pilot trainer.

**Mepu, MEPU** Monofuel emergency power unit.

**MER** 1 Multiple ejector rack.

2 Mission evaluation room.

## Mesh

3 Minor equipment requirement [(A) adds Air] (UK).

4 True height above MSL.

5 Mars exploration rover.

6 Minimum experience requirement.

**Mera** 1 Molecular-electronics radar.

2 See MER (3).

**Mercator** 1 Map projection: light at Earth centre projects map on to cylinder wrapped round Equator.

2 Map electronic remote colour autonomous television output reader.

**Mercier** French aerodynamicist with patents for close-fitting cowlings for radial engines and low-drag ailerons hinged diagonally across wingtip.

**mercury** Hg, the only metal liquid at NTP, MPt  $-39^{\circ}\text{C}$ , BPt  $357^{\circ}\text{C}$ , density 13.5, used (rarely) as vapour in closed-circuit space power and as ion beam (thrusters).

**mercury battery** Dry cell, 1.2V, KOH electrolyte between mercuric oxide/graphite cathode and zinc anode.

**Meredith effect** Making a heat-rejection system, such as a radiator or oil cooler, give positive thrust.

**merge** 1 The coming together of two fighters about to engage in close combat.

2 To fly close beside unknown aircraft in order to identify it visually.

**meridian** Great circle through any place on Earth and the poles.

**meridian altitude** Altitude of celestial body when on celestial meridian of observer ( $000^{\circ}$  or  $180^{\circ}$  true).

**meridian passage** Time at which celestial body crosses observer's celestial meridian.

**Meris** Medium-resolution IR spectrometer.

**Merkel number** Heat transfer equation  $\text{Me} = bS''V/\text{md}$  where  $b$  is mass-transfer coefficient,  $S''$  transport surface per unit volume,  $V$  volume and  $\text{md}$  mass flow of dry gas.

**Merlin** 1 Multi-service extended-range low-cost interceptor (Darpa).

2 Modular ejection-rated low-profile imaging for night.

**Mermoz effort** Collaboration, led by Airbus/Boeing, on improvement of global ATC (Int. 2003-).

**Merod** Message entry and readout device.

**Merritt Island** Site of largest KSC launch complexes (Saturn V vehicle).

**Merto** Maximum-energy rejected takeoff.

**MES** 1 Major equipment supplier (large projects).

2 Main engine start(ing).

3 Medium-energy source (laser).

4 Multi-engine seaplane.

5 Mobile Earth station.

6 Multi-energy spectrum.

**Mesa** 1 Modular equipment stowage area (NASA).

2 Multirole electronically scanned array [radar].

3 Minimum emergency safe altitude.

**mesa** Raised portion[s] of microcircuit.

**Mesar, MESAR** Multifunction electronically-scanned adaptive radar.

**Mesas** Multirole electronically scanned aircraft, or airborne, system.

**MESC** Mid electrical (or, UK CAA, equipment) service centre.

**MESF** Mechanical Engineering Support Flight (RAF).

**Mesfet** Metal semiconductor field-effect transistor.

**MESG** 1 Micro-electrostatically suspended gyro.

2 Main-engine starter/generator.

**Mesh** Measuring engineering safety and health.

**mesh wiring** Network inserted to prevent gasbags chafing against structure of rigid airship.

**mesocline** Lower layer of mesosphere (1) where temperature rises to about 10°C at c60 km.

**mesodecline** Upper layer of mesosphere (1) where temperature falls to about -90°C at mesopause.

**mesometeorology** 1 Meteorology on scale between macro and micro.

2 Meteorology of mesosphere (1).

**mesomorphic states** See *liquid crystal*.

**meson** Family of elementary particles with energy 135–550 MeV and zero spin (possibly nine types, and corresponding anti-particles, but some may be resonances).

**mesopause** Boundary between top of mesosphere (1) and thermosphere, 80–85 km.

**mesopeak** Temperature at mesocline/mesodecline boundary.

**mesosphere** 1 Thermal region of atmosphere between stratopause (c30 km) and mesopause (Chapman gives lower limit as 32 km).

2 Rarely, according to Wares, region between top of ionosphere (c400 km) and supposed bottom of exosphere (500–1,000 km).

**message pick up** Lowering hinged arm to clutch written message (RAF 1927–40).

**Messir** Computerized AFTN message-switching system (F).

**Met, MET** 1 Meteorology, meteorological.

2 Meteorological Office.

3 Meteorological service, or broadcast service.

4 Mission-event timer.

5 Multi-image exploitation tool.

6 Mission-essential task[s] (USAF).

**Metag, METAG** Meteorological Advisory Group (ICAO).

**metacentre** Intersection of line of buoyancy (of marine aircraft) and axis of symmetry.

**metacentric height** Vertical distance from metacentre to c.g.

**metal** Slang for [usually historic] aircraft, especially airliner or warbird.

**Metalastik** Patented family of metal/rubber bonded devices, mainly anti-vibration.

**metal deactivate** Hydrocarbon fuel additive to reduce possibility of electrochemical action in tank or system, esp. catalytic effect of copper on fuel oxidation.

**metal-injection moulding** Working material is mix of metal and plastic binder.

**metallic fuel additive** 1 Various blends of high-energy (so-called "zip") turbine fuel incorporated boranes and metallic compounds.

2 Most high-energy solid rocket fuels incorporate finely divided aluminium powder.

**metallics** See *metal matrix composite*.

**metallization** Vacuum deposition of metal conductive paths in planar IC or other solid-state device. See next.

**metallizing** Vast range of techniques involve coating with metal, usually by plasma-spraying with finely divided metal particles; typical example is electrical bonding of modern airframe, in which most major parts are isolated by non-conductive corrosion protection.

**metal matrix composite** Various structural or refractory composites consist of a metal matrix, the most common

being aluminium, magnesium, titanium and copper, reinforced by continuous fibres or whiskers of silicon carbide or graphite.

**metamic** Cermet (suggest undesirable).

**Metar, METAR** Meteorological aeronautical radio code for routine reports.

**metastable** Pseudo-equilibrium [e.g. supersaturated solution or supercooled liquid] needing small external disturbance to trigger violent change.

**Metdial** Privately run telephone met. service (UK).

**Météo-France** Meteorological service (Toulouse, F).

**meteor** Small solid body in free fall through Earth's atmosphere; also called \*-oid.

**meteor bumper** Thin shield designed to protect spacecraft from penetration by meteors.

**meteor burst communication** OTH radio technique in which short-burst signals are scattered by ionised trails left by meteors.

**meteorite** Meteor large enough to strike Earth's surface.

**meteorograph** Instrument for measuring and recording two or more meteorological measures, eg T, pressure, humidity.

**meteorological rocket** Ballistic vehicle to loft payload to great height, there to free-fall or descend by ballute or parachute.

**meteorological satellite** One designed to assist understanding of atmosphere and preparation/dissemination of actuals or forecasts.

**meteorological wind** Forecast wind.

**meteorology** Science of Earth's atmosphere (abb. met.).

**metering** Control of flow, e.g. of air traffic entering terminal airspace.

**metering orifice** Calibrated nozzle or tube passing exactly known flow at given pressure difference.

**MetFAX** Fax-accessed weather service (UK Met. Office).

**methane** Simplest hydrocarbon fuel CH<sub>4</sub>; gas at NTP but cryogenic liquid.

**methanol** Methyl alcohol, CH<sub>3</sub>OH, BPt 64.6C, S.G. 0.81, used in special blends of fuel for racing piston engine and as additive to water as anti-knock power boost fluid.

**method of least work** Formula for analysis of statically indeterminate structures.

**ME3** Refractory sintered nickel-based disc alloy.

**methyl alcohol** See *methanol*.

**methyl bromide** CH<sub>3</sub>Br, common filling for hand (and some other) fire extinguishers.

**methyl cellosolve** Trade name for various strippers, esp. methylene chloride, CH<sub>2</sub>Cl<sub>2</sub>.

**METI** Ministry of Economy, Trade and Industry [translation] (J).

**Meto** Maximum except takeoff power.

**Metoc** Meteorological and oceanographic (ASW).

**Metplan** A privately operated aviation weather service.

**METPS** Meteorological data processing system.

**METR** Multiple-emitter targeting receiver.

**metre** Fundamental SI unit of length, abb. m, 1,650,763.73 wavelengths in vacuum of radiation from transition 2p<sub>10</sub> and 5d<sub>5</sub> of Kr-86 atom.

**Metrep** Meteorological report.

**metric** Usually means MKS; aerospace is gradually standardizing on SI units.

**metrics** Measurements, esp. of performance and other

health measures normally falling under three headings: cost, quality and schedule-adherence.

**Metro, metro** 1 Increasingly popular word meaning urban; applied to 'downtown' air services, commuter routes and aircraft.

2 Pilot-to-\* voice call.

**metrology** Science of precise measurement, esp. of linear dimensions.

**metroplex routes** Selected recommended high-altitude IFR inner-city (US).

**METS** 1 Mobile engine test stand.

2 Multi-Engine Training Squadron (RAF).

**MetWEB** Internet-based aviation weather service (UK Met. Office).

**MEU** Maritime Expeditionary Unit [SOC adds Special Operations Capable].

**MeV** Mega-electron-volts,  $\text{ev} \times 10^6$ .

**MEW** 1 Manufactured empty weight.

2 Microwave early warning.

3 Ministry of Economic Warfare (UK, WW2).

4 Mean equivalent wind.

**MEWS** 1 Modular EW simulator.

2 Microwave EW system.

3 Missile early-warning station.

**MEWSG** Multiservice [or mobile] EW Support Group (NATO).

**MEX** Microelectronics.

**MEXE** Military Engineering Experimental Establishment (UK).

**Mexepad** Air-portable ground cover for sustained jet-Stovl operations

**MEZ** Missile (esp. AAM) engagement zone.

**MF** 1 Main frame.

2 Main force.

3 Major field.

4 Multifunction.

5 Mandatory frequency.

**m.f., MF** Medium frequency (see Appendix 2).

**M<sup>2</sup>F<sup>2</sup>** Multimode fire and forget.

**M<sub>f</sub>** Fuel mass flow.

**MFA** 1 Minimum flight altitude.

2 Multi-furnace assembly.

3 Military flying area.

**MFAR** Multifunction array radar.

**MFAS** Multifunction active sensor.

**MFBF** Multifunction bomb fuze.

**MFC** 1 Main fuel control, or controller.

2 Maximum fuel capacity.

3 Multi-frequency code, or coding.

4 Miniature flight computer.

**M<sub>FC</sub>** Maximum Mach number for satisfactory flight control and stability.

**MFCD** 1 Modular flare/chaff dispenser.

2 Multifunction colour [or control] display [P adds panel].

**MFCFS** 1 Missile, or modified, fire-control system.

2 Microprocessor flight-control system (drones, targets).

**MFCU** Multifunction concept [or control] unit.

**MFD** Multifunction display [S adds system, U unit].

**mfld** Microfarad.

**MFESAR** Multifunction electronically-scanned adaptive radar.

**MFF** 1 Mixed fighter force, such as all-weather look-

down BVR mixed with simple visual day aircraft [O adds operations].

2 Mixed-fleet flying [common pool of pilots for airline's aircraft].

3 Multisite fatigue fracture.

**MFFC** Mixed fighter force concept (eg, Phantoms/Hawks, RAF).

**MFFO** Mixed-fleet flight operations.

**MFG** 1 Miniature flex gyro.

2 Manufacturing.

3 Master-frequency generator.

**MFHBF** Mean flight-hours between failures.

**MFHDD** Multifunction head-down display.

**MFI** Multirole tactical fighter (R).

**MFIT** Mean fault isolation time.

**MFK** Multifunction keyboard.

**MFL** 1 Minimum field length, TO distance to clear standard (35 or 50 ft) screen.

2 Minimum flight level.

**MFLI** Magnetic fluid-level indicator.

**MFLOPS, Mflops** Million of flops, floating-point operations per second.

**MFM** 1 Maintenance-fault memory.

2 Multisensor fusion module.

**MFMA** Multifunction microwave aperture.

**MFMIS** Military flying management information system [2004-] (UK MoD).

**MFMS** Military flight-management system.

**MFMT** Material and fleet-management program.

**MFN** 1 Mode-forming network.

2 Most favoured nation.

**MFO** 1 Multinational force and observers.

2 Military flight operations.

**MFOP** Maintenance-free operating period.

**MFOQA** Military flight operations quality assurance.

**MFOV** Medium field of view.

**MFP** 1 Mean free path.

2 Main fuel pump.

**MFPD** Multimode-flowpath propulsion demonstrator (scramjet).

**MFPU** Mobile field-processing unit (photo-recon).

**MFQ** Mouvement Français de Qualité.

**MFR** 1 Multifunction radar, or receiver.

2 Medium-range forecast [weather].

**Mfr** Manufacturer.

**MFS** 1 Mexepad for Stovls.

2 Manned flight simulator.

3 Media file server.

**Mfs** Free-stream Mach number.

**MFSK** Multiple-frequency shift-keying.

**MFSP** Multifunction Sigit payload.

**MFSPP** Mediterranean forecasting system pilot project.

**MFT** 1 Multi-radar fusion tracking.

2 Multifunction trainer, or training.

3 Meter fix time (US usage).

**MFTD** Multifunctional touch display.

**M/FTD** Maintenance/flight training device.

**MFTS** Military Flying Training System, or Service (UK MoD).

**MFV** 1 Main fuel valve.

2 Minimum forward visibility.

**MG** 1 Master gauge.

2 Machine gun.

- 3** Motor glider.
- Mg** *1* Magnesium.
- 2* Megagramme, ie 1,000 kg or 1 tonne.
- mg** *1* Milligram[me].
- 2* Machine gun.
- MGA** *1* Middle gimbal angle.
- 2* Ministry of civil aviation (R).
- MGARJS** Mobile ground/air radar jamming system.
- MGCS** *1* Missile guidance and control system.
- 2* Mobile ground control station.
- 3* Meteosat ground computer system.
- MGD** Magnetogasdynamic.
- MGDA** Maintenance Group Defence Agency (UK, now part of DARA).
- MGF** Metallized glass-fibre (chaff).
- MgF<sub>2</sub>** Magnesium fluoride (IR seeker domes).
- MGGB** Modular guided glide bomb.
- MGIR** Motor glider instrument, or instructor, rating.
- MGM** Former US code, mobile-launcher surface-attack guided missile.
- MGOS** Metal glass oxide silicon.
- MGR** Miniature GPS receiver.
- MGRS** Military grid-reference system.
- MGS** *1* Mobile ground station (RPV).
- 2* Minimum groundspeed system.
- 3* Mars global surveyor.
- 4* Main-gear steering [CU adds control unit].
- 5* Microgravity science.
- 6* MoD guard services.
- MGSM** Medium ground station module.
- MGSS** Maintenance and ground-support system.
- MGT** *1* Motor gas temperature (solid rocket).
- 2* Module ground terminal.
- MGTOW** See *MTOW*.
- MGTP** Main-gear touchdown point.
- MGTR** Minimum ground turning radius.
- MG2D** MGaero two-dimensional.
- MGU** Midcourse guidance unit.
- MGVF** Ministry of Civil Aviation (USSR, R).
- MGW** Maximum gross weight (MTOW and MRW are more explicit).
- MH** *1* NDB, less than 50 W.
- 2* Magnetic heading.
- M<sub>H</sub>, M<sub>b</sub>** Turning moment [drive torque] at hub of helicopter main rotor.
- mH** Millihenry.
- MHA** *1* Minimum holding altitude.
- 2* Maintenance hazard analysis.
- MHD** *1* Magnetohydrodynamic(s).
- 2* Magnetic hard drive.
- MHDD** Multifunction head-down display.
- MHDF** Co-located MF and HF D/F (ICAO).
- M/HFE** Maintainability and human factors engineering.
- MHH** Musée Historique de l'Hydraviation [F-40600 Biscarrosse] (F).
- MHI** Missile [or manual] hit indicator.
- mho** Unit of conductance, reciprocal ohm, symbol  $\Omega$ , SI unit siemens.
- MHP** Main hydraulic pump.
- mhp** Muzzle horsepower, measure of automatic weapon.
- MHR** Monopropellant hydrazine rocket.
- MHRS** Magnetic heading-reference system.
- MHS** *1* Message-handling system.
- 2* Masint hyperspectral study.
- 3* Microwave humidity sounder.
- MHV** Miniature homing vehicle.
- MHVDF** Co-located MF, HF and VHF/DF (ICAO).
- MHWs** Mean high water spring tides.
- MHz** Megahertz [ $10^6$  Hz].
- MI** *1* Model improvement.
- 2* Medium intensity.
- 3* Miles (not recommended).
- 4* Military intelligence.
- 5* Shallow (ICAO).
- 6* Maritime interdiction.
- mi** Statute mile[s].
- m.i., M/I** Minimum impulse.
- MIA** *1* Missing in action.
- 2* Minimum IFR altitude.
- Miacs** Multisensor integrated airborne command system.
- MIAG** Modular integrated avionics group (UAV).
- Mials** Medium-intensity approach-light system.
- Miami** Microwave ice-accretion measurement instrument.
- MIAT** Malayan Institute of Aviation Technology [1997–].
- MIATS** Memory interrogation and test system.
- MIB** *1* Minimum-impulse bit (rocket).
- 2* Management information base.
- 3* Mishap Investigation Board (NASA).
- 4* Military Intelligence Battalion; (AE) adds aerial exploitation (USA).
- MIC** *1* Mineral insulated cable.
- 2* Microwave integrated circuit.
- 3* Multinational Interoperability Council (Int.).
- MIC** Pitching moment due to inertial coupling.
- mic** microphone.
- Mica** *1* Missile d'interception et de combat aérien (F).
- 2* Met [meteorological] improvements for controller aids (Euret).
- Micad** Multipurpose integrated chemical-agent alarm device.
- Micap** Mission-capable.
- Micarta** Trade name for phenolic insulator and small-part material made from resin-impregnated cloth.
- Micas** Miniature integrated camera spectrometer, or spectroscopy.
- Mice** Microwave integrated checkout equipment.
- mice** Small inserts fitted by hand to tailor cross-section area of fluid flow path, esp. gas-turbine jetpipe nozzle.
- Michigan height** That at which an air-dropped store, esp. nuclear, is activated by its radar altimeter.
- Mickey** H<sub>2</sub>X (colloq.).
- Mickey Finn** Major exercises involving numerous NW-carrying bombers from dispersed bases (RAF, 1960s).
- MICNS** Modular integrated communications and navigation subsystem (Sotas).
- MICOM, Micom** Missile Command (USA).
- Micos** Multifunctional IR coherent optical scanner.
- micrad** Microwave radiometer.
- micro** *1* Prefix one-millionth,  $\times 10^{-6}$ , symbol  $\mu$ .
- 2* Abb., microlight.
- micro-adaptive flow control** High-frequency alternate blowing and sucking generated electromagnetically to preserve attachment of airflow to surface.

**micro-adjuster** Small permanent magnets arranged to correct magnetic compass for coefficients P, Q, Cz, Fz.

**Micro-aids** Micro-aircraft integrated data system.

**micro air vehicle** Rapidly growing species of aerodyne, using lift from jets, rotating wings or fans, or fixed wing[s], capable of being carried by a human and of carrying various payloads. No quantified definition.

**microballoons** Microscopic hollow spheres used to increase bulk of fillers and potting compounds.

**microbarograph** Records very small transient changes in atmospheric pressure at ground station.

**microbiological corrosion** Eating away by micro-organisms living at fuel/air interfaces and on surface of virtually all aeronautical materials.

**microbolometer** Bolometer able to measure microscopic regions (no numerical definition).

**microburst** Most lethal form of vertical gust, in which core up to 2.5 km (1.5 miles) diameter forms vertical jet below convective cloud with downward velocity up to 20 m/s (4,000 ft/min), an almost instantaneous velocity difference of 80 kt, down to very low levels.

**microchannel plate** Multiplies [ $\times 10^5$ ] electrons passing through and routes them to phosphor screen which converts to green light.

**microcircuit** Basic element of microelectronics, with numerous \* fabricated on each epitaxial chip.

**Micro-Earts** Micro en route automated radar tracking system.

**microelectronics** Electronics based on solid-state devices of microscopic [down to nanometre] dimensions.

**microfabrication** Manufacture of microscopic [to nanometre] devices.

**microfarad** Farad  $\times 10^{-6}$ , symbol  $\mu\text{F}$ .

**microfiche** Common system of storing written or visual information with 24 to 288 microfilmed pages on each 100 mm  $\times$  150 mm (or 4 in  $\times$  6 in) sheet of film.

**microflume** Microfluidic molecular system.

**microflyer** Surveillance aircraft with no dimension exceeding 6 in (152.4 mm), TOW 4 oz (113.4 g).

**microgravity** Gravitational acceleration in the region of  $10^{-6}\text{g}$ . Clearly this is not the same as free fall, but some hold that \* is experienced in parabolic flight and in planetary orbit.

**microinch** One millionth of an inch.

**microjet** Not defined, but commonly a bizjet with six or fewer total seats. It is confusing to use \* for sporting 1- or 2-seaters

**microkernel** Core of software.

**micro level** Critical final design of software.

**microlight** Originally aeroplane with OWE  $\leq 150$  kg (330.7 lb), next definition was MTOW  $\leq 390$  kg,  $\leq 50$  litres fuel; latest definition:  $V_{so} \leq 65$  km/h, MTOW, 1-seat  $\leq 300$  kg [land], 330 kg [sea/amph]; 2-seat  $\leq 450$  kg [land], 495 kg [sea/amph]. (JAA, FAA). See *ultralight*.

**micrometeorite** Microscopic solid particle, many species throughout explored space.

**micrometer** Instrument for precise dimensional measurement, usually mechanical but sometimes based on fluid escape through small clearance.

**micrometre** One-millionth of metre,  $10^{-6}\text{m}$ , symbol  $\mu$ .

**micromirror** Microscopic multilayer reflective device, usually comprising an array of CMOS memory cells. Each mirror can tilt slightly, pointing a beam at an on or an off pixel.

**micron** Previous name for micrometre, still common in US to avoid confusion with micrometer.

**micronavigation** Guidance of aircraft or missile in relation to nearby target (usually air/ground).

**micronic** Concerned with micron dimensions, hence \* filter.

**micronolitre** Quantity of gas: 1 litre at pressure 1  $\mu\text{Hg}$ .

**microprobe** Instrument for investigating regions of micron size, hence laser-pulse \* analyser.

**microgram** Small sub-program for defining computer instructions in terms of other basic elemental operations.

**microsatellite** Mass 10–100 kg.

**microsecond**  $10^{-6}\text{s}$ .

**microshaving** Precision-machining heads of driven countersunk rivets.

**microspark coating** A micropulse discharge deposits sintered metal or ceramic.

**microstrip** Microwave guide comprising conductor supported above ground plane, generally fabricated by printed circuitry.

**microswitch** Miniature electric switch governing system(s) according to external movement such as compression of MLG.

**microtacan** Microelectronic Tacan.

**microtechnology** Has come to mean manufacture at the molecular level, including Mems, microfabrication, nanotechnology, microfluidics and even DNA arrays.

**Microvision** All-weather landing aid (Bendix) with pulsed beacons along runway energising pattern on HUD.

**microwave background** Found throughout universe, corresponding to temperature of 2.7K.

**microwave landing system** Post-1995 successor to ILS, TRSB (US) being political choice. Guides over  $\pm 40^\circ$  sector landing or overshoot.

**microwaves** Electromagnetic radiation between RF and far-IR, normally 1–300 GHz.

**MICS** Manned interactive control station.

**mic-tel socket** Connector for headset.

**MID** 1 Multifunction information distribution.

2 Maritime identification digits.

3 Middle.

4 Middle East (ICAO).

**Mida** Message interchange distributed application.

**midair** Midair collision.

**Midas** 1 Missile-defense alarm system (USA, USAF).

2 Manufacturing information distribution and acquisition system.

3 Multiplexer integration and digital [comsat subsystem] automation system.

4 Multifunction IR distributed-aperture system.

5 Multifunction integrated defensive avionics system.

6 Mobile instrumented data-acquisition system.

7 Multi-user interactive development and analysis system.

8 See MIDS(4).

**MidASH, Midash** Modular integrated display and sight helmet.

**midcourse** 1 Space trajectory linking departure from neighbourhood of Earth and arrival near destination, corresponding to atmospheric flight cruise; hence \* guidance.

2 From missile boost burnout to start of terminal homing.

**midcourse guidance** Applies to midcourse (1), sometimes to (2).

**midcruise weight** Gross weight at midpoint of mission.

**middle airspace** Several national definitions, eg FL 180–290, FL 145–250.

**Middleman** Air-intercept code: VHF or UHF radio relay (DoD).

**middle marker** ILS marker on extended runway centre-line at ILS Point B, usually 1,067 m (3,500 ft) from threshold.

**Midds** Meteorology and oceanography integrated data-display system.

**mid-flap** Intermediate portion of triple-slotted flap.

**mid-high wing** Set about three-quarters way up fuselage.

**midi** Intermediate RPV class, on basis of weight, altitude and speed.

**Midis** Multifunction integrated defensive information system.

**MIDIZ** Mid-Canada identification zone.

**Midl** Modular inter-operable data-link.

**mid-life update** Major refurbishment of costly military [rarely, large commercial] aircraft which in bygone days would have been replaced by a new design.

**MIDN** Midnight.

**Midnight** Air-intercept code: ‘Change from close to broadcast control’ (DoD).

**MIDR** Maintenance (or mandatory) incident and defect report.

**mid-range ballistic missile** One having range of 500–3,000 nm (927–5,560 km); see *medium-range* \* (DoD).

**MIDS, Mids** 1 Management information and decision support.

2 Multifunction[al] or multiuser or multiple, information distribution system [FDL adds fighter data link, LVT low-volume terminal] (NATO).

3 Multi-information display system (weather).

4 Mission-data acquisition system.

**midsize** Important bizjet category, 8–12 seats.

**Midst** Multiple interferometer determination of trajectories.

**MiDSTEP** Microsatellite demonstration science and technology experiment program (Darpa).

**mid tank** Usually, the centre tank in a wing, between the inner and outer.

**MIDU** 1 Missile-ignition delay unit.

2 Multipurpose interactive display unit.

**mid-upper** *Dorsal turret*.

**mid-value logic** Redundant system having odd number of active channels wherein system output is always that of intermediate-value channel, thus eliminating wild values.

**mid-wave IR** This usually means medium-wave, wavelength 3–5  $\mu$ .

**mid-wing aircraft** This usually means a monoplane with its wing[s] in the so-called mid position, half-way down the fuselage, but see next.

**mid-wing pylon** The centre pylon, or hardpoint, of three under each wing, between the inner- and outer-wing pylons; by itself confusing and in any case should be mid wing-pylon.

**MIE** 1 Manoeuvre-induced error.

2 Managing (or management) in inflationary economy.

3 Minimum ignition energy.

**Mie region** Resonating between reflected and creeping waves around radar target.

**MIES** Multi- [or modernised] imagery exploitation system.

**MIIF** Make it fly.

**Mifass** Marine integrated fire and air support system.

**MIFF** Anti-tank mine dispensed from MW-1 system (G).

**MIFG** Shallow fog (ICAO).

**Mifir, MIFIR** Microwave instantaneous-frequency indication receiver (ECM).

**MIG** Metal inert gas [welding].

**Mig, MIG** Miniature integrating gyro.

**MiG CAP** Combat air patrol directed specifically against MiG aircraft, hence MiG screen.

**Might, MIGHT** Malaysian Industry/Government Group for High Technology.

**Migits** Miniature integrated GPS/INS tactical system.

**MiG magnet** Photoflash (US, colloq.).

**migration** 1 Movement at molecular level of one solid into another, eg of vinyl plasticiser into polyethylene core of electrical cable.

2 Movement of secondhand aircraft causing significant variation in demand for new aircraft.

3 Transferring internal equipment, such as a navigation or attack system, to another aircraft.

**Migrator** Microwave guidance radar beacon interrogator.

**MIRS** Modular imagery interpretation and reporting system.

**MIITE** Multi-intelligence and information technology exploitation.

**mike mike** Millimetres.

**MIL** 1 Military (ICAO, US); hence \* specifications, common to all US armed services; \* rating, high-power engine ratings, usually close to max. cold or Meto.

2 Combined USAF/USN specifications, eg MIL-F-8785 covering basic flying qualities of aeroplanes.

3 Merritt Island.

**mil** 1 One-thousandth of an inch,  $10^{-3}$  in, = 0.0254 mm; hence circular \* = area of 1 mil circle =  $506.7\mu^2$ .

2 Angular measure,  $1/6400$  of circle = 3.375'.

3 Military (UK, CAA).

**Milcon** Military construction (USAF).

**MILD** Magnetic-intrusion line detector.

**Milds, MILDS** Missile [originally meant ICBM] launch detection system.

**mile** Imperial unit of length 1,609.344 m; aviation more commonly uses nautical mile, 1,853.184 m [US 1,852 exactly], except when reporting visibility.

**‘mile-high club’** Notional clique of those who have sex at high altitude.

**Miles** Multiple integrated laser engagement system (USA).

**miles in trail** Longitudinal spacing of en-route military aircraft in loose procession.

**miles per hour** Statute mph = 1.609344 km/h, 0.86842 kt, 88 ft/min, 0.44704 ft/s; reciprocals 0.621371, 1.15152, 0.011364, 2.2369.

**milestones** Usually I programme launch, II full development, III production.

**MIL-H** Military Handbook (US).

**miligraphic display** Large (19 in, 483 mm) software-driven colour display of radar overlaid on map.

**military aerodrome traffic zone** Protected airspace typically extending 5 nm (9.26 km) round airfield periphery and from surface to 3,000 ft (914 m) AAL. Approach to main runway may be protected by an extended stub. In UK MATZ recognition by civil traffic is not mandatory.

**military aircraft** Any operated by armed service, legal or insurrectionary, no matter what aircraft type; combat aircraft retired and privately owned is not military (see *paramilitary*).

**Military Aircraft Release** Statement of operating envelope, build standard, limitations and procedures within which airworthiness has been established, which, if accepted, transfers responsibility to the Procurement Executive. This would apply were there to be a new British military aircraft.

**military emergency diversion airfield** Available 24-h, 365 days, to aircraft in distress, offering radar vectoring (UK).

**military power** Normally maximum cold (unaugmented) thrust; for piston engine METO.

**military productivity** Several forms, including flying rate per squadron or wing, aircraft utilization, ordnance work rates, etc.

**military qualification test, MQT** Final hurdle hardware must pass before entering US military service; schedule varies depending on item.

**military spaceplane** MSP, family of systems providing 'rapid global presence . . . including precision strike on terrestrial targets'. Main element will be SOV, which will probably carry CAV, MIS (3), OTV and SMV (USAF).

**mill** 1 To machine fixed workpiece with rotary cutter.

2 Machine tool, often very large, for this purpose; hence skin \*, spar \*.

3 Large historic piston engine (US colloq.).

4 Large propeller (US colloq.).

5 Jet engine (US colloq.).

**milled block circuit** Circuit (eg fluidic) machined from 3-D block.

**Mill file** Single-cut tapered hand file for fine metal-working.

**milli** Prefix one-thousandth,  $\times 10^{-3}$ , symbol m, thus milliampere = mA.

**millibar** Unit of atmospheric pressure =  $10^{-3}$  bar =  $100\text{Nm}^{-2}$ , =  $9.87 \times 10^{-4}$  atm,  $\approx 29.53$  in Hg [contrary to SI, = 100Pa].

**milligal** Former unit of gravitational attraction, =  $10^{-5}\text{ms}^{-2}$  = 10 g.u.

**millimetric** Concerned with magnitudes of the order of one millimetre; hence \* waves, EM radiation of this order of wavelength.

**milling machine** See *mill* (2).

**milliradian** Small angular measure = 3'26.25".

**MIL-1553B** Standard requirements for airborne digital data bus (US, originally military, now Int.).

**MilOWS** Military obstacle-warning system.

**MIL-PRF** Primary reference fuel specifications; 5606 is red mineral type, 83282 is synthetic hydrocarbon-based.

**MILS, M-ILS** 1 See *MLS*.

2 Multiple independent levels of security.

**Milsatcom** Military satellite communications.

**Milspec** Military specification.

**Milstamp** Military standard transportation and movement procedure (DoD).

**Milstan** Military standard.

**Milstar** Military strategic and tactical relay.

**MIL-STD** Military Standard(s); eg, \*-882 is that for safety requirements, \*-1760 is protocol for air-dropped conventional weapons; see 1553B (US).

**Milstrip** Military standard requisitioning and issue procedure (DoD).

**Miltracs** Military air traffic control system(s).

**MILTS** Modern intermediate-level test station (USAF).

**MILU** Missile interface and logic unit (Smiths).

**Milvan** Military-owned ISO container.

**MIM** 1 Mobile-launched SAM (former US category).  
2 Minimum.

**MIMD** Multiple instruction, multiple data stream.

**Mimic** Microwave/millimetre-wave monolithic integrated circuit(s).

**MIMO, Mimo** Multiple input, multiple output.

**Mims** Multispectral MWS(1).

**MIMU** Multisensor inertial-measurement unit.

**min** 1 Minimum.

2 Minute (of time; abbreviation for minute of angular measure is ').

**M<sub>ind</sub>** Indicated Mach number.

**mine countermeasures** All methods of reducing damage or danger from land or sea mines.

**mineral oil** Lubricating oil of mineral (normally North American crude) base, thus not a synthetic turbine oil nor vegetable oil such as castor oil used in rotary engines; dyed red.

**mineral wool** Fibrous heat insulator made by blowing steam through molten slag with additives.

**Miner's hypothesis** If alternating stresses S<sub>1</sub>, S<sub>2</sub> . . . are applied for n<sub>1</sub>, n<sub>2</sub> . . . cycles, and N<sub>1</sub>, N<sub>2</sub> . . . are the cycles to failure at constant S<sub>1</sub>, S<sub>2</sub> . . . , fatigue damage will begin when  $\Sigma \left(\frac{n_i}{N_i}\right) = 1$ .

**minfap** Minimum facilities project; Eurocontrol, Maastricht.

**Mings** Micro-internetted unattended ground sensor[s].

**mini** Smallest RPV class, on basis of weight, altitude and speed; resemble large model aircraft.

**miniature flex gyro** DTG is mounted on flex shaft with opposing strut producing destabilizing force in proportion to rotor angular displacement. At tuned speed (=f[N]<sup>2</sup>) spring force and torques cancel.

**Minigun** GE multi-barrel belt-fed weapons of rifle calibre, usually 7.62 mm or 5.56 mm.

**mini-M** Single-channel voice, fax or data [small GA aircraft].

**minima** Lower limit of weather [esp. visibility] for particular aircraft and type of flight operation, esp. landing.

**minimal flight path** That for shortest time en route (ASCC).

**minimally manned** Aircraft available for flight as RPV but sometimes flown with safety pilot.

**minimum airplane** Concept, most active in US, of smallest/lightest/simplest aeroplane. By 1985 being accepted as MTOW not exceeding 100 kg, or 120 kg for two-seater.

**minimum altitude** Normally undefined except in same terms as lo.

**minimum-altitude bombing** Horizontal or glide bombing (ie not toss) with release height below 900 ft (274 m) (DoD, IADB).

## minimum break-off height

**minimum break-off height** For practical purposes, minimum descent height.

**minimum burner pressure** That below which combustion in idling engine may be extinguished, maintained by \* valve.

**minimum-control speed VMC** Lowest IAS at which aeroplane can always be flown safely (eg after sudden worst-case engine failure); specified as such in flight manual. See *VMCA*, *VMCG*, *VMCL*.

**minimum crossing altitude** Lowest altitudes at certain radio fixes at which aircraft may cross en route to higher IFR MEA (FAA).

**minimum decision altitude** Minimum descent altitude (NESN, NFSN).

**minimum descent altitude** 1 MDA, lowest altitude, expressed in feet above MSL, without sight of runway to which descent is authorized on final approach or during circle-to-land manoeuvre in execution of standard instrument approach where no electronic glideslope is provided such as ILS, PAR (FAA). See *MD height*.

2 Decision height (UK and others).

**minimum descent height, MDH** Height above touchdown, at which pilot making a non-precision instrument approach must either see to land or initiate overshoot, based entirely on topography and characteristics (including sink) of aircraft. Not used in US.

**minimum design weight** Not normally used; existing definitions are generally similar to operating weight.

**minimum-energy orbit** See *Hohmann orbit*.

**minimum en route altitude** That between radio fixes which meets obstruction clearances and assures good radio reception or navaid signal coverage; MEAs apply to entire width of all airways or other direct routes (FAA).

**minimum equipment item** Device whose failure does not delay departure, also called allowable deficiency, despatch deviation.

**minimum flying speed** Lowest TAS at which aeroplane or autogyro can maintain height; often well below *VMCA* or angle of attack at which operative stall-warning system would trigger.

**minimum fuel** 1 Smallest quantity of fuel with which aircraft may be authorized to fly.

2 Smallest quantity of fuel with which c.g. can fall within permitted range, normally sufficient for 30 min at maximum continuous power.

3 Lowest quantity of fuel necessary to assure safe landing in sequence with other traffic without ATC priority (USAF).

**minimum glide path** This has appeared in print but is surely meaningless. There is only one glideslope angle at each ILS.

**minimum gliding speed** Lowest TAS at which aircraft can fly without propulsion; below *VMCA*, or best-range gliding speed.

**minimum groundspeed system** Subsystem in AFCS which continuously calculates correct approach speed using TAS, G/S and W/V (entered into FMS by pilot) to protect against windshear.

**minimum holding altitude** Lowest altitude prescribed for holding pattern which complies with obstruction clearance and assures good radio/navaid signal reception.

**minimum human force** At least three sets of measures in use as basis for aircraft/spaceship design, factored to allow for injury, fatigue, g, anoxia and other influences.

## minimum vectoring altitude

**minimum IFR altitude** As published in FAR-95 and 97, 1,000 ft above highest obstruction [2,000 ft in designated mountainous areas] within 5 statute miles of track [FAR word is "course"], or as otherwise authorized by ATC.

**minimum line of detection** Arbitrary line at which hostile aircraft must be detected if defending interceptors are to destroy them before they reach vital area; usually same at ATC (1) line.

**minimum line of interception** Arbitrary line at which hostile aircraft should be intercepted by aircraft if friendly AAA and SAMs are to destroy all objects not thus intercepted.

**minimum military requirement** Specification or description of infrastructure designed to meet immediate or obvious future need and no more, on 'no frills' basis (NATO).

**minimum navigation performance specification, MNPS** Effective from October 1978 over ocean areas FL275–400, calling for certain standards of navigation and close adherence to flightplan, and permitting major reductions in separation.

**minimum normal burst altitude** Height AGL below which air-defense nuclear warheads are not normally detonated (DoD).

**minimum obstruction clearance altitude** Specified altitude between ratio fixes on VOR/LF airways, off-airway routes or segments, which meets obstruction clearances and ensures acceptable signal coverage only with 22 nm of each VOR (FAA).

**minimum off-route altitude** MORA charts published by Jeppesen show details of terrain and obstruction clearance within 10 nm of track.

**minimum operating strip** All-weather runway devoid of non-portable facilities, see *BOP* (USMC).

**minimum reception altitude** Lowest altitude required to receive adequate signals to determine VOR/Tacan/Vortac fixes (FAA).

**minimum rpm** Engine rotational speed normally governed; with throttle on rearmost stop the speed depends on a governor, IAS and possibly other factors, such as MLG microswitch allowing a ground condition with superfine propeller pitch.

**minimum runway** Not defined, other than a limiting runway for particular aircraft or mission, with regard to weather, aids and surrounding terrain.

**minimums Minima.**

**minimum safe altitude warning, MSAW** Included in ARTS, monitors all controlled aircraft and alerts controller of potentially unsafe situations, usually 100 ft below MDA.

**minimum safe distance** Sum of radius of safety and buffer distance.

**minimum sector altitude** That which in emergency will provide 300 m (984.2 ft) clearance within specified sector within 25 nm radius of radio aid.

**minimum-sink speed** Of glider, self-explanatory, but note that MSS is not the same as speed for best L/D or glide ratio.

**minimum speed** See *minimum flying speed*.

**minimum TAS** Corresponds to IAS for minimum flying speed, and below MSL or on cold day can be lower.

**minimum vectoring altitude** Lowest altitude, expressed in feet AMSL, to which aircraft may be vectored by radar controller.

## minimum warning time

**minimum warning time** Sum of personnel and system reaction times.

**mini-NW** Commonly called a mini-nuke, or minimuke, weapon with yield  $\leq 5\text{kT}$ .

**minisat** Satellite launch mass 100–500 kg.

**Minitat** Family of helicopter armament systems, from minimum tactical aircraft turret.

**Mited** Mini trailing-edge device.

**Minitrack** See *Stadan*.

**minor equipments** Simple hardware items such as fasteners and clips, bought out by major supplier but not shared in collaborative programme.

**MINS** Minimums (ICAO).

**Mins** Minutes.

**Mint** 1 Multi-intelligence.

2 Mutual interference.

**Mintech** Ministry of Technology (UK, obs.).

**minute** 1 One-sixtieth [ $1.667 \times 10^{-2}$ ] of hour; abb. min.

2 One-sixtieth [ $1.667 \times 10^{-2}$ ] of degree of angular measure.

**MIO** Multiple input/output control system.

**Mio** Million (G).

**MIP** 1 Missile impact predictor [S adds set].

2 Multilateral interoperability program (NATO).

3 Multinational interoperability protocol (G).

**Mipas** Michelson interferometer for passive atmospheric sounding.

**MIPB** Mono-isopropyl biphenyl.

**MIPCC** Mass-injected [or injection] pre-compressor cooled [or cooling].

**MIPI** Material in process inventory.

**MIPR** Military interdepartmental purchase request (US).

**MIPS, Mips** 1 Million instructions per second.

2 Maintenance information planning system.

3 Midlife improvement project study.

4 Multiband imaging photometer for SIRTF.

5 See *MIP*.

**MIR** 1 Multiple-target instrumentation radar.

2 Modular integrated rack, or racking.

3 Micropower impulse radar.

4 MLS inspection receiver.

5 Manipulated information rate.

**Mira** 1 Miniature IR alarm.

2 Medium [wavelength] IR array.

**Miracl** Mid-IR advanced chemical laser.

**Miradcom** Missile R&D Command (USA).

**Mirage** Microelectronic indicator for radar ground equipment.

**Miran** Missile ranging system interrogating at 600 MHz with beacon reply at 580 MHz.

**Miras, MIRAS** Multicolour infra-red [missile] approach [or alerting] sensor.

**Mirc, MIRC** Missile in-range computer.

**MIRFS** Multifunction integrated RF system.

**MIRL** Medium-intensity runway-edge lights.

**Mirls** Miniature IR linescan[ner].

**mirror** Aerobatic manoeuvres by two aircraft in tight formation [usually one above the other], roll attitude of one  $180^\circ$  from that of partner.

**mirror sight** Optical device to assist fixed-wing recovery on aircraft carrier, giving pitch-stabilized light indications to approaching pilot.

## mission-capability rate

**MIRTS** Modular[ized] infra-red transmitting set, protects against IR-seeking missiles.

**Mirv** Multiple independently targeted re-entry vehicle[s], hence to \* an existing missile, mirved warheads, \* Salt limits.

**MIS** 1 Management information system.

2 Missing (ICAO).

3 Micro-inertial sensor[s].

4 Modular insertion stage.

5 Man in space.

6 Meteorological impact statement.

**MISDS** Multiple instruction, single data stream.

**mismatch** 1 Inability of gas-turbine (invariably super-sonic) inlet system to supply engine with correct airflow in yawed flight or other disturbed conditions.

2 Upper and lower dies not perfectly aligned in closed die forging.

**MISR** Multiangle imaging spectroradiometer.

**Misrep** Mission report.

**misrigging** Incorrect angular setting of neutral position of control surface or other aerodynamic surface [less often, of wing(s)].

**MISS, Miss** 1 Model integrated suspension system.

2 Missile-intercept scoring system.

**miss-distance scorer** Indicates minimum passing distance between munition and target but does not give any co-ordinate values (ASCC).

**missed approach** 1 One aborted for any reason, followed by a go-around (overshoot).

2 Standard flight procedure to be followed in (1). Captain or pilot flying elects to overshoot upon reaching DH and not seeing runway, or upon command to do so from approach controller.

**missed-approach point** Point on published ILS approach, expressed as distance or time from FAF or height on glideslope, at which, if runway or approach lights are not in sight, MA(6) procedure must be initiated.

**missile** No existing definition satisfactory; general assumption is flight wholly or mainly through atmosphere, with/without propulsion, with/without guidance, with one or more warheads.

**missile free** Usually voice command, authority to launch AAM unless target is identified as friendly.

**missile range** Ambiguous, can mean range (1) or (2).

**Missile Technology Control Regime** Prohibits transfer to rogue state of hardware or technology with range over 300 km, 165 nm.

**missilry** Technology of (assumed guided) missiles (colloq.).

**missing-man flyby** Restrained flypast by formation team configured to leave one obvious gap in formation, symbolism (variable) being known to audience.

**mission** 1 Single military operation flown by assigned force of aircraft.

2 Sortie, ie military operation flown by one aircraft.

3 Rarely (incorrectly) special flight of non-military nature.

4 Basic function or capability of missile or rocket, as shown by MDS designator (DoD).

**mission-adaptive wing** One whose section profile varies automatically to suit the requirements of each flight condition.

**mission-capability rate** Time out of each 24 h period that

aircraft is available to perform its mission, expressed as percentage.

**mission control [center]** Term usually means control of spacecraft.

**mission degradation factor** Variables affecting mission, eg abort, navigation error, misidentification of target, etc.

**mission equipment** See *role equipment*.

**mission-oriented items** Those required following numerical assessment of enemy capabilities or targets.

**mission profile** Graphical or written plot of flight level from start to finish of mission, usually a succession of lo and/or hi.

**mission radius** Practical radius of action for aircraft equipped and loaded for mission on given profile, with allowances varying in peace or war; invariably less than half range with same load.

**mission review report** Intelligence report containing information on all targets covered by one reconnaissance sortie.

**mission specialist** Engineer or mathematician responsible for planning spaceflight, assigning payloads and assisting integration.

**Mist** 1 Miniature spaceplane technology.

2 Meteorological-information self-briefing terminal.

3 Modular interoperable satellite terminal.

4 Mosaic IR sensor technology.

**mist** 1 Visibility reduced by water droplets to 1–10 km.

2 Mixture of gas (invariably air) and finely divided liquid (usually an oil).

3 Definition ‘popular expression for drizzle’ is erroneous.

**Mistel** Code name for explosive-filled pilotless aircraft guided to target by a pilot in a fighter initially linked to it (G, WW2).

**misting** 1 Obscuration of transparency caused by condensed water droplets.

2 Tendency of fuel to form easily ignited dispersion in crash.

**Mistral** Cold, dry wind from N/NW [French S coast].

**Mists** Modular(ized) IR transmitting set.

**mistuning** Introducing microscopic variation into the thickness of gas-turbine rotor blades (alternate blades, pairs or quadrants) to reduce stress due to flutter.

**MIT** 1 Massachusetts Institute of Technology.

2 Moscow Institute for Thermotechnology.

3 Miles in trail.

4 Military integrated team.

**MITAS, Mitas** Multi-sensor imaging technology for airborne surveillance.

**Mite** Micro tactical[ly] expendable.

**MiTEx** Micro-satellite technology experiment (Darpa, NRL, USAF).

**MITI** Ministry of International Trade and Industry (J).

**MITO** Minimum-interval takeoff.

**MITS** Multi-integrated TCPED systems.

**MIU** Missile interface unit.

**mix** See *mixer*.

**mixed compression** In a supersonic inlet, flow compression through shockwaves both outside and inside the duct.

**mixed conventional loads pattern management** Software enabling B-2 [possibly other aircraft] to attack target[s] with several types of free-fall weapon in single pass.

**mixed-exhaust nacelle** Engine nacelle fitted with a mixer (3).

**mixed fleet flying** Qualification of all airline’s pilots to fly two aircraft types on successive flights, e.g. a narrow- and a widebody, or a four-engine aircraft and a twin (Airbus).

**mixed-flow augmentation** Turbofan whose core and bypass flows are mixed upstream of augmenter (afterburner, reheat jetpipe).

**mixed-flow compressor** Axial followed by centrifugal.

**mixed-flow nozzle** Single nozzle for fan and core. Not necessarily a mixer.

**mixed-manned UCAV** Fleet of UCAVs under integrated control, also called MSIC.

**mixed mode** 1 Combining two EM-wave propagation modes.

2 Takeoffs and landings on same runway; hence MM operations.

**mixed power aircraft** Equipped with more than one species of propulsion, notably turbojet and rocket.

**mixed propellant** See *dual propellant*.

**mixed traffic** Contrasting types of aircraft (eg jets and lightplanes) under control or otherwise in same airspace, esp. on approach.

**mixed twin-spool turbofan** Engine in which the fan rotates with an LP compressor which supercharges the core [the most common type].

**mixer** 1 In communications radio, first detector in superhet receiver, which combines received signal with locally generated oscillation to yield intermediate frequency.

2 In AFCS, pitch/roll proportioning device, either mechanical or electronic, for supplying required signals to different surface power units.

3 Annular array of chutes in turbofan jetpipe which causes rapid mixing of core and bypass [fan] flows.

**mixer nozzle/ejector** Proposed propulsion for SSBJ: low-BPR tubofan with con/di ejector nozzle mixing jet and bypass flows.

**mixing box** Mixer (2), occasionally purely mechanical for translating flight-control input into required surface deflections on two axes.

**mixing length** Most common meaning is linear distance for fuel droplet to be vaporised.

**mixture** Air/fuel vapour suitable for piston engine, other than direct-injection types; hence \* control, \* ratio, etc.

**mixture control** Manual inceptor formerly included in carburettor to maintain desired mixture as piston engine gains altitude.

**MJ** Megajoule[s],  $10^6$  joules.

**Mj** Fully expanded jet exit Mach number.

**mJ** Millijoule[s] [ $10^{-6}$ J].

**MJP** Magnetron jamming pod.

**MJPO** Milsatcom Joint Project Office (USAF).

**MJS mission** Mars, Jupiter, Saturn mission; hence MJSU also includes Uranus.

**MK** Machine cannon (G).

**Mk** Mark (UK designations).

**MKB** Machine-construction [i.e., engine design] bureau (R).

**MKC** Multiple-kill capability.

**MKR, Mk** Fan marker.

**MKS** 1 Metre/kilogramme/second [A adds ampere]; outmoded “engineering” system of metric units.

<b>2</b> International Space Station (R).	<b>MLZ</b> MLS receiver.
<b>MKSA</b> Metre/kilogramme/second/ampere.	<b>MM</b> <b>1</b> Rare prefix mega-mega (tera), $10^{12}$ .
<b>MKU</b> Translated: ‘multi-round catapult installation’, rotary missile launcher (R).	<b>2</b> Middle marker (ICAO).
<b>MKV</b> <b>1</b> Miniature kill vehicle.	<b>3</b> Missile prefix mer/mer (sea/sea) (F).
<b>2</b> Multiple kill vehicle (MDA).	<b>4</b> Mass memory.
<b>ML</b> <b>1</b> Missile launcher.	<b>5</b> Mission Manager.
<b>2</b> Minelayer.	<b>6</b> Mission Module (CEV2).
<b>3</b> Middle locator.	<b>mm</b> Millimetre[s].
<b>M<sub>L</sub></b> Local Mach number.	<b>MMA</b> <b>1</b> Multimission aircraft.
<b>m<sub>L</sub></b> Total mass on landing.	<b>2</b> Mono-methyl aniline.
<b>ml</b> Millilitre = cm <sup>3</sup> .	<b>3</b> Multimission, or multirole, maritime aircraft.
<b>MLA</b> <b>1</b> Manoeuvre load alleviation.	<b>MACS</b> Multimission aft crew station; cockpit occupied by either crew member or avionics.
<b>2</b> Maneuver limited altitude.	<b>MM&amp;T</b> Manufacturing methods and technology.
<b>ML(A)</b> Magic lantern adaptation.	<b>M-marker</b> Beacon with Morse-coded emission (obs.).
<b>MLB</b> <b>1</b> Multi-layer board.	<b>MMARS</b> Military Middle Airspace Radar Service, available to all aircraft FL100–245 (UK).
<b>2</b> Main-lobe blanking (ECM).	<b>MBB</b> International bank in Moscow.
<b>MLBM</b> Modern large ballistic missile.	<b>MMC</b> <b>1</b> Metallic-, or metal-, matrix composite.
<b>MLC</b> <b>1</b> Main-lobe clutter.	<b>2</b> Monitor Mach computer.
<b>2</b> Main-line contactor.	<b>3</b> Monopolies & Mergers Commission (UK).
<b>MLCCM</b> Modular life-cycle cost model.	<b>4</b> Miniaturized munitions capability.
<b>MLCM</b> Microprocessor logic control module.	<b>5</b> Modular mission [or mission management] computer.
<b>MLCS</b> Mobile launching, or launcher, and control system.	<b>6</b> Multimedia controller.
<b>MLD</b> <b>1</b> Maintenance logic diagram.	<b>7</b> Mission Management Center (USA, SWC, USSC, 2001).
<b>2</b> Multi-layer defense (DoD).	<b>8</b> Maximum material condition.
<b>MLDI</b> Meter-list display interval (timed arrivals, US).	<b>MC<sup>2</sup>C</b> Multi-mission command and control constellation [abb. MC <sup>2</sup> C].
<b>MLDS</b> Missile-launch detection system; -F adds fighter.	<b>MMCM</b> Multi-mission common modular.
<b>MLE</b> <b>1</b> Missile launch envelope.	<b>MMD</b> Master monitor [or mission-management, moving-map or multi-mode] display.
<b>2</b> Maximum likelihood estimation.	<b>MMDL</b> Multi-mode data-link.
<b>MLF</b> Multilateral nuclear force [never activated].	<b>MMDP</b> Modular mission display processor; drives HUD and MFDs.
<b>MLFS</b> Modular lightweight Flir system.	<b>MMDR</b> Multi-mode Doppler radar.
<b>MLG</b> Main landing gear; sometimes m.l.g.	<b>MMDT</b> Master-model design tool.
<b>MLI</b> <b>1</b> Mid-life improvement; S adds study.	<b>MME</b> <b>1</b> Maritime-mission electronics.
<b>2</b> Magnetic level indicator.	<b>2</b> Miscellaneous military equipment [R adds requirement] (UK).
<b>MLM</b> Multipurpose laboratory module (ISS4).	<b>3</b> Modular mounting enclosure.
<b>MLLV</b> Medium-lift launch vehicle.	<b>MMEL</b> Master minimum equipment list.
<b>MLMS</b> Multipurpose lightweight missile system.	<b>MMF, mmf</b> <b>1</b> Magnetomotive force.
<b>MLND, Mlnd</b> Maximum landing weight (usually MLW).	<b>2</b> Model-management framework[s].
<b>MLP</b> <b>1</b> Multi-level pegging.	<b>MMFC</b> Monomethyl fuel cell.
<b>2</b> Multi-link processor.	<b>mmf</b> Micro-microfarad = picofarad, pf.
<b>MLPRF</b> Modular low-power RF.	<b>MMFF</b> Multimode fire and forget.
<b>MLRR</b> Mode-locked ring resonator.	<b>MMH</b> <b>1</b> Monomethyl hydrazine.
<b>MLRS</b> Multiple launch rocket system.	<b>2</b> Maintenance man-hour.
<b>MLS</b> <b>1</b> Microwave landing system.	<b>MMI</b> <b>1</b> Mandatory modification and inspection.
<b>2</b> Multi-level secure (or security) computer operating system.	<b>2</b> Man/machine interface, or integration.
<b>3</b> Mapping and localization system (UAV).	<b>3</b> Marine Militare Italia.
<b>MLST</b> Mars local solar time.	<b>MMIC</b> <b>1</b> Millimetre-wave integrated circuit.
<b>MLT</b> <b>1</b> Munitions lift trailer.	<b>2</b> Monolithic microwave integrated circuit.
<b>2</b> Multi-line terminal.	<b>3</b> Marina Militare Italia.
<b>MLTI, MLT/I</b> Mesosphere and lower thermosphere/ionosphere.	<b>MMLS</b> <b>1</b> Modular MLS.
<b>MLU, MLUD</b> <b>1</b> Mid-life update, or upgrade.	<b>2</b> Mobile MLS.
<b>2</b> Monitor and logic unit.	<b>MMLSA</b> Military MLS avionics.
<b>MLV</b> <b>1</b> Mobile launch vehicle.	<b>MMKV</b> Multiple MKV.
<b>2</b> Medium launch vehicle (upgraded Delta).	<b>MMMA</b> Multi-mission maritime aircraft.
<b>ML/V</b> Memory loader/verifier.	<b>MMEL</b> Master mandatory minimum equipment list.
<b>MLW</b> Maximum certificated landing weight.	<b>MMMM</b> Sudden-change special weather report (ICAO).
<b>MLWA</b> MLW authorized.	
<b>MLWS</b> Missile launch warning system.	

## MMMP

**MMMP** Multimission mobile processor.  
**M-MMS** Military-mission management system.  
**MMMS, M<sup>3</sup>S** Multimission management system.  
**MMO** 1 Main meteorological office.  
2 Mixed-mode operations.  
**M<sub>MO</sub>** Maximum operating Mach number.  
**MMOU** Multinational memorandum of understanding.  
**MMP** 1 Metallic materials processor (company category).  
2 Modular mission payload.  
3 Maintenance monitoring panel.  
4 Material management program[me].  
**MMPM** MEECN message processing mode.  
**MMPP** In English, machine-building production enterprise = factory (R).  
**MMR** 1 Machmeter reading.  
2 Minimum military requirement.  
3 Multi-mode receiver.  
4 Multi-mode [or multimission] radar [S adds system].  
**MMRC** Modular multi-role computer.  
**MMRH/FH** Mean maintenance and repair hours per flight hour.  
**MMRPV** Multi-mission RPV.  
**MMS** 1 Missile-management system.  
2 Mast-mounted sight (or sensor).  
3 Multi-mission modular spacecraft.  
4 Metal measuring set.  
5 Magnetic minesweeping system.  
6 Moisture, or maintenance, management system.  
7 Magnetospheric multiscale mission (NASA).  
8 Mission-management system.  
**MMSA** Multimission surveillance aircraft.  
**MMSE** Minimum mean square error.  
**MM/SI** Miniature munitions.store interface.  
**MMSS, M<sup>2</sup>S<sup>2</sup>** Mobile mass-storage system.  
**MMT** 1 Multiple-mirror telescope.  
2 Message/management terminal.  
3 Multimission trainer.  
4 Mission management team.  
**MMTD** Miniaturized, or miniature, munition[s] technology demonstration.  
**MMTS** Multi-modal transport system (Airbus).  
**MMU** 1 Manned maneuvering unit (gas-powered flight control system for Shuttle astronauts).  
2 Mobile meteorological unit (RAF).  
3 Mass memory unit.  
**MM/UCAV** Mixed manned UCAV.  
**MMVX** Medium-speed support aircraft (project).  
**MMW** Millimetre, or millimetric, wave; R adds radar.  
**MN** 1 Meganewton[s].  
2 Model number.  
3 Magnetic north.  
**M<sub>n</sub>** Mach number.  
**mN** Millineutron[s] =  $N \times 10^{-3}$ .  
**m<sub>n</sub>** Neutron rest-mass,  $1.6749286 \times 10^{-24}$  g.  
**MNA** Maritime Notification Area.  
**MNAOS** Merchant Navy and Airline Officers' Association [office, London E11] (UK).  
**MNB** Multiple narrow beam(s).  
**MNC** Major NATO command.  
**MNCID** Management of network category interaction diagram.  
**MND** 1 Mission need documents (NATO).

## mobile quarantine facility

2 Multi-National Division (SFOR).  
3 Minimum nuclear deterrent.  
4 Ministry of National Defence (Poland).  
**MNE** 1 Mixer nozzle/ejector.  
2 Multi-national experiment [followed by suffix number] (NATO, US, UK).  
**M<sub>NE</sub>** Mach number never to be exceeded, and not even approached in normal flying, but demonstrated in civil certification.  
**mnemonic** Easily remembered sequence to assist aircrew with their pre-flight and other checks, eg HTMPFFG = hood/harness, trim, mixture, pitch, fuel, flaps, gills/gyro (largely archaic except in general aviation).  
**MNFP** Multinational fighter program (US).  
**MNIIRS** Moscow scientific-research institute of radio communication.  
**MNLIC** Multi-National Logistic Command.  
**MNLID** Mainland.  
**Mnm, mmm** Minimum (ICAO).  
**MNO** Ministry of national defence (Czech).  
**M<sub>NO</sub>** Normal operating Mach number, now generally replaced by M<sub>MO</sub>.  
**MNOS** MOS with silicon nitride on oxide.  
**MNP** Magnetic north pole.  
**MNPA** Minimum navigation performance airspace, allowing 60 nm lateral separation at FL275–400.  
**MNPS** Minimum navigation performance standards, or specification [A adds airspace].  
**MNR** Minimum-noise route, or routeing.  
**MNS** Mission-need[s] statement.  
**MNT** Monitor[ing].  
**MNTN** Maintain.  
**MNVD** Monocular night-vision device.  
**MO** 1 Meteorological Office.  
2 Magneto-optical.  
3 Ministry of defence (R).  
4 Massive ordnance.  
**m.o.** Master oscillator.  
**MOA** 1 Memorandum of agreement.  
2 Military operations area.  
3 Minimum operating altitude.  
4 Military operational approach[es].  
5 Maintenance organisation approval.  
**MoA** Ministry of Aviation (defunct in UK).  
**MOAB** 1 Missile optimised anti-ballistic.  
2 Massive ordnance aerial bomb.  
3 Massive ordnance air-burst, or [more often] air blast.  
**MoAS** Ministry of Aviation Supply (UK defunct).  
**MOB** 1 Main operational base (USAF).  
2 Main operating base (RAF).  
3 Mobile offshore base (ONR).  
**MOBA** Mobility operations for built-up areas (USA).  
**Mobidic** Modular bird with dispensing container (MBB/Aérospatiale).  
**mobile air movements team** Air Force team trained for deployment on air-movement traffic duties.  
**mobile lounge** Lounge which also conveys passengers between terminal and aircraft and vice versa (eg Washington Dulles Airport).  
**Mobile Packet Data service** Internet Protocol service charged not on length of connection but on megabits sent or downloaded.  
**mobile quarantine facility** Set up on vehicle, usually

helicopter-capable ship, for receiving special cargo, eg lunar rock.

**mobile satellite system** One designed to serve mobile (eg aeronautical) subscribers.

**MOBSS** Mobility support squadron.

**MOC** 1 Maintenance operational check.

2 Minimum operational characteristics.

3 Minimum obstacle clearance.

4 Mars orbiter [or orbital] camera.

5 Modular [or mission, or multifunction] operations centre [or console].

**MOCA** Minimum obstruction- [or obstacle-] clearance altitude.

**mock-up** Quickly built replica of aircraft or other product, usually full-scale, to solve various problems (see *customer* \*, *engineering* \*, *exhibition* \*, *furnishing* \*, *hard* \*).

**MOCM** Multispectral ocean colour monitor.

**MOCN** NC machine tool (F).

**MOCVD** Metal organic chemical vapour deposition.

**MOD** 1 Magneto-optical drive.

2 Meteoroids and orbital debris.

**MoD** Ministry of Defence [London SW1A 2HB] (UK).

**mod** 1 Modification, or modified.

2 Modulation, or modulator.

3 Moderate.

**Modar** Modular aviation radar.

**Modas** 1 Modular data-acquisition system.

2 Modular defensive-aids suite (UK, RAF).

**MOD-DIG, Mod-Dig** Modular digital image-generator.

**mode** 1 The five classical \* of aeroplane motion; see *motion*.

2 Any of selectable methods of operation of device or system.

3 Number or letter referring to specific pulse spacing of signal transmitted by interrogator (IFF, SIR, SSR).

4 Each possible configuration of spatial variable, eg EM wave, flutter or aerodynamic phenomena.

**Mode A** Pulse format for interrogation of ATCRBS, displaying aircraft identity, range and bearing on SSR.

**Mode B** Optional for ATCRBS transponder.

**Mode C** Pulse format which also adds aircraft altitude.

**Modec** Automatic reporting of altitude.

**mode-coupled oscillation** PIOs, assumed linear, which interact with flexible modes of structure [in complex and usually unique ways].

**Mode D** Optional or unassigned transponder mode.

**model** Ambiguously used in aviation:

1 Small-scale replica for testing characteristics of full-size aircraft.

2 In general aviation, improved version marketed at (often annual) intervals.

3 To reproduce a functioning system synthetically, eg in EDP program.

**model atmosphere** Mathematically exact numerical values closely approximating to an idealized real atmosphere.

**model basin** See *towing tank*.

**model cart** Often large and elaborate wheeled truck on which are mounted a balance or sting and aircraft model, the whole then installed in tunnel working section with large number of electrical and manometric connections.

**model qualification test** US military clearance of new item, esp. engine, for production.

**model tank** 1 See *towing tank*.

2 Tank filled with fluid for flow exploration round model by electrical potential analogy.

**model tunnel** Ambiguous, term best reserved for any small-scale model of a future large wind tunnel.

**modem** Telecommunications or EDP (1) device: modulator + demodulator.

**moderator** In nuclear reactor, substance specifically present to slow down neutrons by collisions with nuclei.

**Mode S** Selective interrogation of SSR offering Mode C plus mode-select for discrete interrogation and data-link between nearby aircraft and ATC.

**modex** Three-numeral designator for quick identification of individual aircraft within CAG or other unit (USN).

**modification** Temporary or permanent change to either single aircraft (for particular purpose) or all aircraft of type (to rectify fault or shortcoming or offer improved capability); can be unique, to owner's requirement, or one of planned and controlled series throughout life of aircraft.

**modified close control** Interceptor is told only target-position information (USAF).

**modified mission** MDS(4) letter added to left of basic mission letter to indicate a permanent alteration to basic mission (DoD).

**modified PAR** Precision approach guidance for high-performance aircraft to flare point instead of to touchdown point (USAF).

**Modils** Modular ILS.

**Modir** Modulated IR jammer.

**Modis** Moderate-resolution imaging spectrometer, or spectrometer.

**Modmor** Commercially produced (Morgan Crucible) family of carbon/graphite fibres.

**Modos** Mobile Doppler Sodar.

**MoD(PE)** MoD Procurement Executive (UK).

**modular** Designed in discrete series of major components for ease of inspection, overhaul or repair by module replacement without greatly disturbing neighbours; engine may comprise fan, LP compressor, HP compressor, combustor, turbine and accessories modules, while major avionic system may be series of \* boxes [see next].

**Modular Concept Unit** Standardised sizes for boxes [e.g., for avionics], developed in conjunction with Arinc 600 to replace ATR sizes. An MCU has a height of 7.64 in (194 mm) and depth of 12.76 in (324 mm). The width is equal to  $1.3N - 0.032$  in, where N is the MCU size number; thus an 8 MCU box has a width of 10.368 in.

**modular insertion stage** A low-cost expendable upper stage to the MSP that would be used to deploy mission payloads for rapid replenishment and other critical-time missions (USAF).

**modular licence** One obtained by studying and passing successive stages or chapters, common in obtaining CPL.

**modular lounge** Airport lounge built as unit capable of (1) being moved from place to place to add capacity where required or (2) being driven to/from aircraft (mobile lounge).

**modulated augmentation** Afterburner (reheat) with fuel

## modulated waves

flow continuously variable to give smooth increase in thrust from max. cold to max. augmented.

**modulated waves** Electromagnetic waves on which is impressed information in form of variation in amplitude (AM) or frequency (FM).

**module** 1 One of assemblies of modular system, easily replaced but seldom itself torn down except at major base or by manufacturer; eg spacecraft command \*, engine fan \*.

2 Single box of electronic equipment replaceable as plug-in unit.

3 Any standard dimensions or standard size of container.

4 Standard-capacity building block of computer memory.

**modulus of elasticity** Ratio of unit stress to unit deformation of structural material stressed below elastic limit (limit of proportionality), symbol K.

**modulus of rigidity** Shearing modulus of elasticity, proportional to angle of distortion but measured in stress per unit area, symbol C or N.

**modulus of rupture** In beam loaded in bending to failing point  $S_M = Mc/I$  [M bending moment, c distance from neutral axis]; in shaft or tube failing in torsion  $S_S = T_c/J$ .

**MoE, MOE** 1 Measure of effectiveness.

2 Maintenance organization exposition.

**MOET** More open electrical technologies (Hispano-Suiza).

**Moffett** Moffett Field, CA, home of NACA lab., now known as NASA Ames Research Center, and an NAS.

**Mofle** Mid and outer fixed leading edge.

**MOG** Maximum on ground, areas suitable for large number of airlift transports in front-line LZ at time of peak delivery of, or resupply of, ground force.

**Mogas** Motor gasoline, ie ordinary automotive petrol. Usually 91 or 93 octane.

**Mogr** Moderate or greater.

**MOG spots** Unloading spots for STOVL transports in battle area, typically along short length of highway.

**MOH** Major overhaul.

**Mohol** Mix of Mogas and alcohol.

**MoHS** Ministry of Home Security [against air attack, 1940–46], (UK).

**MOI** Mars orbit insertion.

**MOKA** Methodology of knowledge acquisition.

**MOL** Manned orbital laboratory.

**mol** See mole (2).

**MOLA** Mars orbiter laser altimeter.

**mold** Mould (US spelling).

**Mole** Molecular electronics, many suffixes, not listed.

**more** 1 Self-contained intelligence sensor air-dropped over hostile territory.

2 SI unit for amount of substance containing as many units [eg, atom, ion, molecule] as in 0.012 kg of C<sup>12</sup>, abb. mol.

**molecular sieve** Filter designed continuously to remove particles of a selected size from an airflow [water, or gases other than oxygen].

**mole dropper** Usually a UAV, see previous.

**moleskin strip** Soft strip around bonedome to eliminate scratching canopy.

**Molle** Modular lightweight load-lifting equipment.

**Mollier diagram** Plot of enthalpy (ordinate) against entropy.

## momentum wheel

**Molochite** Precision casting mould material, a Ca-Mg-Al silicate.

**moly** Colloquial for molybdenum disulphide lubricant.

**molybdenum** Mo, hard white metal, density 10.2, MPt 2,620°C, important alloying element in steels and in 'moly'.

**moly bolt** Patented bolt which can be inserted or removed with access from one side only.

**MOM** 1 Metal-oxide-metal.

2 Methanol/oxygen mix.

3 Moment.

**moment** Turning effect about an axis: force multiplied by perpendicular distance from axis to force; for conversion factors, see *torque*.

**moment arm** Distance from axis to force, eg from c.g. to aerodynamic centre of tailplane.

**moment coefficient** 1 Any moment reduced to non-dimensional form, usually by dividing by dynamic pressure.

2 Particular values such as  $C_m$  (section \*),  $C_{mo}$  (pitching \*),  $C_{mac}$  (about aerodynamic centre) and  $C_{mcg}$  (about c.g.).

**moment distribution** Analytical method for frameworks based on bending moments at rigidly attached joints between members.

**moment index** Divisor, typically 10<sup>4</sup>, to reduce numerical values in balance calculations of heavy or large aircraft.

**moment of area** Not normally used, though term 'second \*\*\*' synonymous with moment of inertia.

**moment of inertia** Symbol I, sum of all values of  $mr^2$  where m is elementary particle and r its distance from axis about which I is measured, or  $Mk^2$  where M is total mass and k is radius of gyration; SI unit usually  $\text{kg}\cdot\text{m}^2 = 23.73 \text{ lb}\cdot\text{ft}^2 = 0.73756 \text{ slug}\cdot\text{ft}^2$ .

**moment of momentum** See *angular momentum*.

**momentum** Mass multiplied by velocity, symbol p = mv, units  $\text{kg}\ \text{ms}^{-1}$ .

**momentum coefficient** For CC/BLC System in Vj/qS, symbol C $\mu$ .

**momentum drag** Drag due to change in momentum of air entering lateral or other non-ram inlet; major factor in design of ACVs and small high-power jet-lift V/STOLs;  $= \frac{WV}{g}$  where W is mass flow and V vehicle speed.

**momentum separation** Flow separation from convex duct wall or other surface where Coanda effect is inadequate.

**momentum theory** Idealized Froude treatment for propellers and other driven rotors by calculating momentum ahead of and behind disc exerting uniform pressure on uniform flow through a *stream tube* exactly containing the propeller.

**Momentum thickness** Measure of reduction in momentum of flow due to viscous forces in boundary layer.

**momentum thrust** Component of jet-engine thrust due to acceleration of jet  $= \frac{WV_j}{g}$  where W is mass flow and V<sub>j</sub> is jet velocity. See *thrust*.

**momentum transfer method** Drag measurement by pitot traverse of wake.

**momentum wheel** Flywheel, eg in attitude stabilization.

**moment weight** Mass of gas-turbine or other blade multiplied by distance of its c.g. from axis of rotation.

**Moms, MOMS** 1 Modular opto-electronic multi-spectral scanner.

2 Mission Operations and Mission Services (NASA).

**MON** 1 Above mountains (ICAO).

2 Mixed oxides of nitrogen.

3 Motor octane number.

4 Month.

**Mon** Monitor (NASA).

**Mona** Advanced hyperbolic/computer/display airborne navigator system (from modular navigation).

**Monab** Mobile naval airbase, on shore (USN).

**Monel** Range of corrosion-resistant Ni-Cu alloys.

**monergol** Hydrazine (F), often capital M.

**Money flare** Flame from petrol-soaked roll of asbestos in steel basket (RAF, 1918 to WW2).

**Monica** Large series of active radars used by RAF bombers 1943–46 for rear warning of interception.

**monitor** 1 To listen out on a particular frequency.

2 Pipe, usually on RIV or CFR vehicle, through which water/foam or other retardant is delivered.

**monitored system** One continuously subjected to surveillance and if necessary corrective action (eg isolating failed channel) by separate avionic subsystem; feature of autoland and other highly reliable systems.

**monitor lane** In a flight-control system, this duplicates the functions of the command lane for both the command and standby lanes.

**monkey strip** Strong fabric strip securing backseater [esp. when standing to fire gun] to aircraft (UK, colloq., 1916–40).

**Monnex** Dry-powder fire extinguishant.

**monoball mount** Primary structural joint, eg pylon to wing, where loads are transmitted radially across spherical surface.

**monobloc** 1 Shaped from single block, usually by forging or casting.

2 Control surface in form of single aerofoil, not hinged downstream of fixed fin or tailplane; also called slab type or all-moving.

**monochromatic** EM radiation of single frequency, or extremely narrow band.

**monochromator** Various devices for filtering out unwanted wavelengths.

**monocoque** Three-dimensional form, such as fuselage, having all strength in skin and immediate underlying frames and stringers, with no interior structure or bracing. Some purists argue there must be skin only.

**monocrystal** Turbine blade or other item formed from metal grown as a single crystal, devoid of inter-grain boundaries which would weaken it mechanically. Adjective monocrystalline.

**MONOCV, Mono-CV** Future single-hull aircraft carrier.

**monofuel** Fuel used alone without need for air or other oxidant; eg HTP, MMH.

**monohud** Monocular HUD, for one eye only.

**monolithic** Usually means *monocrystal*, but see next.

**monolithic rocket** Having solid grain cast or extruded in one piece.

**monomer** Substance consisting of single molecules, esp. one which can be polymerised.

**monomethyl hydrazine** Rocket propellant; hydrazine in

which one hydrogen atom is replaced by methyl group  $\text{N}_2\text{H}_3\text{CH}_3$ .

**monoplane** Aerodyne having single wing, or single wing each side of the axis of symmetry.

**monopropellant** Monofuel used in liquid rocket, eg HTP.

**monopulse** Radar technique using four overlapping pencil beams, two for azimuth, two for elevation, with circuitry so arranged that, when target is at centre, output voltage vanishes.

**monorail** Installed along ceiling of paratroop transport, to which static lines are hooked.

**monoslabs** Standard heavy concrete castings set into ground to form large grid, seeded with grass, in unpaved regions of airfield subjected to severe jet erosion.

**monospar** Wing construction based on single spar, strong in bending and torsion.

**monostatic radar** Radio whose transmitter and receiver are co-located.

**Monroe effect** Formation of hot high-velocity jet by explosion of shaped charge.

**monsoon** 1 Winds which reverse direction seasonally, blowing seaward in winter.

2 In India, seasonal rains.

**Monte Carlo method** Computation based on computerized random sampling.

**Montgolfière** Common term for early (pre-c1850) hot-air balloons.

**Montreal Protocol** Mandatory regulations for civil aircraft, especially safety and environment (ICAO).

**MON25** Mixed oxides of nitrogen comprising 25 per cent nitric oxide (the remainder the tetroxide NTO).

**mooring area** Water reserved for mooring of marine aircraft.

**mooring band** Reinforces upper part of envelope in line with mooring lines.

**mooring drag** See *trail rope*.

**mooring guy** Rope or cable for securing aerostat.

**mooring line** See *mooring guy*.

**mooring mast** Rigid or cable-braced high mast to which airship can be fastened and up/down which all supplies and people can pass; also called mooring tower, but purists reserve this term for a large and elaborate structure with lift[s], for mooring giant rigidis.

**Moose** Manned orbital-operations safety equipment.

**MOOTW** Military operations other than war.

**MOP** 1 Ministry of public works (Spanish-speaking countries).

2 Magnetic orange pipe.

3 Modulation on pulse.

4 Minimum operational performance; see \* RS.

5 Massive ordnance penetrator.

6 See next.

**MOP costs** Maintenance and overhaul personnel costs.

**Mopitt** Measures of pollution in the troposphere.

**MOPRS** Minimum operational performance requirements standards.

**Mops, MOPS** 1 Minimum operational performance standard[s].

2 Million operations per second.

**Moptar** Multiple-object phase tracking and ranging; short-baseline CW phase-comparison.

**MOQA** Maintenance operations Quality Assurance.

## MOR

## Mount

**MOR** 1 Mandatory occurrence reporting, or report (CAA).

2 MF omni-range (365–415 kHz).

3 Military operational requirement(s).

4 Meteorological optical range.

**MORA** 1 Minimum off-route altitude.

2 Memorandum of requalification agreement.

**Morag** MOR (1) advisory group.

**Morass** Modern ramjet systems synthesis.

**MoRE** Modular receiver/exciter.

**More-Electric Initiative** Major effort to use electric power for secondary power [such as HEL] and propulsion (DoD, NASA, industry).

**morph** A morphable aircraft.

**morphing** To change shape of aircraft in flight [in gross and significant manner, not just by lowering flaps, for example]. Effort at present mainly on UAVs.

**Morrison shelter** Mild-steel ‘table shelter’, able to support collapsed house; issued to British civilians 1942–44.

**MORS** MOR (1) scheme.

**Morse** Code for transmitting messages by succession of dots and dashes.

**Morse key** Hand-operated switch for sending short and long signals [dots and dashes].

**Morsviatsputnik** National signatory to Inmarsat (USSR).

**mortar** Large-calibre low-velocity gun for projecting payloads, eg Shuttle drag chute.

**mortar signal** Large signal flare fired vertically to c300m/1,000 ft, thereafter falling free or on parachute.

**MOS** 1 Metal oxide silicon, family of semiconductor devices.

2 Maritime observation satellite.

3 Minimum operating strip.

4 Multiprocessor operating system[s].

**MoS** 1 Ministry of Supply (UK, April 1946, became MoA).

2 Military occupational specialty (USA).

**MoS<sub>2</sub>** Molybdenum disulphide.

**MOSA, Mos** Modular open-systems approach [architectures].

**Mosaic** Multifunction on the move secure adaptive integrated communications (USA).

**mosaic** Large assemblage of mating aerial photographs, from optical camera, vidicon, IR or other source, with adjacent boundaries accurately aligned, to cover whole area under surveillance (military reconnaissance or photogrammetric mapping and surveying).

**Mosdap** MOS dynamic analysis program.

**MO17** Ad hoc AOPA group formed to resolve IRM4 problems [2006–7] (Int.).

**MOSFET, Mosfet** Metal oxide silicon, field-effect transistor.

**MOSLK** MOS (3) lighting kit (USMC).

**MOSLS** Minimum operating strip lighting system.

**MOSP** Multimission optronic stabilized payload.

**Mosquito** Light military [i.e., observation] aircraft used as FAC platform in Korea, Vietnam (US).

**Most, MOST** Metal oxide silicon (or semiconductor) transistor.

**MOS-VAO** All-union association for experimental aircraft (USSR).

**MOT** Maximum overhaul time(s).

**MoT** Ministry of Transport (many countries).

**Mote, MOT&E** Multinational operational test and evaluation.

**MoTE** Mobile threat emitter; S adds system.

**moteur canon** Patented (Hispano Suiza) installation of cannon between banks of V-12 engine, firing through geared propeller hub.

**moth** Former generic term for a simple light aeroplane; with capital M, product of several companies 1925–46.

**mother** Used in parental capacity, such as RPV control aircraft (\* ship) or \* printed-circuit board.

**motion** In aeroplane, can occur in five classical modes: phugoid, roll, spiral, Dutch roll and longitudinal short-period. Other masses can rotate about 2, 3 or 6 axes.

**motionless electromagnetic generator** Device which efficiently derives useful EM energy from an active vacuum (US patent 26 March 2002).

**motion seat** Seat in simulator, fitted to impart vibration and small accelerations, tighten harness, and give other sensations, often along any axis.

**Motis** Message-oriented text interchange system.

**motivator** Device causing major change in trajectory, eg control surface, flap, vectored nozzle, etc.

**Motne** Meteorological operational telecommunications network in Europe.

**motor** Best restricted to solid rockets and hydraulic/electrical/air machines, though several non-English languages have to use it for most or all main propulsion. Acceptable as adjective = powered, eg \* glider.

**motorboating** Oscillations at sub-audio frequency in any device.

**motor glider** Ultra-light aeroplane derived from glider; best not used for powered or assisted sailplanes which are competition sailplanes with auxiliary propulsion (retractable, if propeller-type) used intermittently.

**motoring** Rotating main engine by means of starter for purpose other than starting (usually gas turbine).

**motoriste** Engine manufacturer (F).

**motor octane number** Preferred scale of measurement of gasoline [petrol] resistance to detonation. Typically unleaded fuels are 85–87 MON, whereas RON figures are 95–97.

**motor specific impulse** For solid-propellant rocket, total impulse divided by total motor loaded weight, symbol  $I_{Ta}$ , unit kNs or MNs (in US, lbf-s).

**MOTR** Multi-object tracking radar.

**MOTS** 1 Modular, [or modified, or military,] off the shelf.

2 Mobile tower systems.

**MOTU** Maritime operational training unit.

**MOTV** Manned orbital transfer vehicle.

**MOU** 1 Memorandum of understanding.

2 Mountain landings (Swiss national licence).

**mould** 1 3-D template.

2 3-D reference tool for fabrication of composite parts of thermosetting sheet (eg canopy).

3 Enclosed cavity for cast parts.

**mould dimension** Any dimension to or along a mould line.

**mould line** Line formed by intersection of two surfaces, eg sheet-metal parts.

**Mouldy** Air-launched torpedo (UK colloq. 1920–50).

**Mount** Military operations in urban terrain.

**mountain breeze** Cold wind flowing down mountainside [night/winter].

**mountain wave** Powerful air mass immediately downstream of transverse mountain range, rotating about horizontal axis. There can be a succession of such waves. Arguably = rotor (3).

**mounted vertical manoeuvre** US warfighting doctrine calling for aerial delivery of vehicle and equipment loads up to 20 t (40,000 lb) hundreds of kilometres behind battle-front, giving theatre commander ability to place mobile combat power anywhere in battlespace.

**mounting** 1 Vague term acceptable for most objects hung on vehicle but not for landing gear or strut attachments. Includes all linkage of structural nature, and any ad hoc parts of airframe such as pylon, but not control or accessory systems.

2 Process of fitting a tire [tyre] to a landing-gear wheel.

**mounting pad** Circular attachment on engine or ADG for shaft-driven accessory.

**mouse** See *mice*.

**moused** Completely wrapped in soft copper wire [in mooring flying boat].

**moustaches** Small canard foreplanes, usually retractable and used only at high-alpha regimes by supersonic delta.

**MOUT** See *Mount*.

**mouth** 1 Inlet of circular parachute, esp. where this has diameter less than canopy maximum.

2 Open bottom of hot-air-balloon envelope.

**mouth lock** Reef.

**MOV** 1 Metal-oxide varistor.

2 Main oxidiser valve.

**mov** Move, moving.

**movables** All flight-control, high-lift or high-drag surfaces on wing.

**movement** 1 One aircraft flight as recorded by particular ground location; for airport, transits overhead are not counted and a \* is either an arrival or a departure.

2 Single military airlift operation by one or more aircraft.

**movement area** Region where aircraft may be found on ground proceeding under their own power.

**move off blocks** Start of an aeroplane flight from parked position, esp. commercial transport; time entered in ATC and flight logs. Where parked nose-on, time is from start of backward push.

**MOVG** Moving.

**moving-armature speaker** Audio loudspeaker driven by oscillation of part of soft-iron (ferromagnetic) circuit.

**moving-base simulator** One whose flight deck or cockpit can move linearly as well as rotate, usually in any direction.

**moving-coil speaker** Dynamic loudspeaker, driven by forces developed by interaction of currents in conductor and surrounding field.

**moving flight deck** In 1943–49 the advantages of making a carrier flight deck as a powered belt, with an axial motion similar to, or opposite to, that of landing aircraft, was shown to offer no advantage.

**moving-iron instrument** Coil carrying current to be measured moves soft-iron armature connected to indicating pointer.

**moving-map display** One having topographical, radar, IR, target or other map projected optically on screen with aircraft position fixed (usually at centre).

**moving target indication** Radar which incorporates circuits automatically eliminating fixed echoes so that

display shows only those moving with respect to Earth. For airborne radar, eg AWACS, aircraft platform motion is automatically subtracted.

**moving wings** Wings whose incidence is varied in flight as primary means of trajectory control.

**Movlas** Manually operated visual landing-aid system (carrier LSO).

**MOVPE** Metal organic vapour-phase epitaxy.

**MOVTAS, Movtas** Modified visual target-acquisition system.

**MOX, Mox** Mixed dioxides of Pu and U.

**Mozaic** Measurement of ozone by Airbus in-service aircraft.

**MP** 1 Midpoint between fixes or waypoints.

2 Manoeuvre programmer (RPV).

3 Manifold pressure.

4 Multiphase (or pulse).

5 Manual proportional (flight-control system).

6 Manpower and Personnel (USAF).

7 Maintenance period.

8 Middle plug.

9 Main, or maritime, processor.

10 Modification proposal.

11 Multipurpose.

12 Mission planner, or planning.

13 Maximum payload.

14 Multi-platform.

15 Montreal Protocol.

**M<sub>p</sub>** Pitching moment due to propulsive thrust.

**mp** Maritime polar air.

**m<sub>p</sub>** Proton-rest mass.

**MPA** 1 Man-powered aircraft.

2 Management problems analysis.

3 Maritime-patrol aircraft.

4 Million passengers [per] annum.

5 Module performance analysis.

**MPa** Megapascal, SI unit for high pressures = 145.0376 lb/in<sup>2</sup>.

**MPAA** Multi-beam (or multifunctional) phased-array antenna (or aerial).

**MPAG** Man-Powered Aircraft Group.

**MPAR** Multipurpose airport radar (FAA).

**MPAV** Multi-purpose air vehicle.

**MPB** 1 Multiple pencil beam.

2 Mobility procedures branch.

**MPBA** Multiple practice bomb adapter.

**MPBE** Multiple-platform boresight equipment [helicopter].

**MPBW** Ministry of Public Buildings and Works (UK, defunct).

**MPC** 1 Multi-purpose console.

2 Military personnel centre.

3 Multilayer printed circuit.

4 Message-processing centre.

5 Missile practice camp.

**MPCD** Multipurpose colour, or CRT, or computer, or control and, display.

**MP-CDL** Multi-platform common data-link (USAF).

**MPCDU** Multi-purpose control and display unit.

**MPCF** Million parts/particles per cubic foot.

**MPCS** 1 Mission planning and control station.

**MPCU** Multiport protocol converter unit.

2 Maintenance/power control system.

**MPD** 1 Medium-prf pulse Doppler.

**2** Maximum permitted dose (radiation).  
**3** Maintenance planning document.  
**4** Multi-purpose display.  
**5** Mobile packet data (Satcoms); S adds service.  
**6** Mandatory Permit Directive (CAA).  
**MPDI** Multi-purpose display indicator (see *MDRI*).  
**MPDM** Multi-purpose dextrous manipulator.  
**MPDR** Monopulse Doppler radar.  
**MPDS** *1* Missile-penetrating discarding sabot.  
**2** Multi-purpose display system.  
**3** Maintenance-planning data support.  
**4** Message processing and distribution system.  
**5** See *MPD* (5).  
**MPE** *1* Mass-properties engineering.  
**2** Mission-planning element.  
**MPED** Multi-purpose electronic display.  
**MPEL** Maximum permissible exposure level.  
**MPEO** Mineral piston-engine oil.  
**MPESS** Multipurpose experiment support structure [space-payload pallet].  
**MPET** Metallized polyethylene terephthalate.  
**MPFF** Multi-purpose fighter facility.  
**MP Flt** Mission-planning Flight (RAF).  
**MPG** *1* Or **m.p.g.**, miles per gallon, rare in aviation.  
**2** Moulded propellant gain.  
**MPGS** Mission-planning ground station.  
**mph** Statute miles per hour, see *mile* for conversions.  
**MPHD** Multi-purpose head-down.  
**MPHT** Missile potential hazard team.  
**MPI** *1* Mission and Payload-Integration office (NASA).  
**2** Magnetic-particle inspection.  
**3** Mean point of impact.  
**4** Multiprotocol interface.  
**5** Major periodic inspection.  
**6** Moving plan indicator.  
**mpig** Miles per Imperial gallon (not recommended).  
**mpk** Maritime polar, colder than surface.  
**MPL** *1* Multi-programming level.  
**2** Mid-Pacific landing (NASA).  
**3** Mars polar lander.  
**4** Multi-pilot, or multiple-crew pilot, licence [ICAO-JAR/FCL] (2006–).  
**5** Maximum probable loss.  
**MPLH** Multi-purpose light helicopter.  
**MPLM** *1* Multi-purpose logistics module.  
**2** Multi-purpose loitering missile.  
**MPM** *1* Multi-purpose missile, or modem.  
**2** Microwave power module (radar xmtr).  
**MPMS** *1* Maritime patrol-mission system.  
**2** Missile-performance monitoring system (inertial guidance).  
**MPNL** Master parts-number list.  
**MPNVS** Modernised pilot's night-vision system.  
**MPO** *1* Mission Planning Officer (RAF).  
**2** Main production order.  
**3** Mission-payload operator.  
**MPOA** Multi-protocol over ATM.  
**MPP** *1* Massively parallel processor.  
**2** Maintenance programme proposal.  
**3** Master program[me] plan.  
**4** Most probable point [of failure].  
**MPPA, mppa** Million passengers per annum.  
**MPPM** Microwave pulsed power module.  
**MPPS** Multi-purpose pylon system.

**MPPU** Multi-purpose processor unit.  
**MPR** *1* MIL (military) power reserve.  
**2** Medium-power radar.  
**3** Microburst-prediction radar.  
**MPRD** Metal produce and recovery depot.  
**MPRF** Modulated, or medium, pulse-repetition frequency.  
**MP-Rtip** Multi-platform RTIP.  
**MPS** *1* Mixed-propellant[s] system.  
**2** Main propulsion stage, or system.  
**3** Mid-platform ship (pad amidships).  
**4** Materials processing in space.  
**5** Mission-payload subsystem.  
**6** Multiple protective structure (ICBM).  
**7** Military postal system (US includes other services).  
**8** Minimum-payload subsystem.  
**9** Minimum-performance specification.  
**10** Mission-planning, or processing, system.  
**11** Maintenance processing system.  
**12** Maximum-pitch stop.  
**13** Motor/pump set.  
**14** Metres per second (ICAO, contrary to SI, which dictates m/s).  
**15** Master phasing schedule of program[me].  
**16** Message processing system.  
**mps** Metres per second (see *14* above).  
**MPSM** Multi-purpose submunition.  
**MPSS** Man-hours per ship-set.  
**MPT** *1* Memory point track.  
**2** Multi-purpose tracer.  
**3** Missile procedure trainer.  
**MPt** Melting point.  
**MPTA** Main-propulsion test article.  
**MPTO** Maximum-performance takeoff (helicopter).  
**MPU** *1* Missile power unit.  
**2** Master processor unit.  
**3** Message pick-up.  
**4** Mission programming unit.  
**5** Multifunction process unit.  
**MPUAV** Multipurpose UAV.  
**MPVI** Memory, planes, video input.  
**MPVO** Local air defence (USSR, R).  
**MPVT** Multi-pulse vectored thrust.  
**MPVU** Multi-plot variable update.  
**MPW** *1* Mission-planning workstation.  
**2** Minimum pavement width (required for 180° turn).  
**mpw** Maritime polar air, warmer than surface.  
**MPZ** Matched pole-zero.  
**MQ** US DoD role prefix, multirole UAV.  
**mq** Pitching moment coefficient due to pitching.  
**MQAD** Materials Quality Assurance Directorate (UK MoD, now Qinetiq).  
**MQF** Mobile quarantine facility.  
**MQLF** Mobile quick-look facility.  
**MQP** Moulded quality phenolic.  
**MQT** Model qualification test.  
**MR** *1* Maritime reconnaissance.  
**2** Medium-range.  
**3** Marker ranger (laser).  
**4** Military Region.  
**5** Machine-readable.  
**6** Magneto-resistive.  
**7** Mission rehearsal.  
**8** Memo for record.

9 Magnetic resonance.  
 10 Microwave receiver (Awacs).  
 11 Morning report (US usage).  
 12 Manual rectification.  
 13 Main rotor.  
**M<sub>R</sub>** Aerodynamic moment about the reference point, e.g. c.g., or wing c.p.  
**mR** Milliroentgen[s]; also incorrectly used to mean milliradian[s].  
**MRA** 1 Major replaceable assembly.  
 2 Maximum relight altitude.  
 3 Minimum reception altitude.  
 4 Miniature radar altimeter.  
 5 Maritime reconnaissance and attack.  
**MRAAM** Medium-range air/air missile.  
**mRad** Milliradian, = 3'6.25", just over 0.05°.  
**MRAF** Marshal of the Royal Air Force.  
**MRAG** Metallics Research Advisory Group (MRCC).  
**MRALS**, **Mrlas** Marine remote-area [and] landing system, also rendered as **MRAALS**.  
**MRAM** Magnetoresistive random-access memory.  
**MR&R** Mobile reclamation and repair.  
**MRASM** Medium-range air-to-surface missile.  
**MRB** 1 Materials, or Management, Review Board.  
 2 Maintenance Review Board.  
 3 Main rotor blade.  
**MRBR** MRB(2) Report.  
**MRBF** Mean rounds before failure.  
**MRBM** Ambiguous, can be medium-range or mid-range ballistic missile.  
**MRBR** Maintenance Review Board Report.  
**MRBS** Mean rounds between stoppages.  
**MRC** 1 Meteorological Research Committee (UK).  
 2 Major regional conflict [or contingency], for practical purposes = war.  
 3 Maximum recommended cruise, or cruising; P adds power [piston engines].  
**MCRA** Multi-role combat aircraft.  
**MRCC** Materials Research Consultative Committee (UK).  
**MRCH** Maximum range at constant height.  
**MRCLOS** Missile reference command to line of sight.  
**MRCP** See MRC[3].  
**MRCS** 1 Multiple-RPV control system.  
 2 Mobile reporting and control system.  
**MRD** 1 Main-rotor diameter.  
 2 Machine-readable document.  
**MRDA** Missile round design agent.  
**MRDAU** Multiple recorder data-acquisition unit.  
**MRDEC** Missile Research, Development and Engineering Center (USA).  
**MRD/FT** Missile restraint device field tester.  
**MRDL** Multirole datalink.  
**MRDP** Multi-radar data processing.  
**MRE** 1 Mean radial error (weapon delivery).  
 2 Multi-role endurance (UAV).  
 3 Medium-range Empire (UK 1947).  
 4 Mission Rehearsal Exercise.  
**mrem** Milliröntgen, thus mrem/h.  
**MRRES** Mobile remote-emitter simulator.  
**MRF** 1 Meteorological Research Flight.  
 2 Multi-role proximity fuze.  
 3 Medical red flag.  
 4 Multi-role fighter.

**MRFD** Modular rugged flat display.  
**MRG** 1 Master reference gyro.  
 2 Medium-range (ICAO).  
 3 Main-rotor gearbox.  
**MRGB** Main-rotor gearbox.  
**MRGL** Marginal.  
**MRH** Maintain runway heading.  
**MRI** 1 Magnetic/rubber inspection.  
 2 Magnetic resonance inspection, or imaging.  
**MRIR** Medium-resolution infra-red radiometer.  
**MRIS** Medium-resolution spectroradiometer.  
**MRIU** Missile remote interface unit.  
**MRL** Modular rocket launcher.  
**MRLG** Monolithic ring-laser gyro.  
**MRM** 1 Medium-range missile.  
 2 Map rectification machine.  
**MRMS** Mission-ready management system, or service.  
**MRO** 1 Maintenance and Repair Organization.  
 2 Maintenance repair and overhaul.  
 3 Mars reconnaissance orbiter.  
**MROC** 1 Multi-role operations cabin (air defence).  
 2 Minimum [rarely maximum] rate of climb.  
**M-Rose** Multi-tasking real-time operating-system executive.  
**MRP** 1 Medium-angle rocket projectile (air/ground sight setting).  
 2 Multi-annual research programme (EC).  
 3 Materials requirement[s] planning.  
 4 Manufacturing resources planning.  
 5 Materials, resource and planning.  
 6 Mobile repair party.  
 7 Machine-readable passport.  
 8 Modular reconnaissance pod.  
 9 Mission replay.  
 10 Meteorological reporting point.  
**MRPC** Mercury-Rankine power conversion.  
**MRPV** Mini-RPV.  
**MRR** 1 Mission-reliability rate.  
 2 Multimode radar; in Norwegian air defence, radio.  
 3 Manufacturing revision request.  
 4 Mechanical-reliability report.  
 5 Maritime radar reconnaissance.  
 6 Missile, or medium, range-recovery.  
**MRRV** 1 Manoeuvring (British spelling), or maneuverable, re-entry vehicle.  
 2 Multi-role reusable vehicle.  
**MRS** 1 Master, or military, radar station, or site.  
 2 Maintenance recording system.  
 3 Mobile radio service.  
 4 Medical record system.  
 5 Monitoring and ranging station.  
 6 Meteorological radar station, service, or system.  
 7 Mobility requirements study.  
 8 Mountain Rescue Service.  
 9 Magyar Repulo Szovetseg, sport-aviation association (Hungary).  
**Mrs** Generalized mass, esp. in co-ordinates of dynamic model.  
**MRSA** Mandatory radar service area.  
**MRSI** Multiple-round[s] simultaneous impact.  
**MRSP** Multifunction radar-signal processor.  
**MRSR** Multi-role survivable radar.  
**MRT** 1 Maximum reheat thrust.  
 2 Military rated thrust.

- 3** Multi-role turret.  
**4** Miniature receive terminal.  
**5** Maintenance release tag.  
**6** Mountain rescue team.  
**7** Multi-radar tracker, or tracking.  
**8** Multiple remote terminal.
- MRTA** Medium-range tactical aircraft.
- MRTD** **1** Minimum-resolvable temperature [rarely, time] difference.  
**2** Machine-readable travel document[s].
- MRTF** Mean rounds to failure (gun).
- MRTFB** Major range and test-facility base (USAF).
- MRTM** Maritime.
- MRTS** Microwave repeater test set.
- MRTT** **1** Multi-role tanker/transport.  
**2** Multi-role towed target.
- MRTU** Multiple remote terminal unit.
- MRU** **1** Mountain rescue unit.
- 2** Mobile radio, or radar, or reporting, unit.  
**3** Mach repeater unit.  
**4** Mobile receiver unit (UAV).  
**5** Maintenance recorder, or recording, unit.  
**6** Medical Rehabilitation Unit (RAF, Headley Court).
- MRUASTAS** Medium-range unmanned aerial surveillance and target acquisition system.
- MRV** **1** Multiple re-entry vehicles.  
**2** Machine-readable visa.
- MRW** Maximum ramp weight.
- MRWS** Manned remote work-station (for space-station construction).
- MS** **1** Minus (ICAO).  
**2** Military standard (US).  
**3** Mild steel.  
**4** Maintenance schedule.  
**5** Medium supercharge[d].  
**6** Mossbauer spectrometer.  
**7** Margin of safety.
- M<sub>s</sub>** Minus.  
**ms** Millisecond =  $10^{-3}$ s.  
**m/s** Metres per second.
- MSA** **1** Mission system(s) avionics.  
**2** Monolithic stretched acrylic.  
**3** Minimum sector altitude.  
**4** Minimum safe, or separation, or sector, altitude.  
**5** Maritime Safety Agency(J).
- MSAB** Multinational security accreditation board [overdue] (NATO).
- MSAD** Multisatellite attitude determination.
- MSAFQ** Minimum speed for acceptable flying qualities.
- MSAM** Mobile (or, UK, medium) surface-to-air missile.
- MSAR** Miniature synthetic-aperture radar.
- MSAS** **1** MTSAT satellite-based augmentation system.  
**2** Multifunction satellite augmentation system.
- MSAT** Multi-sensor aided targeting [-Air adds airborne].
- MSAW** Minimum safe altitude warning; S adds system.
- MSB** **1** Most significant bit (EDP [1]).  
**2** Mandatory service bulletin.  
**3** Master systems bench.
- MSBS** Mer/sol balistique stratégique; submarine-based strategic missile (F).
- MSC** **1** Manned Spacecraft Center [now Lyndon B Johnson Spaceflight Center, Houston, TX 77058] (NASA).  
**2** Major subordinate command (NATO).  
**3** Manpower Services Commission (UK).
- 4** Military Sealift Command (US).  
**5** Multi-scan correlation.  
**6** Master server computer.  
**7** Microspark coating.  
**8** Military Satellite Communications [JPO adds Joint Program Office] [DoD/USAF] (US).
- MSCADC** Miniature standard CADC.
- MSCP** Mean spherical candlepower (non-SI).
- MSD** **1** Mass storage device.  
**2** Minimum separation distance.  
**3** Multisensor display.  
**4** Multimode silent digital (radar).  
**5** Most significant digit.  
**6** Multiple-site damage [airframe].  
**7** Mid-span damper.  
**8** Map storage display.  
**9** Mean square deviation.
- MSDB** Mission-system databus.
- MSDF** Manual spinning direction finding.
- MSDPS** Military survey digital production system.
- MSDS** **1** Mode-selector damping service.  
**2** Material safety data sheet (OSHA).
- MSE** **1** Minimum single-engine speed.  
**2** Manned spacecraft engineer.  
**3** Mean square error (signal processing).  
**4** Mission support element.
- msec** Millisecond.
- MSER** Multiple stores ejector rack.
- MSET** Multi-sensor exploitations testbed.
- MSF** **1** Militarily significant fallout.  
**2** Multi-sensor fusion.  
**3** Mission support facility.  
**4** Mobile strike force.
- MSFC** George C Marshall Space Flight Center [Huntsville, Alabama 35821] (NASA).
- MSFL** Minimum safe flight level.
- MSFN** Manned Space Flight Network (NASA).
- MSFP** Mosaic-staring focal plane (early-warning sensors).
- MSFSG** Manned spaceflight support group (USAF).
- MSFU** Merchant ship fighter unit (WW2).
- MSG** **1** Maintenance steering group [inter-airline; suffix number denotes edition, currently 3] (Int.).  
**2** Message (ICAO).  
**3** Microgravity science glovebox, for space experiments.
- MSH** **1** Metastable helium.  
**2** Medium support helicopter; ATF adds aircrew training facility [RAF Benson] (UK).
- MSHE** Multispectral hostile environment.
- MSI** **1** Medium-scale integration.  
**2** Moon's sphere of influence (NASA).  
**3** Mission-systems integration.  
**4** Multi-source integration or integrator.  
**5** Mission, or missile, store interface.  
**6** Multi-sensor integration.
- MSIAC** Modeling and Simulation Information Analysis Center (DoD).
- MSIC** Multi-ship integrated control.
- MSIM** Museum of Science and Industry in Manchester [M3 4FP] (UK).
- MSIP** **1** Multinational [or multi-] staged improvement program.  
**2** Multispectral imagery processor.  
**3** Multi-sensor integrated payload.

<b>MSIS</b>	Multisensor stabilized integrated system.	2 Mode-S specific protocol.
<b>MSK</b>	Modulation, or minimum, shift keying.	1 Monopulse SSR.
<b>MSL</b>	1 Mean sea level.	2 Mars surface-sample return.
	2 Mapping Sciences Laboratory (NASA).	3 Multi-spectral scanning radiometer.
	3 Mars Science Laboratory (NASA).	<b>MSSS</b> 1 Man/seat separation system.
<b>msl</b>	Missile.	2 Mode-S specific services.
<b>MSLC</b>	Maintenance stock level case.	<b>MST</b> 1 Multisensor tracking, or turret.
<b>MSLT</b>	Multiple sleep latency test.	2 Moving surface target; E adds engagement.
<b>MSLV</b>	Microsatellite launch vehicle.	3 Mountain Standard Time.
<b>MSMA</b>	Macro sensor management application.	4 Microprocessor simulation technology.
<b>MSMM</b>	Multisensor, multimission.	5 Missile surveillance technology.
<b>MSMS, MS<sup>2</sup></b>	Maritime-surveillance mission system.	6 Microsystems technology.
<b>MSN, MSn</b>	Manufacturer's serial number.	7 Mobile service tower.
<b>MSO</b>	1 Manager, shop operations.	8 Mechanical-systems trainer.
	2 Molecular-sieve oxygen [C adds concentrator, S adds system].	<b>MST&amp;E</b> Multi-service test and evaluation.
<b>MSOGS</b>	Molecular-sieve oxygen generation system.	<b>M-Star, MSTAR</b> 1 Moving and stationary target acquisition and recognition.
<b>MSOSA</b>	Modelling and simulation operational support activity.	2 Man-portable surveillance and target-acquisition radar.
<b>MSOV</b>	1 Modular standoff vehicle.	3 MLRS smart tactical rocket.
	2 Master, or modulating, shut-off valve.	<b>MStart, M-Start</b> Missile system to attack relocatable targets.
<b>MSOW</b>	Modular standoff weapon.	<b>MSTCS</b> Multiservice target control system.
<b>MSP</b>	1 Mach sweep programmer.	<b>MSTI</b> Miniature sensor technology integration.
	2 Maintenance service plan.	<b>MSTR</b> Moisture.
	3 Magnetic speed probe.	<b>MSTRS</b> Miniature-satellite threat-reporting system.
	4 Mosaic sensor program(me).	<b>MSTS</b> Multiservice tactical system.
	5 Maximum structural payload.	<b>MSTSAP</b> Medium-speed tactical-support aircraft program.
	6 Military spaceplane, also military spaceplane program [no longer active] (USAF).	<b>MSU</b> 1 Mobile satcom unit.
	7 Multisensor processor.	2 Mode-selection unit.
	8 Mode-S protocol.	3 Master switching unit.
	9 Magnetic south pole.	4 Mass storage unit.
	10 Mission-system processor.	5 Maintenance station unit.
<b>MSPFE</b>	Multi-sensor programmable feature extraction.	<b>MSV</b> Mobile [explosion-] suppression vessel.
<b>MSPS</b>	1 Modular self-protection system.	<b>mSV</b> Milli-solar volts.
	2 Modern signal-processing system.	<b>MSW</b> 1 Maximum STOL weight.
<b>MSPT</b>	Marine silent power-transmission system (ASW).	2 Magnetic surface wave.
<b>MSR</b>	1 Multi-sensor reconnaissance.	<b>MSWS</b> Multisensor warning system.
	2 Missile-site radar.	<b>MSX</b> Mid-course space experiment.
	3 Modular strain recorder.	<b>MSZ</b> Magnesium-stabilized zirconia.
	4 Missile simulated round.	<b>MT</b> 1 Megaton[s], usually means $10^6$ short tons.
	5 Main supply route.	2 Metric tonne[s], confusing.
	6 Modular survivable radar.	3 Motor [surface] transport.
	7 Maximum-speed range.	4 Mean, or minimum, time.
	8 Misrouted.	5 Message, or mobile, terminal.
	9 Mars sample return.	6 Multi-frequency transducer.
	10 Microwave sounding radiometer.	7 Maximum-top (weather).
	11 Multi-scan radar.	8 Mountain (ICAO).
<b>MSRF</b>	Microwave Space Research Facility (USN).	<b>mT</b> Maritime tropical air mass.
<b>MSRS</b>	Miniature-sonobuoy receiver system.	<b>m<sub>T</sub></b> Total mass on takeoff, not necessarily MTOW.
<b>MSS</b>	1 Multi-spectral scanner, or satellite.	<b>mt</b> Tonne[s].
	2 Missile-sight subsystem.	<b>MTA</b> 1 Military training area.
	3 Mobile satellite service, or system.	2 Multithread architecture.
	4 Model support strut.	3 Maintenance-task analysis.
	5 Mission-support system[s].	<b>MTACS, Mtacs</b> Marine tactical air control system.
	6 Multi-sensor system.	<b>MTAD</b> Multi-trace analysis display (EW).
	7 Maritime surveillance system.	<b>MTADS</b> Modernized target-acquisition and designation sight.
	8 Minimum sinking speed.	<b>MTAE</b> Multiple-time-around echoes (radar and EW).
	9 Master servicing schedule.	<b>MTAP</b> Mine/torpedo aviation regiment (USSR, WW2).
<b>MSSC</b>	Maritime surface-surveillance capability.	<b>MTAS</b> Millimetric, or modular, target-acquisition system.
<b>MSSL</b>	Mullard Space Science Laboratory (UK).	<b>MTAT</b> Mean turn-around time.
<b>MSSMP</b>	Multipurpose security and surveillance monitoring platform.	
<b>MSSP</b>	1 Mobile satellite service provider.	

**MTBAA** Mean time between avionics anomalies.

**MTBCF** Mean time between critical failures.

**MTBCM** Mean time between corrective maintenance.

**MTBE** Methyl tertiary butyl-ether.

**MTBF** Mean time between failures.

**MTBF<sub>c</sub>** Mean time between component failure (also written MTBCF).

**MTBFRO, MTBFro** Mean time between failures requiring overhaul.

**MTBI** Mean time between incidents.

**MTBIE** Mean time between interruption, or instability, events.

**MTBMA** 1 Mean time between maintenance action[s].  
2 Mean time between mission aborts.

**MTBO** Mean time between overhauls or outages.

**MTBR** Mean time between repair, or removals, or replacement.

**MTBSF** Mean time between significant failure.

**MTBUER** Mean time between unscheduled engine removal.

**MTBUM** Mean time between unscheduled maintenance.

**MTBUR** Mean time between unscheduled, or unit, removals, or replacement, or repair.

**MTC** 1 Mach-trim compensator, or computer.  
2 Mission Training Center (DMT).  
3 Maintenance terminal cabinet.  
4 Military-Technical Co-operation (R).  
5 Measured-term contract (UK, MoD).

**MTCA** 1 Ministry of Transport and Civil Aviation (UK, Oct. 1951, became MCA).  
2 Minimum terrain-clearance altitude.  
3 Military terminal control area [MTMA more common].

**MTCD** Medium-term conflict detection.

**MTCR** Missile Technology Control Regime [ $\leq 250$  km] (Int.).

**MTD** 1 Mounted.  
2 Maintenance terminal display.  
3 Maintenance training device.  
4 Moving-target detection, or detector (primary radar).

**MTDA** Mean time to dispatch alert.

**MTDAS** Mobile telemetry data-acquisition system.

**MTDP** Mid-term defense program.

**MTDS** 1 Marine tactical data system (USMC).  
2 Mission, or military, training through distributed systems, or simulation.

**MTE** 1 Megatons equivalent, unit of area destruction.  
2 Modular threat emitter.  
3 Moving-target exploitation.  
4 Magnetic turning error.

**MTEL** Methyl-triethyl lead.

**MTF** 1 Modulation transfer function.  
2 Mississippi Test Facility (NASA, now SSC 4).  
3 Mid-tandem fan.  
4 Maintenance terminal function.

**MTFF** Man-tended free flyer.

**MTG** Meeting.

**MTGW** Maximum taxi gross weight.

**MTHEL** Mobile tactical high-energy laser.

**M<sub>θ</sub>** Pitching moment due to elevator deflection.

**m<sub>θ</sub>** 1 Torsional stiffness.  
2 Pitching moment of tailless aircraft.

**Mthly** Monthly.

**M3R** Multimission modular radar.

**MTI** 1 Moving target indication, or indicator.  
2 Multiple-target interception.  
3 Multispectral thermal imager.  
4 Marked temperature inversion.

**MTIP** Maintenance training improvement program.

**M<sub>tip</sub>** Tip Mach number of rotor of hovering helicopter.

**MTIRA** Machine Tool Industry Research Association (UK).

**MTIS** Modular thermal-imaging sight.

**MTIX** Moving-target information exploitation.

**mTk** Maritime tropical air, colder than surface.

**MTL** 1 Mean (rarely maximum) transmitter level.  
2 Minimum triggering level [transponder].  
3 Magnetic-tape loader.  
4 Multiturn loop [ISS].

**MTLA** Minimum takeoff and landing area.

**MTLM** Major throttle-lever movement.

**MTLO** Moscow Technical Liaison Office (NASA).

**MTM** 1 Mission and traffic model; co-ordinates Space Shuttle payloads and customer requirements.  
2 Maximum takeoff mass.  
3 Ministry of transport machine construction (USSR).  
4 Million ton-miles (short tons).  
5 Module test and maintenance [bus interface].

**MTMA** Military terminal manoeuvring area.

**MTMC** Military Traffic Management Command.

**MTMD** Million ton-miles per day (short tons).

**MTMIU** Module test and maintenance bus interface unit.

**MTMP** Mid-term modification [or modernization] program (US; UK equivalent is MLU).

**MTMT** Multiple target and missile tracker.

**MTN** Mountain[s].

**MTO** See *MTOW*.

**MTOA** Maintenance training organisation approval.

**MTOD** Mean (or maximum) time on deck.

**MTOE** 1 Mid-term operations estimate.  
2 Modified table of organization and equipment.

**MTOW** Maximum takeoff weight [MTOGW adds gross], a certificated value exceeded only during certification flight testing.

**MTP** 1 Mandatory technical publications.  
2 Maintenance test panel.

**MTPA** Mobile transponder performance analyser.

**MTPS** Maintenance Test Pilots' School (formerly RNAS Brawdy).

**MTR** 1 Missile tracking radar.  
2 Marked-target receiver.  
3 Military training route.  
4 Main and tail rotor (helicopter configuration).

**MTRA** Megafloat Technological Research Association.

**MTRE** Missile test and readiness equipment.

**MTRIV** Mission-tape recorder interface unit.

**MTS** 1 Marked-target seeker.  
2 Mobile training set.  
3 Mobile test set.  
4 Motion/time survey.  
5 Maintenance training simulator.  
6 Multispectral, or multisensor, targeting system(s).  
7 Mobile telephone service.  
8 Mountains.  
9 Manned tactical simulator, or simulation.

**10** Movement tracking system (JBFSAs).

**MTSAT** Multifunctional transport satellite.

## MTT

**MTT** 1 Multiple-target tracking.  
2 Maintenance-training tutorial.  
3 Maximum turbine temperature.

**MTTA** Machine Tool Technologies [originally Trades] Association (UK).

**MTTDA** Mean time to dispatch alert.

**MTTF** Mean time to (next) failure [differs from MTBF in that no credit is given for items that have not failed].

**MTTSF** Mean time to first system failure.

**MTTM** Mean time to maintenance [A adds alert].

**MTTR** 1 Mean time to repair.

2 Multiple-target tracking radar.

**MTTRS** Mean time to restore service.

**MTTS** Multi-task training system, versatile simulators which can be configured for particular aircraft types.

**MTUR** *MTUR*.

**MTU** 1 Use metric units (ICAO).

2 Mobile training unit.

3 Magnetic-tape unit.

**MTUR** Mean time to unscheduled removal, or replacement [differs from MTBUR in that no allowance is made for items not removed].

**MTV** Magnesium, Teflon, Viton [flare material].

**MTVC** 1 Motor thrust-vector control.

2 Manual thrust-vector control.

**MTW** 1 Major theatre [of] war.

2 Mountain wave[s].

**mTw** Maritime tropical air, warmer than surface.

**MTWA** Maximum takeoff [or total] weight authorized, = *MTOW*.

**MTX** Miniature transmitter.

**M-type marker** See *M-marker*.

**MTZT** Multiple time-zone travel.

**MU** 1 Maintenance unit.

2 Management unit [usually Acars].

3 See  $\mu$  [Greek letters].

**MUA** Military utility assessment (DoD).

**MUAC** Military upper-area control centre.

**MUAS** Multimission unmanned aerial system.

**MUAV** Micro, or maritime, UAV.

**Mucels** Multiple communications emitter location system.

**MUCO** Manned/unmanned convertible optronics.

**MUD** Maximum unambiguous Doppler.

**mud** Pilot of \*-mover.

**Mudas** Modular universal data-acquisition system.

**mud-mover** Low-level close-support or attack aircraft, or its pilot (colloq.).

**MUE** Modernized user equipment (GPS).

**MUF, muf** Maximum usable frequency.

**muff** Exhaust heat exchanger, usually for cabin heating.

**muffler** Silencer (US).

**Mufids** Multi-user flight-information display system.

**$\mu$ FORS** Mu (micro) fibre-optic rate sensor.

**multi** Civilian dress worn by Serviceman off duty (UK usage, Hindustani origin).

**MUGS, Mugs** Multiple universal gunner system.

**mule** 1 Refuelling bowser (US term).

2 Hydraulic test rig (colloq.).

3 Modular universal laser equipment.

**Mullite** Commercially produced ablation material.

**mult** Multiple, or multiplier.

**Multack** Multiple target attack program (software).

**multibank engine** Piston engine with several linear banks.

## multi-mode radar

**multi-body freighter** Hypothetical aircraft with payload in detachable bodies all carried on one wing.

**multi-bogey** Air-combat situation in which there are many enemy aircraft.

**multi-burn** See *multi-impulse*.

**multi-cell** ACM engagement in which two or more DA cells participate.

**multicellular foam** Material of low density with air or gas-filled closed cells such as expanded polystyrene; term not used for honeycombs.

**multichannel receiver** Usual meaning is ability simultaneously to track several GPS signals.

**multichannel selector** Manual controller for preselected communications channels.

**Multicom** Multiple communications.

**multicombiner** Optical system for projecting several sets of displays all focused at infinity on HUD screen.

**multicommunications service** Mobile private communications service on 122.9 MHz for such activities as ag-aviation and forest firefighting.

**multicolour system** Guidance, tracking or other target-oriented system which operates alternately or continuously on several EM wavelengths, not necessarily in visible range.

**multicoupler** Device for making single aerial (antenna) serve several receivers.

**multi-energy spectrum** Gives output in contrasting colours depending on average atomic number (baggage screening).

**multi-foil wing** Wing of extremely thick (up to t/c 30%) supercritical profile comprising a main fixed portion and upper/lower rear hinged foils (up to 35% chord), with or without blowing between the foils.

**multifunctional control surface** Flight-control system in which lateral and direct-lift control is effected by spoilers and full-span Fowler flaps and variable-camber tabs, one advantage being fast letdown and steeper approach.

**multifunction display** EFIS display offering selectable weather radar, navigation maps, checklists and other information other than that on PFD.

**multihead towbar** Fitted with head[s] for attachment to many types of NLG.

**multi-impulse** Capable of repeated cutoff and restart to meet propulsion demands of mission (rocket).

**multi-lane airway** For reasons of traffic, control, noise, disturbance or safety, airway divided into two (rarely three) parallel lanes, denoted by North/South or East/West, with Centre where three; lateral separation up to 20 km.

**multilateral** Agreement on air-carrier rights between regional groups of sovereign states.

**multilateration** Surveillance and control of airspace by using numerous surface sensors to monitor pulses from aircraft transponders, fixing position by *TDOA*.

**multilayer board** Any printed-circuit, hybrid or related electronic assembly fabricated as stack of subcircuits in single board.

**multilayer defense** Provided by hierarchy of systems designed to counter spacecraft, satellites, ICBMs, long-range missiles and tactical missiles (DoD).

**multi-media classroom** Equipped with audio-visual aids, overhead projection, tape/slides systems, blackboard and student dialogue buttons.

**multimission** Able to perform different military roles, esp. air-combat/interception and ground attack/interdiction.

**multi-mode radar** Designed to function in several oper-

ating modes with quick switching between each, eg (for MMR for attack aircraft) ground map, ground map spoiled, etc, each mode requiring a different waveform.

**multi-mode receiver** Usually means compatible with VOR, ILS, MLS, DGPS.

**multipath effect** Anomalies in radar target range and position, and many other optical/radar situations, caused by receipt of reflected radiation from land or sea surface and other reflectors as well as direct signal from target.

**multiplane** 1 Aeroplane with several sets of main wings, normally superimposed.

2 Adjective: tail unit or other assembly with several superimposed horizontal surfaces.

**multiple-access receiver** Lasercom to make uplink/down-link by sensing beacons to refine beam aiming.

**multiple courses** Narrow false courses heard on radio range, esp. among mountains.

**multiple echoes** Reception of more than one transmission of a single signal because of refractions and reflections.

**multiple ejection rack, MER** Interface allowing several stores to be carried on single external-stores station, with positive ejector rams to ensure clean separation.

**multiple independently targeted RV** Delivery system containing several missile re-entry vehicles each having own guidance system to separate targets.

**multiple independent RV** Broader concept than above; system delivers several warheads which may free-fall or be independently targeted.

**multiple kill capability** Usual meaning is that platform has several types of armament, eg gun plus two types of missile.

**multiple options** Force employment alternatives depending on flexibility in tactical/strategic situations, retargeting and availability of conventional or nuclear weapons.

**multiple RV** Re-entry vehicle containing number of separate warheads which scatter slightly but fall on same area target.

**multiple-time-around echoes** Those from targets at exact multiples of the radar unambiguous range.

**multiplexing** 1 Act of combining signals from many sources into common channel, requiring frequency, phase and time-division.

2 In electrical wiring of whole vehicle, providing redundant pathways or alternative routes with auto switching triggered by battle damage or other discontinuity.

**multiplexer, multiplexor** Device, often stored-program computer, which handles I/O (input/output) functions of on-line EDP (1) system with multiple communications channels.

**multi-ply** Material, eg wood, fabric, metal or composite, assembled from several laminar layers.

**multiplying valve, multiplier** Device whose output is exact product of several inputs.

**multiprocessor** Multiprogrammed processor.

**multiprogramming** Technique allowing single computer to run several programs simultaneously.

**multi-row engine** Piston engine having more than two banks or radial rows of cylinders.

**multi-sensor** Using more than one type of signal to gather information; eg optical camera, radar, IR linescan, passive elint etc.

**multiservice connector** Personal coupling for suit pressure, electric heating, oxygen, radio and possibly other services.

**multisite fracture** Main break was preceded by numerous micro-cracks.

**multispectral** Capable of responding usefully to wide range of EM wavelengths including all visible hues, IR and possibly UV.

**multi-stage rocket** Vehicle with several stages each fired and staged in succession.

**multistatic dependent surveillance** Fusion of airfield surface sensors and surface-movement radar to provide precision display for controllers.

**multi-step** See *multi-stage rocket*.

**multithread architecture** Simple parallel programming.

**multitube launcher** External store filled with parallel tubes for air-launched rockets.

**multi-use thruster** Rocket engine capable of being started and stopped repeatedly in the same mission.

**multivibrator** Oscillator having two cross-coupled valves or transistors operating alternately, each input coming from other stage's output; can be bistable (flip/flop), monostable or astable.

**MULTS, Mults** Mobile universal Link-11 translator system.

**Mumacs** Multiple unmanned aircraft control system.

**mu-metal** High-permeability alloy used to screen equipment (eg CRT) from stray magnetic influences.

**mu-meter** Rolling truck with pair of toed-out tyres, measures side force and hence coefficient of friction. From  $\mu$  (mu), coefficient of sliding friction.

**Mumps** Multi-user MEMS process.

**MUN, MUNI, MUNL** Municipal.

**Munk factor** Formula for performance of biplanes based on ratios of spans, lifts, gap and interference.

**MUOS, Muos** Mobile- or, confusingly, multiple-, user objective system (satcom system, USN/DoD).

**Mupsow** Multi-purpose stand-off weapon.

**Murlin** Multiband research laser IR.

**Muroc** Dry California lake, site of USAF flight-test centre of same name (now Edwards AFB).

**Murphy's law** If it is physically possible for an assemblage of parts to be connected incorrectly, sooner or later they will be thus connected.

**MUS** Minimum-use specification.

**MUSA, Musa** 1 Multiple-element steerable array.

2 Frag submunition for semi-hard targets, dispensed by MW-1 system (G).

**muscle pressure** Pneumatic pressure for applying force on a shaft bearing.

**MUSE, Muse** 1 Multi-user system [and] environment [sometimes Musent], includes LBA, L-DCS, BVIS and other functions.

2 Monitor of UV solar energy.

3 Multiple unified simulated environment.

**mush** To increase angle of attack suddenly but without immediate corresponding vertical acceleration, resulting from momentum along original path.

**mush-head** See next.

**mushroom rivet** One having thin convex head with sharp edge, for thin sheet.

**Music** 1 Multiple signal classification.

2 Multi-spectral IRCM.

**music** EW emissions, esp. jamming (colloq.).

**Musical** Prefix to marking techniques denoting Oboe guidance (RAF 1943–45).

**MUSPA** Area-denial mine, dispensed by MW-1 system (G).

**Must** Multimission u.h.f. satcom terminal.

**Mustrs, MUSTRS** Multisensor target-recognition system.

**MUT** Multi-use thruster.

**Muta, MUTA** Military upper [-level] traffic control area.

**Mutes** Multiple-threat emitter system; simulates many hostile emissions simultaneously.

**mute switch** Disconnects headset, microphone (term also often used for PA disconnect).

**muting** See mute switch.

**mutual inductance** The e.m.f. in a circuit caused by rapid change in surrounding magnetic field, unit = henry, symbol M, also = Wb per ampere.

**mutual interception** By two friendly interceptors on each other.

**mux** Multiplex[er].

**muzzle brake** Any of variety of gun-muzzle gas deflector units to reduce recoil, or blast on surrounding structure.

**muzzle cap** Frangible closure on gun muzzle to reduce drag and ingestion of precipitation.

**muzzle energy** Kinetic energy of each projectile as it leaves gun, measured relative to gun.

**muzzle horsepower** Standard non-SI measure of gun power, esp. automatic weapons; muzzle energy multiplied by rate of fire (units being compatible).

**MV** 1 Muzzle velocity.

- 2 Miniature vehicle.
- 3 Mass value.

**mV** Millivolt[s].

**MVA** 1 Minimum vectoring altitude.

- 2 Multivariate analysis.
- 3 Megavolt-amperes, basic unit of large AC powers.

**MVAR** Magnetic variation.

**MVDF** MF and VHF D/F facilities co-located (ICAO).

**MVEE** Military Vehicles Experimental Establishment (UK).

**MVFR** Marginal VFR.

**MVG** Moving.

**MVIS** Microgravity vibration-isolating system.

**MVL, mvl** Mid-value logic.

**MVM** 1 Muzzle-velocity measure(ment).

- 2 Mounted vertical manoeuvre.

**MVME** Modular virtual memory environment.

**MVMT** Movement.

**MVPA** Military variable-profile area (air-traffic management).

**MVPS** Multiple vertical protective shelter (ICBM).

**MVS** 1 Minimum vector speed (light pen).

- 2 Multi-vendor system (distributed networks).

**MVSRF** Man/vehicle systems research facility (NASA, Ames).

**MVT** Multi-view tomography.

**MVTU** Moscow higher technical school.

**MVW** 1 Maximum VTOL weight.

- 2 Maintenance virtual workplace.

**MW** 1 Medium wave.

- 2 Methanol/water.

3 Megawatt[s].

4 Microwave.

5 Mine warfare.

**Mw** Bending moment at wing root.

**mW** Milliwatt[s].

**MWA** 1 Multiple weapons adaptor.

- 2 Momentum-wheel assembly.
- 3 Mountain-wave activity.

**MWARA** Major world air-route area.

**MWCS** Multiple weapons carrier, or carriage, system.

**MWD** Military working dog.

**MWDB** Miscellaneous Weapons Development Branch (UK, 1942–45).

**MWDP** 1 Mutual weapons development program.

- 2 Master warning display panel.

**MWE** 1 Manufactured (or manufacturer's) weight empty.

- 2 Maximum weight empty.

**MW(E)** Megawatts electrical.

**MW50** Methanol 50%, water 49.5%, inhibitor 0.5%.

**MWG** Maintenance Working Group[s].

**MWIR** Mid-, or medium-, wave IR.

**MWL** 1 Minimum takeoff distance on water to clear standard (35 or 50 ft) obstacle.

- 2 Maintain wings level.

**MWLD** Man-worn laser detector.

**MWO** 1 Meteorological Watch Office (ICAO).

- 2 Modification work order.

**MWP** 1 Museum of Women Pilots (US).

- 2 Meteorologist weather processor (FAA).
- 3 Master warning panel.

**MWR** 1 Millimetre-wave radar.

- 2 Microwave radiometer.

**MWS** 1 Master warning system.

- 2 Missile Warning Squadron (USAF).
- 3 Multiple-warhead system[s].
- 4 Modular workstation.
- 5 Missile warning system; –PE adds passive element.

**MW(T)** Megawatts (thermal).

**MWVS** Mission weapon visionics system.

**MX** Mixed types of icing, white and clear (ICAO).

**Mx** 1 Bending moment at any station x.

- 2 Helicopter-rotor rolling moment, positive to starboard.

**MXD** Mixed (ICAO).

**MY** Multi-year [C adds contract(ing)].

**My** Helicopter-rotor pitching moment, nose-up positive.

**Mylar** Tough transparent film, of terephthalate polyester family, usable down to extreme thinness (hence light weight per unit area).

**Mynapak** Integrated circuit with up to three ceramic substrates carrying devices connected by gold wires, the whole being N<sub>2</sub>-filled (BAe).

**Myopia** Short sight, near-parallel rays being focused in front of the retina.

**MYP** Multi-year procurement, or programme.

**myriametre** Non-SI term for 10<sup>4</sup> metres, hence myriametric.

**M<sub>0</sub>, M<sub>zero</sub>** Zero-lift pitching moment.

**MZFW** Maximum zero-fuel weight.

# N

- N**
- 1 Newton[s].
  - 2 Shaft rotation speed, with suffix number ( $N_1$ ,  $N_2$  etc) for each shaft (see *gas-turbine numerology*).
  - 3 Yawing moment.
  - 4 Code: operates by sound in air (JETDS).
  - 5 Code: navaid (ICAO).
  - 6 Prefix, amount of cloud.
  - 7 Number of turns in a coil, or of load cycles, usually per second, or number of samples in statistics.
  - 8 North (ICAO, or nothern).
  - 9 Synoptic chart code: air mass has had characteristics changed.
  - 10 Telecom code: aircraft.
  - 11 Avogadro's number.
  - 12 Nitrogen.
  - 13 STOL aircraft (FAI).
  - 14 Prefix, night, negative, nose, no.
  - 15 Prefix, nuclear (USSR).
  - 16 Knots [flight plan].
  - 17 Nicrosil-nisil thermocouple.
  - 18 IFR weather.
  - 19 Non-scheduled civil transport flight.
  - 20 Permanent special test (USAF/USN aircraft designation prefix).
  - 21 Trainer (USN 1922–60).
  - 22 Noise.
  - 23 Modified mission suffix, night or all-weather (USN 1950–62).
  - 24 Aircraft category STOL aeroplanes (FAI).
- n**
- 1 Prefix, nano ( $\times 10^{-9}$ ).
  - 2 Generalized symbol for an aircraft equipped with Tacan only and 64-code transponder.
  - 3 Normal acceleration in g, load factor.
  - 4 Number in a sample, any integer.
  - 5 Frequency, esp. of rotation.
  - 6 Refractive index.
  - 7 Negative, hence n-type semiconductor.
  - 8 Number of frames or supports to a beam.
  - 9 Subscript, normal, e.g., to leading edge.
- N̄**
- 1 Normal force on 2-D aerofoil [per unit span, normal to chord].
  - 2 Normal acceleration factor [positive downwards].
- (N)** Night.
- ñ** Angular acceleration.
- N<sub>1</sub>** Fan or LP compressor speed.
- N<sub>2</sub>** 1 Nitrogen.
- 2 IP compressor speed (CAA).
  - 3 HP compressor speed (2-shaft engine).
- N<sub>3</sub>** HP compressor speed (CAA).
- N'**, **N°** Rate of change of N(2) on spool-up or rundown.
- Ñ** Vector representing integrated noise energy.
- N-code** ICAO code, amount of cloud.
- N-display** Target forms two blips on horizontal time-base (as in K-display), lateral positions giving range and relative amplitudes bearing.
- N-layer** N is set for any layer name [link, net, etc] or for the initial [open system architecture].
- N-sector** Sector of radio range in which Morse N is heard.
- N-strut** Arrangement of interplane struts or cabane struts resembling N.
- n-type semiconductor** One in which charge carriers are nearly all electrons.
- N-wave** Shockwave remote from source; far-field boom signature, when profile of pressure/linear distance has settled down to N-like profile.
- (N)** Night.
- NA**
- 1 Noise abatement (procedure).
  - 2 Numerical aperture.
- N/A**
- 1 Not applicable, not available, not authorized, not approved.
  - 2 Navigation/attack.
- N<sub>A</sub>** Avogadro constant.
- Na** Sodium.
- NAA**
- 1 National Aeronautic Association of the US, founded 1905 as Aero Club of America [Arlington, VA 22209–1805] (US).
  - 2 National Aviation Academy [Clearwater FL33760] (US).
  - 3 National Aviation Authorities (European countries).
  - 4 National Airport Authority (India).
- NAAA** National Agricultural Aviation Association (US), or National Aerial Applicators Association [office, Washington, DC] (US).
- NAAAS** National Association of Air Ambulance Services [office, Basingstoke] (UK).
- NAAC**
- 1 National Aviation Associations Coalition (US)
  - 2 National Association of Agricultural Contractors [promotes ag-aviation, office Maldon, Essex] (UK)
  - 3 See *sodium acetate*.
- NAADC** North American Aerospace Defense Command.
- NAAFI** Pronounced “naffy”, Navy, Army and Air Force Institutes [civilian organization in support of Other Ranks] (UK).
- NAAM** National Agricultural Aviation Museum [Jackson, Mississippi] (US).
- NAAP** Netherlands Agency for Aerospace Promotion (NIVR).
- NAAQS** National ambient-air quality standard[s].
- NAAS**
- 1 National Association of Aerospace Sub-contractors [office, Palos Verdes, CA] (US).
  - 2 Naval Auxiliary Air Station (USN).
- NAATS** National Association of Air Traffic Specialists [office, Wheaton, MD] (US).
- NAAWS** NATO anti-war warfare system.
- NAB** Navy Air Base (USN).
- Nabs** NATO air base Satcom.
- NAC**
- 1 North Atlantic Council, of NATO ambassadors.
  - 2 Noise Advisory Council (UK).
  - 3 National Air Communications (UK, 1939–40).
  - 4 National Aviation Club [office, Arlington, VA] (US).
  - 5 Naval Air Command (UK).
  - 6 Naval Avionics Center (USN).
  - 7 Non-airline carrier.
  - 8 Network access controller.

## NACA

naked

- 9 NASA Advisory Council.
- NACA** 1 National Advisory Committee for Aeronautics (US, 1915–58, became NASA).
- 2 National Air Carrier Association [office, Washington, DC] (US, from 1962).
- NACA cowling** Drag-reducing annular cowl for radial engines with aerofoil-profile leading edge and cylindrical main section.
- NACA section** Any of numerous aerofoil sections designed by NACA.
- NACA standard atmosphere** Original idealized atmosphere, published in 1925; later superseded by ICAO, ARDC and others.
- NACEL** Naval air crew equipment laboratory.
- nacelle** Streamlined body sized according to what it contains, which may be an engine, landing gear, human occupants etc; when tail carried on separate booms\* takes place of fuselage.
- NACES, Naces** Navy aircrew common ejection seat (USN).
- Nacisa, NACISA** NATO Communications and Informations Systems Agency.
- Nacma** NATO Air Command and Control Management Agency.
- Nacoss** National Approval Council for Security Systems (UK).
- Nacre** New aircraft concepts research.
- NACP** Noise-abatement climb procedure.
- nacreous cloud** High layer cloud with iridescent appearance; also called mother-of-pearl cloud.
- Naci** NATO Advisory Committee on Signals Intelligence.
- NAD** 1 National Armament Director[s] (NATO nations).
- 2 Navy area defense (SAM, USN).
- NADB** Netherlands Aircraft Development Board.
- NADC** 1 US Naval Air Development Center.
- 2 Nuclear Affairs Defence Council (NATO).
- 3 NATO Air-Defence Committee.
- 4 Noise-abatement departure procedure.
- Nadcap** Widespread industry group, originally US when name meant National Aerospace and Defense Contractors Accreditation Program, now no longer an acronym, (Int.).
- NADEEC** NATO Air Defence Electronic Environment Committee (NATO).
- NAD83** North American datum of 1983, precise geographic co-ordinates.
- Nadep** Naval Aviation [or Air] Depot (USN).
- Nadge** NATO air-defence ground environment; multi-national programme for unified air-defence system of radars, computers, displays and communications from North Cape to eastern Turkey.
- Nadgeo** Multinational company formed to implement Nadge plan.
- Nadgeo** Nadge Management Office; formed within NATO to act as unified customer.
- Nadin** 1 National airspace data-interchange network (FAA).
- 2 North American data-interchange network.
- Nadir** Point on celestial sphere vertically below observer, ie 180° from zenith. Thus, through-\* tracking = during overflight.
- NADL** US Navy Avionics Development Laboratory.
- NADS** 1 US Naval Air Development Station (from 1947).
- 2 National Armaments Directors (NATO).
- 3 Next available delivery slot.
- NAE** 1 National Aeronautical Establishment (Canada).
- 2 National Academy of Engineering (US).
- 3 US Naval Air Engineering, concerned with aerospace installations in ships [F adds Facility 1956–62, L adds Laboratory from 1962].
- NAEC** 1 US Naval Air Engineering Center (Philadelphia), NAMC renamed 1962.
- 2 National Aerospace Education Council (US).
- Naegis, NAEGIS** NATO airborne early warning ground environment integration segment.
- NAEL(SI)** Naval Air Engineering Laboratory (Ship Installations), from 1962.
- NAES** 1 Naval Aviation Engineering Services (US); plus U = unit.
- 2 US Naval Air Experimental Station (1943–57).
- NAEW** NATO airborne early warning; F adds force (base Geilenkirchen, G).
- NAF** 1 Norsk Astronautisk Førening (Norway).
- 2 Non-appropriated fund(s).
- 3 Naval air facility (US).
- Nafag** NATO Air Force Armaments Group.
- Nafdu** Naval Air Fighting Development Unit.
- NAFEC, Nafe** National Aviation Facilities Experimental Center; Atlantic City, NJ (US 1958, in 1981 became FAATC).
- NAFI** National Association of Flight Instructors [Dublin, OH] (US).
- NAFIN, Nafin** Netherlands armed-forces integrated network.
- NAFP** National aeronautical facilities program(me).
- NAFS** National Association of Flight Schools [office, Miami Lakes, FL] (US).
- Nagara** Japanese word in Western use: a critical-path technique linking manufacturing operations, and balancing times to reduce lead times and WIP inventory.
- NAGR** Short-range reconnaissance wing (G, WW2).
- NAGS, Nags** NATO alliance ground surveillance.
- NAGTE** Non-aircraft gas-turbine engine.
- Nahema** NATO Helicopter Management Agency [Aix-en-Provence F-13082] (Int.).
- NAHF** National Aviation Hall of Fame [Dayton, OH 45402] (US).
- NAHSI** National Aviation Heritage Skills Initiative (BAPC).
- NAI** 1 Negro Airmen International [education and training; Oshkosh, WI54903] (US).
- 2 Netherlands Aerospace Industries (member AECMA, title in English).
- 3 National Aerospace Initiative (US).
- NAIA** National Aerospace Intelligence Agency (USAF).
- Nails** National airspace integrated logistics support (FAA).
- NAIU** Naval Accident Investigation Unit.
- NAK** 1 National aero club (R).
- 2 Norsk Aero Klubb [N-0102 Oslo] (Norway).
- 3 Negative acknowledgement.
- NaK** Generalised term for all mixtures of sodium and potassium; used eg as liquid-metal heat-transfer media.
- NAKA** National aerospace agency (Kazakhstan).
- naked** See *clean* (1, 2).

**NAL** 1 National Aerospace Laboratories [Bangalore 560 017] (India).

2 National Aerospace Library [being established on site at Farnborough of former Royal Aircraft Establishment] (UK).

**Nallads** Norwegian Army low-level air-defence system.  
**NAM** 1 National Association of Manufacturers [Washington DC] (US).

2 National Atomic Museum (Albuquerque, NM).

3 NATO Air Meet (annual).

4 North American region (ICAO).

5 National Aviation Museum [Ottawa, PO] (Canada).

6 Newark Air Museum [Newark NG24 2NY] (UK).

**nam, n.a.m.** Nautical air miles; hence \*/lb of fuel.

**NAMAS** National Measurement and Accreditation Service (UK).

**NAMC** US Naval Air Material Center (1943, in 1962 became NAEC).

**Nameadsma** NATO medium extended air-defence system management agency.

**NAMFI, Namfi** NATO Missile Firing Installation (Crete).

**NAMI** Scientific auto-motor institute (Sweden).

**Namis** NATO automated meteorological information system.

**NAML** Naval Aircraft Materials Laboratory (UK).

**NAMMA** NATO MRCA Management Agency.

**NAMP** Naval Air Maintenance Program (USN).

**NAMRL** Naval Aerospace Medical Research Laboratory (USN).

**NAMS** NATO Maintenance and Supply [A adds Agency, Luxembourg; O Organization].

**NAMTD** Naval Air Maintenance Training Detachment (USN).

**NAMU** US Naval Aircraft Modification Unit, (1943–47).

**NAND** 1 NOT + AND logic device, retains output until voltage at all inputs, then goes to 0.

2 Nested analysis and design.

**nano** Prefix,  $\times 10^{-9}$ , hence many technologies eg, \* electronics, \* engineering, \* physics, \* structures. Suffixes include array, circuit, metre [nm], particle, scale, switch and wire.

**nano air vehicle** Smallest possible UAV, span  $\leq 75\text{mm}$ , 3 in.

**nanosatellite** Mass  $1 \leq 10\text{ kg}$ .

**NAO** National Audit Office (US, UK).

**NAOAL** National Aviation Officer for Airworthiness and Logistics (US Fire Service).

**NAOC** National Airborne Operations Center (E-4B platform for NCA).

**NAOMS** National Aviation Operations Monitoring Service [Washington DC].

**NAOS** North Atlantic Ocean station.

**NAOTS** North Atlantic organised track system.

**NAP** 1 Noise-abatement procedure[s].

2 Normal acceleration point (SST).

3 National airport plan (US).

**nap** 1 Local profile of land surface; hence \* of Earth, \* of the Earth flying (as close to ground as possible).

2 Short fibre ends along edge of fabric.

**napalm** 1 Mixture of naphtha and palm oil (hence name), usually with additives, used as incendiary material.

2 Air-dropped ordnance filled with \* designed to burst and distribute flame over large area.

**NAPC** Naval Air Projects Co-ordination office (USN).

**NAPCA, Napca** National Air-Pollution Control Association [now APCC] (US).

**nape** Use napalm against (colloq.).

**Napgel** Mix of ethylene/propylene glycols [de-icing fluid tradename].

**naphtha** Generalized name for inflammable oils distilled from coal tar and other sources.

**NAPL** National Air Photo Library (Canada).

**NAPMA** NATO AEW&C Programme Management Agency.

**Napoc** No acceptable price, no contract.

**NaPO** NASA Pasadena Office.

**Napol** North Atlantic Policy [ECAC working group].

**NAPP** National Association of Priest Pilots [1964–, office, Chicago, IL] (US).

**NAPR** NATO armaments planning review.

**NAPTC** Naval Air Propulsion Test Center (USN).

**NAR** 1 National airspace review (US).

2 National Association of Rocketry [office, Elizabeth, PA] (US).

**NARC** 1 Nexcom Aviation Rulemaking Committee (FAA).

2 National Aerospace Resource Centre [RMIT] (Australia).

**Narcap** National Aviation Reporting Center for Anomalous Phenomena [2000–] (US).

**NARF** 1 Naval Air Reserve Force (USN).

2 Naval Air Rework Facility; Pensacola (USN).

**NARG** Navaids and area-navigation working group (ICAO).

**NARIM** NAS (2) research and investment model.

**NARO** Naval Aircraft Repair Organization [Gosport, now part of DARA] (UK).

**narrow-body** Commercial transport with fuselage width of approximately 10 ft (3 m) with single aisle between passenger seats.

**narrow gate** AAM operating mode permitting homing on target only within narrow limits of rate of closure.

**NARS** Navigation and attitude reference system.

**Narsim** NLR ATC research simulator.

**NARTEL** National air radio telecommunications (UK).

**NARUC** National Association of Regulatory Utility Commissioners (US).

**NAS** 1 Naval Air Station (USN).

2 National airspace system (FAA).

3 National Academy of Sciences (US).

4 Nozzle actuation system.

5 National aerospace standards (FAA, CAA, UK).

6 Numeric aerodynamic simulation.

7 Nav/attack system.

8 Naval Air Squadron [Fleet Air Arm] (UK).

9 National Avionics Society [office, Richfield, MN] (US).

**NASA** National Aeronautics and Space Administration [October 1958–; Headquarters, Washington DC20546–0001] (US).

**Nasad** National Association of Sport Aircraft Designers [office, Wickliffe, OH] (US).

**NASAF** North African Strategic Air Force (US/UK, WW2).

**NASAO** National Association of State Aviation Officials [office, Silver Spring, MD20910] (US).

**NASC** 1 Naval Air Systems Command (USN).  
2 National Aeronautics and Space Council (US).  
3 National Association of Spotters' Clubs (UK, 1941–46).  
4 National Aerospace Standards Committee.  
5 National AIS (1) system centre (UK).

**Nascom** NASA Communications Network.

**NASDA** National Space Development Agency (J).

**NASF** Navigation and Attack Systems Flight (RAF).

**NASH** Nav/attack system for helicopters.

**NASIP, Nasip** National aviation safety inspection program (FAA).

**NASM** National Air and Space Museum [part of the Smithsonian Institution, Washington DC20560] (US).

**NASMDEF** NATO anti-ship missile defence evaluation facility.

**NASN** National Air-Sampling Network (EPA).

**NASO** 1 Naval Aviation Supply Office (USN).  
2 Non-acoustic systems, or sensor, operator.

**NASP** 1 National aerospace plane (US).  
2 National Aviation Security Plan (UK).  
3 Navy airship program (USN).

**Naspac** NAS (2) performance-analysis capability.

**Naspals** NAS (2) precision approach and landing system (FAA).

**NASPG** North Atlantic Systems Planning Group.

**Naspo** National Airspace System Planning Office (FAA, from 1966).

**NASR** Naval and Air Staff Requirement.

**Nasroc** New anti-submarine rocket (J).

**NASS** 1 Naval Anti-Submarine School.  
2 Non-acoustic sensing system.

**NASSA** National AeroSpace Services Association [office, Washington, DC] (US).

**Nassi** NAS (2) status information, developed under FFP1 to provide such data as ARC, RVR and delays.

**Nassim** NAS (2) simulation.

**Nasstat** NAS (2) facility status database and display.

**NAST** Naval Air Staff Target.

**Nastar** Navier-Stokes analysis for arbitrary regime.

**Nastran** NASA structural analysis [GP finite-element program].

**NASU** Naval Air Support Unit [formerly RNAS Brawdy].

**NASWDU** Naval Air/Sea Warfare Development Unit (UK).

**NAT** 1 North Atlantic Region (ICAO).  
2 North Atlantic tracks.  
3 Netherlands Airport Technology (trade association, 32 members).

**NATA** 1 National Air Taxi Association (UK).  
2 National Air Transportation Association, Inc. [1940–, office, Alexandria, VA22302] (US).  
3 National Aviation Trades Association [office, Alexandria, VA] (US).  
4 Northern Air Transport Association [office, Yellowknife, NT] (Canada).

**Natar** NATO transatlantic advanced radar (Belgium, Canada, Denmark, Luxembourg, Norway, US).

**NATC** 1 Naval Air Test Center (Patuxent River, Md).  
2 Naval Air Training Command (US).  
3 National Air Transportation Conferences (US).

**Natca** National Air Traffic Controllers Association (US).

**Natcapit** North Atlantic Capacity And Inclusive Tours Panel.

**NATCC** National Air Transport Co-ordinating Committee (US).

**NATCS** National Air Traffic Control Services (UK, now NATS).

**NATF** US Naval Air Test Facility.

**Natinad** NATO Integrated Air Defence [S adds system].

**national airline** Designated flag carrier of sovereign state.

**National Airspace System** That administered by the FAA, traditionally linking VORs.

**National Air Traffic Services** Provides ATC over UK, division of CAA but from 2002 part-privatized.

**National Flight Data Center** FAA office in DC which collates useful information on civil airspace and publishes it each weekday in the NFD Digest.

**national responsibility** Part of collaborative programme wholly assigned to one country.

**National Route Plan** Rules and procedures designed to increase the flexibility of user flight planning (FAA).

**National Search and Rescue Plan** US inter-agency agreement to facilitate application of full national resources in emergencies.

**Natlas** National Testing Laboratories Accreditation Scheme (NPL, UK).

**Natmac** National air-traffic management advisory committee (CAA).

**NATO** 1 North Atlantic Treaty Organization, formed 1949, always written thus yet spoken as Nato [Secretariat, B-1110 Brussels] (Int.).  
2 N African theatre of operations (WW2).

**Natops** Naval Air Training and Operating Procedures Standardization (USN).

**NATR** National air-tour rule (proposed 2004, FAA).

**NATS** 1 National Air Traffic Services Ltd. [subsidiary of CAA, head office, London WC2B 4AP] (UK).  
2 Naval Air Transport Service (USN, 1941–62).  
3 National Air Telecommunications Service [U adds Unit] (US).  
4 North Atlantic track system.  
5 National aerospace technology strategy [July 2004–] (UK AeIGT).

**Natsim** Network advanced training simulator: -ATC adds ATC (1); -Stars adds scenario, radar and target simulation.

**NATSPG** North Atlantic Systems Planning Group (ICAO).

**Natsu** Nominated air traffic service unit (CAA).

**NATTC** 1 Naval Air Turbine Test Center (USN).  
2 Naval Air Technical Training Command.

**natural buffet** Buffet occurring automatically near stall as result of airflow turbulence, thus giving warning to pilot.

**natural finish** Unpainted.

**natural frequency** That at which a system oscillates if given one sudden perturbation and thereafter left to itself.

**natural laminar flow** Laminar flow induced by quality of aircraft skin, notably by extremely fine parallel grooves or “sharkskin teeth”.

**natural language** That spoken by human beings (usually means English).

**naturally aspirated** Not supercharged but left to draw in air at local atmospheric pressure.

**natural satellite** Not man-made.

**natural wavelength** That corresponding to natural frequency of tuned electronic circuit; that at which open aerial [antenna] will oscillate.

**NAU** Network access unit.

**nausea bag** Sickbag.

**nautical mile** Standard unit of distance in air navigation, totally at variance with SI; aviation uses International \*, 6,076.1 ft, 1,852 m; UK \* is 6,080 ft, 1,853.18 m. A common aviation approximation is 6,000 ft (1,828.80 m). Abb. n.m. See *knot*.

**nautical twilight** Period when Sun's upper limb is below visible horizon and Sun's centre is not more than 12° below celestial horizon.

**NAV** 1 Air navigation services provider (Portugal).

2 Nano air vehicle.

**nav** Navigation, navigator.

**navaid** Navigation aid, esp. one of electronic nature located at fixed ground station.

**Navair** US Naval Air Systems Command.

**naval aircraft** 1 Loosely, one used by a navy.

2 One specially equipped for operation from aircraft carrier or other warship.

**nav/attack system** One offering either pilot guidance or direct command of aircraft to ensure accurate navigation and weapon delivery against surface target.

**nav/bomb** Crew-member combines functions of navigator and bomb aimer.

**nav/com** Loosely, navigation and communications, or a single radio transceiver used for both functions.

**navex** Navigation exercise.

**Navhars** Navigation, heading and attitude reference system.

**NAVICP** Naval inventory control point (USN).

**Navier-Stokes** Basic set of equations for motion of body or flow parcel in viscous fluid.

**navigation aid** Any facility intended to assist takeoff, en route flight and landing.

**navigation datocard** Portable holder of customized database.

**navigation flare** Bright-burning pyrotechnic dropped over open country at night to provide fixed object for measurement of drift (obs.).

**navigation flight test** A section of the practical examination for the PPL and IRT.

**navigation float** Navigation aid in form of clearly visible float, with or without pyrotechnics, for drift measurement over sea; hence navigation flame-float, navigation smoke-float (obs.).

**navigation lights** Regulation wingtip lights (red on left, blue-green on right) visible from ahead through 110° to side, and white light at tail visible each side of rear centreline.

**navigation satellite** Artificial satellite whose purpose is to assist navigation [not only of aircraft].

**navigation smoke bomb** See *navigation flare*.

**navigation stars** Those used in astro-navigation.

**Navsat** Navigation satellite.

**Navsep** Specialist [semi-permanent] panel on navigation and separation of aircraft.

**Navspasur** Naval space surveillance system (USN).

**Navspoc** Naval Space Operations Center (Dahlgren, VA).

**Navstar** Pioneer GPS system based on 24 satellites in 63° orbits at 11,000 n.m.; acronym = Navigation system tracking [or time] and range.

**Navwar** Navigation warfare, eg by jamming enemy's GPS reception.

**Navwass** Navigation and weapon-aiming subsystem.

**NAW** Night/adverse weather.

**Nawacs** NATO Awacs.

**Nawas** National warning system (US).

**NAWAU** National Aviation Weather Advisory Unit (Kansas City).

**NAWC** Naval Air Warfare Center [AD adds Aircraft Division, SR sea range, WD Weapons Division] (USN).

**NAWS** Naval Air Weapons Station (USN China lake).

**Nawtol** Night/all-weather takeoff and landing.

**Naxos** German WW2 family of passive electronic systems tuned to home on H<sub>2</sub>S.

**NB** 1 Enhanced-radiation weapon (colloq., from 'neutron bomb').

2 Northbound.

3 Night bombardment [L, S, added long/short range] (USA, 1919–26).

**N<sub>b</sub>** Number of landing gear braked wheels, or helicopter main-rotor blades.

**Nb<sub>3</sub>Sn** Niobium/tin superconductive alloy.

**NBA** 1 New-build aircraft.

2 Certification authority (Finland).

**NBAA** National Business Aviation Association [office, Washington DC 20036–2527] (US).

**NBC** 1 Nuclear, biological, chemical; D adds damage.

2 Navigation and bombing computer.

**n.b.c.** Noise-balancing control (radio).

**NBCAP** National beacon code-allocation plan (US).

**NBD** Network-based defence.

**n.b.f.m.** Narrow-band frequency modulation.

**NBFR** Not before.

**NBH** Normal business hours (ICAO).

**NBMD** NATO business management directory.

**NBP** No-break [electrical] power; T adds transfer.

**NBPA** National Broadcast Pilots Association (US).

**NBR** Nitrile-based rubber.

**NBS** 1 National Bureau of Standards, now NIST (US).

2 Navigation/bombing system.

**NBSV** Narrow-band secure voice.

**NBTA** National Business Travel Association (US).

**NC** 1 Numerical control (machine tool).

2 Nitrocellulose (or Nc).

3 No change (ICAO).

4 Node, or nozzle, controller.

5 Normally closed.

6 No charge.

7 Narrow coverage (Satcoms).

8 Network centric, or netcentric.

**N<sub>c</sub>** Compressor speed in rpm.

**N/C** 1 New [installation] concept.

2 Numerical control.

**n<sub>c</sub>** Subscript, non-circulatory part.

**NCA** 1 National Command Authorities (US).

2 Nuclear-capable aircraft.

3 NATO conventional armaments; PC adds Planning Committee, RC review committee.

**4** Non-commissioned aircrew; ITC adds initial training centre; LT liaison team (RAF).

**NCAA** National Council of Aircraft Appraisers (US).

**NCADE** Network-centric airborne defense element.

**NCAE** National Coalition for Aviation Education (US).

**NCAGE** NATO commercial and government entity code.

**NCAP** Night combat air patrol, also called nightcap.

**NCAPA** See *ANPAC*.

**NCAR** National Center for Atmospheric Research (Boulder, Colorado).

**NCAS** Nomex core, aluminium skin.

**NCAT** Network-centric analysis tool.

**NCC** *1* Network control center/centre.  
*2* Nickel-coated carbon.

**NCCAFB** NASA Center for Computational Astrobiology and Fundamental Biology (at Ames).

**NCCAT** National Committee for Clear-Air Turbulence [many, including FAA, DoD, NASA, ESSA, NSF] (US).

**NCCA, NC3A** NATO Consultation, Command and Control [or Communications] Agency.

**NCCIS** NATO Command, control and information system.

**NCCT** Netcentric, or network-centric, collaborative targeting.

**NCD** *1* No computed data.  
*2* Net control device.

**NCDS** Navigation/checklist display system.

**NCDU** Navigation[all] control and display unit.

**NCE** Non-cooperative emitter.

**NCF** Non-crimp fabric.

**NCGS** Nomex core, GRP skin.

**NCI** *1* Navigation control indicator.  
*2* Not currently implemented.

**NCIAP** Networked communications/intelligence weapon data-link architecture program (USAF).

**NCIS** National Criminal Intelligence Service (UK).

**NCISA** NATO Communicatons and Information Systems Agency.

**NCMA** National Contract Management Association (US, now Int.).

**NCMC** Norad Cheyenne Mountain Complex.

**NCMS** Network channel-management system.

**NCMT** Numerically-controlled machine tool.

**NCN** National Composites Network [to disseminate from GKN on Isle of Wight from 2004] (DTI, UK).

**NC/NG** Nitrocellulose/nitroglycerine.

**NCO** *1* Non-commissioned officer.  
*2* Numerically controlled oscillator.  
*3* Navigation/communications operator.  
*4* Network-centric operations.  
*5* Near-circular orbit.

**NCOIC** Network Centric Operations Industry Consortium [October 2004] (Int.).

**NCPA** National Center for Physical Acoustics (University of Mississippi).

**NCPS** Network-centric, or netcentric, precision strike.

**NCQR** National Centre for Quality and Reliability (UK).

**NCR** National Capital Region [i.e., DC] (US).

**NCRP** Non-compulsory reporting point.

**NCS** *1* Numerical-Control Society (US).  
*2* Network control, or coordinating, station (Comsats).

*3* NATO codification system.

**NCSA** NATO Communications and Information Systems Services Agency [August 2004] (Int.).

**NCSC** National Cargo Security Council (US).

**NCSR** National Committee on Space Research [sub-committee of The Royal Society, London] (UK).

**NCT** *1* National Centre for Tribology, now ESTB (UK).  
*2* Non-cooperative, or non-cooperating, target; see NCTR.  
*3* NATO comparative, or cooperative, test.  
*4* Network control terminal.  
*5* National Commission on Terrorism (US).

**NC3A** NATO Consultation, Command and Control Agency.

**NC3B** NATO C3 Board.

**NCTI** Navcanada Training Institute [Cornwall K6H 6L2] (Canada).

**NCTR** Non-cooperative target recognition.

**NCU** Navigation computer unit; R adds readout.

**NCW** Network-centric warfare.

**NCWI** Network-centric weather integration.

**NCWX** No change in weather.

**ND** *1* Nose-down (trim control).  
*2* Unable to deliver message, notify originator (ICAO).  
*3* Navigation display.  
*4* No date.  
*5* Neutron detector.  
*6* Networks Directorate.

**Nd** Neodymium.

**NDA** *1* National defense area [not DoD property but military or security interest] (US).  
*2* Non-disclosure agreement.

**NDAA** National Defense Authorization Act (US 2002).

**NDAC** *1* Northern Defence Affairs Committee (NATO).  
*2* National Defense Advisory Commission (US, 1940).

**NDB** *1* Non-directional beacon [L adds locator].  
*2* Navigation database, stored in FMC.  
*3* Nuclear depth bomb.

**NDBC** Non-discrete beacon code.

**NDCL** Nozzles-down cue line.

**NDE** Non-destructive evaluation, or examination (NDT research).

**NDEW** Nuclear directed-energy weapon.

**NDH** No damage history.

**NDHQ** Address for all Department of National Defence offices [Ottawa, K1A 0K2] (Canada).

**NDI** *1* Non-destructive inspection.  
*2* Non-development[all] item.  
*3* Northern Defence Industries [-A adds Aerospace; office Sunderland SR5 2TH] (UK).

**NDIA** National Defense Industry [previously Industrial] Association (US).

**NDIC** National Defence Industries Council (UK).

**Nd-KGW** Neodymium-doped potassium gadolinium tungstate.

**NDM** Noise Definition Manual (JARs).

**Ndot** =  $\dot{n}$ , esp. rate of change of shaft speed.

**NDP** *1* National Defense Panel, or planning (US).  
*2* National Disclosure Policy [C adds Committee].  
*3* Night and day payload (UAV).

**NDPER** National designated pilot examiner registry (US).

- ND point** Nominal deceleration point (SST).
- NDRC** National Defense Research Committee (US, WW2).
- NDS** Nuclear detection system.
- NDT** Non-destructive testing.
- NDTA** National Defense Transportation Association [office, Alexandria, VA] (US).
- NDTS** Non-Destructive Testing Society (UK).
- NDU** Navigation display unit.
- NDV** Nuclear delivery vehicle.
- NdYAG** Nd-doped YAG.
- NE** 1 No echo [radar weather].  
2 Network element.
- N/E** 1 Neon/ethane mixture (for flushing payload compartments in space).  
2 Northings and eastings.
- Ne** Neon.
- N<sub>e</sub>** 1 Number of engines.  
2 Shaft power (USSR, R).
- NEA** 1 National Electronics Association (US).  
2 Nuclear Energy Agency (OECD).
- 3** Nitrogen-enhanced, or enriched, air.
- 4** Near-Earth asteroid [R adds rendezvous, T tracking, TS tracking system].  
5 Non-effective airframe (RAF).
- NEAC** Noise and Emission Advisory Committee (IATA).
- NEACP** National-emergency airborne command post (US).
- NEA4** Nitrogen-enriched air with 4% oxygen and other constituents.
- Neal-Smith** Criterion for assessing pitch control: lead/lag pilot model with time delay 0.3s [adjusted to aircraft] provides closed-loop resonance and phase lead for comparison with opinions of real pilots.
- NEADS** NorthEast Air Defense Sector (US).
- NEAM** New England Air Museum (Windsor Locks).
- Neame** Gunsight for use at night, with illuminated ring backsight and red dot foresight, 1917 (UK).
- NEAN** North European ADS-B network.
- Neap** Northern European CNS/ATM (7) application project (Euret).
- NEAR** Near-Earth Asteroid Rendezvous (NASA).
- near encounter** Close fly-by of planet or other body.
- near field** 1 Shockwave region close to source (hence \*\* signature).  
2 Sonic boom area closest to SST track.
- near-field effects** With jet aircraft, include entrainment of free stream, blockage behind the nozzles and [STOVL] suck-down.
- near-hit** Airmiss.
- near-IR** Usually defined as 0.75–1.5μ.
- near miss** DoD term for airmiss.
- near space** Region between 100,000 and 120,000 ft [30.48 – 36.58 km], regarded by USAF as a “not used” region which could be exploited. Hence NSMV.
- Near-term data radio** A restricted LOS1 system that relies on terrestrial relay to cover long distances (USA).
- NEAT** North European Aerospace Test facility (Kiruna, Sweden).
- Neat, NEAT** Near-Earth asteroid tracking.
- neatlines** Parallels and meridians surrounding body of map (NATO); also called sheetlines.
- NEB** 1 National Enterprise Board (UK).  
2 National Energy Board (C).  
3 Nuclear exo-atmospheric burst (DoD).  
4 National Examiner Board (US).
- NEC** Network-enabled capability.
- NECI** Noise exposure computer/integrator.
- neck** Lower tube-like portion of gas-balloon envelope.
- necking** Local reduction in cross-section of member due to plastic flow under tension.
- necking down** Reducing the diversity of types, e.g. on a carrier.
- necklace vortex** Formed at a junction between a quasi-flat surface, such as the local skin of a fuselage, and a bluff projection, such as the leading edge of the wing. Unable to penetrate the adverse pressure-gradient, the fuselage boundary layer separates and forms a \*, coiling above and below the wing. In most applications the same as a horse-shoe vortex.
- neck moment** Bending moment on neck on entering slip-stream in ejection.
- NED** North/east/down co-ordinate system.
- NEDO** English rendition of New Energy and Industrial Technology Organization (Japan).
- NEDS** Narcotics eradication delivery system (US).
- NEEC** Noise-excluding ear capsule.
- needle** Rotary ‘hand’ of traditional dial-type instrument; but see plural.
- needle and ball** See *turn and slip*.
- needle beam** Extremely directional radio beam with suppressed sidelobes (difficult for enemy to detect).
- needles** Generalized term for instrument (esp. flight instrument) readings; thus ‘the \* all dropped to zero’.
- needle split** Divergence between helicopter engine and rotor speed indications, with normally superimposed needles.
- needle valve** One offering fine adjustment of fluid flow by linear translation of tapering pointed rod centred in orifice.
- NEF** Noise exposure forecast.
- NEFC** NATO electronic-warfare fusion cell.
- NEFD** Noise equivalent flux density.
- Nefma, NEFMA** NATO European Fighter Management Agency (Int.).
- NEG** Negative.
- “negative”** Voice communications word meaning “no”.
- negative altitude** Angular distance below horizon; depression (ASCC).
- negative area** 1 Area on tephigram enclosed between path of rising particle at all times colder than environment and surrounding air.  
2 Generally, vague area (volume) surrounding colder air that happens to be rising.
- negative camber** Usually interpreted as concave on upper surface.
- negative feedback** 1 Signal either reversed in sense or otherwise out of phase and thus tending to increase departure from original condition.  
2 Transfer of part of amplifier output in reverse phase to input.
- negative flow** Through an axial compressor, flow from delivery to inlet.
- negative g** Subject to acceleration in the vertical plane in the opposite-to-normal sense, eg aircraft in sustained inverted flight or in pushover from steep climb to steep dive; wings are bent ‘downwards’ (relative to aircraft atti-

## negative-g valve

## net height

tude) and pilot can experience ‘red-out’. This condition is intermittently inevitable in severe turbulence but is normally prohibited for non-aerobatic aircraft.

**negative-g valve** Inverted-flight valve.

**negative image** Apart from photographic meaning, transposition of blacks and whites in TV, EO or IR picture.

**negative pole** Cathode, or S-seeking pole of magnet.

**negative pressure relief valve** Prevents dP in pressurized aircraft becoming negative.

**negative rolling moment** Tending to rotate aircraft anticlockwise, seen from rear.

**negative stability** See *instability*.

**negative stagger** Backwards stagger; lower plane in advance of upper.

**negative stall** Stall under negative g; this regime provides lower left boundary of basic manoeuvre envelope.

**negative sweep** See *forward sweep*.

**negative terminal** That from which electrons flow; thus towards which ‘current’ flows.

**negative-torque signal** Indication of fault characterized by driven member (eg propeller) tending to drive driving input (eg turboprop).

**negative yaw** Rotating aircraft anticlockwise about z-axis seen from above.

**NEGL** Negligible.

**negotiation** Commercial discussion preceding contract.

**negotiation threshold** Point in escalating conflict at which either participant is likely to draw back and initiate negotiation.

**NEH** Code: ‘I am connecting you to a station accepting traffic for station you request’ (ICAO).

**N18** Powder metallurgy nickel alloy, MPt 1,225–1,323°C.

**NEIA** Net-enabled information access.

**NEL** National Engineering Laboratory (UK).

**NEMA** National Electrical Manufacturers Association (US).

**nematic** See *liquid crystal*.

**NEMO, Nemo** Navy [or Naval] Earth Map Observer.

**NEMP** Nuclear electromagnetic pulse.

**Nems, NEMS** Nano-electromechanical system[s].

**Nemspa** National EMS Pilots’ Association [offices, Alexandria, VA22314] (US).

**NEO** 1 National energy outlook (US).

2 Near-Earth object[s].

3 Non-combatant evacuation, or extraction, operation.

4 Network-enabled operations.

**neodymium** Nd, silver metal, density 7.0, MPt 1,021°C, used in lasers and in permanent magnets of highest known energy level [see next].

**Neomax** Magnetic material Nd<sub>15</sub>Fe<sub>77</sub>B<sub>8</sub>.

**neon** Ne, inert gas, density 0.9×10<sup>-3</sup>, BPt –246°C.

**Neoprene** Family of synthetic rubbers (polymerized chloroprenes) resistant to hydrocarbon fluids.

**NEP** 1 Noise equivalent power.

2 Nuclear-electric propulsion.

3 Night enhancement program, or package.

4 Nuclear explosive package (ICBM).

**Nepal drop** Low-level airdrop of cargo, usually food, in which about 20 sacks are attached to strong plywood sheets by cords which break on impact.

**neper** Unit (Napier) expressing scalar ratio of two

currents,  $N = \text{nat log } (I_1/I_2)$  nepers, = 8.686 dB. Applicable to all scalar ratios of like quantities.

**nephelometer** Measures light scattering by fine particles in suspension.

**nepheloscope** Measures temperature changes in gases rapidly compressed or expanded.

**nephometer** Convex mirror divided into one central and five radial parts for estimating cloud cover.

**nephoscope** Optical instrument for measuring direction and angular velocity of cloud motion.

**NEPP** Normal and emergency preflight procedures.

**Neptco** Process for manufacturing soft-skin composite in which main fibres are pultruded rods.

**Nerc, NERC** 1 New EnRoute Centre (Swanwick, NATS, UK).

2 Natural Environment Research Council (UK).

3 National Environmental Research Centre (EPA).

**NERO** 1 National Energy Resources Organization (US).

2 Nederlandse Vereniging voor Raketonderzoek.

**Nerva** Nuclear energy, or engine, for rocket-vehicle applications; May 1961.

**NES** 1 Netcentric Enterprise Services, moves nets such as GCCS and GLCS into web-based environment.

2 National Estimating Society [Huntsville, AL] (US).

**Nesacc** North, east and southern area control centres (China).

**NESC** 1 Naval Electronics Systems Command (USN).

2 National Environmental Satellite Center (NOAA).

3 NASA Engineering & Safety Center (LaRC, 2003–).

**NESDIS, Neddis** National environmental satellite data and information service or system (NOAA).

**NESN** NATO English-speaking nations.

**Nest** Non-expendable space transport [S adds system].

**Nesterov loop** Flying 360° circle in horizontal plane whilst rolling continuously (1913).

**NET** 1 Network entity title.

2 Network enabled technologies.

**net** 1 Tailored mesh forming structural link between traditional gas balloon envelope and useful load.

2 Electronic, optical or other telecommunications system(s) forming single service covering designated area accessible at any point.

**net area** 1 Traditional gross area (normally of wing) minus projected horizontal area of fuselages, booms, nacelles, pods, etc.

**net dimensions** Those of final shape, thus a \* moulded core.

**netcentricity** Conduct of future warfare governed by an integrated ISR network using aircraft and UAVs; hence netcentric warfare, etc.

**NETD** Noise equivalent temperature difference., or differential.

**net dry weight** Basic weight of engine or other device calculated according to various rules but always excluding fluids (fuel, lubricant, coolant, etc) and usually all accessories, protective systems, instrumentation systems, etc, not essential for device to function.

**net flightpath** That followed by aircraft, esp. aeroplane, after application of factors (particularly for average-aircraft performance and average pilot skill); ie gross flightpath fully factored.

**net height** That at any point on net flightpath, esp. during takeoff and climb-out.

**Netma** NATO Eurofighter and Tornado Management Agency.

**net performance** Gross performance factored to take account of temporary variations (from whatever cause) and pilot handling skill.

**net propulsive force** See *net thrust*.

**net radiation factor** Percentage of radiant energy emitted by one surface or volume that is absorbed by another surface or volume.

**net shape** Finished shape [many refinements, depending on tolerances and which dimensions are chosen].

**nettage decrement** Percentage difference between gross and net performance.

**net thrust**  $F_n$ , effective thrust of jet engine numerically equal to change in momentum of fluids (air/gas and fuel) passing through engine (plus, in engine operating with choked nozzle, extra aerodynamic thrust generated in nozzle).

**netting** Electronically interlinking numerous related stations, such as SAM launchers or battlefield communications centres, which are dispersed randomly over a wide area and move relative to each other.

**net weight** Loosely empty weight, but usually excluded from aerospace usage.

**net wing area** Gross area minus projected plan area of fuselage, nacelles over wing and other non-aerofoil parts.

**network** System of communications linking computers and other management tools.

**network carrier** Large airline serving many cities or countries, opposite of hub/spoke.

**network centric warfare** Radical new command, control and communications systems, with every post, vehicle [including airborne] and sensor interconnected. A core objective is to find targets using multiple—possibly widely dispersed—sensors and provide near-instantaneous target data.

**network enabled capability** Local or global linkage of sensors, decision-makers and weapons in order to achieve rapid and correct overwhelming effect.

**neutral networks** Loosely follow architecture of human neurons and their dendritic connections; *NNP* is a pioneer multiple instruction/multiple data neural processor.

**neutral-angle intake** An inlet whose mouth is shaped to minimise variation of ram pressure with airspeed.

**neutral area** “A strip of ground of specified width adjoining the sides of a runway” (B.S., 1940).

**neutral axis** Locus of points within structural member at which bending imposes neither tension nor compression.

**neutral burning** Combustion of solid propellant grain in which exposed surface [and thus thrust] remains almost constant over burn-time.

**neutral engine** Main propulsion engine devoid of dressing peculiar to either particular aircraft type or to left or right installation in multi-engined aircraft, and thus available for quick completion for desired installation.

**neutral equilibrium** Normally means that system will tend to stay in most recently commanded attitude or condition, without oscillation, unstable divergence or recovery of previous condition.

**neutral flame** Neither oxidizing nor reducing.

**neutral hole** Aperture cut from sheet, esp. in wall of internally pressurized container (usually taken to be cylindrical) shaped so that peak stress around periphery is minimised and stress in surrounding material is as if hole

did not exist. Credited to E.H. Mansfield, RAE. Normally approximates to ellipse, with minor axis parallel to cylinder longitudinal axis.

**neutralized controls** Usually taken to mean centralized.

**neutralized track** Air intercept code: target is ineffective or unusable.

**neutral point** 1 Location of aircraft, esp. aeroplane, c.g. at which longitudinal stability would be neutral [ $C_m = 0$ ]; rear extremity from which static margin is measured. More strictly, stick-fixed \*\* is c.g. position at which stick movement to trim a change in speed is zero; stick-free \*\* is c.g. position at which stick force to trim a change in speed is zero.

2 Lagrangian point.

3 Any sky direction where polarization of diffuse (ie not from specific source) radiation is zero.

**neutral stability** See *neutral equilibrium*.

**neutrino** Elusive small particle, rest mass 0, spin  $\frac{1}{2}$ .

**neutron** Particle of atomic nucleus having no charge and mass  $1.6749286 \times 10^{-24}$  g (proton is  $1.6726231 \times 10^{-24}$  g).

**neutron bomb** Enhanced-radiation weapon.

**neutron radiography** NDT method similar to X-ray inspection and ‘photography’ but using beam of neutrons.

**Nevatron** Possible future gyro: magnetic field guides atoms at near-zero temperature round 20-mm ring.

**NEW** 1 NATO electronic warfare [AC adds advisory committee, TS training system].

2 Network-enabled warfare.

**Newac** NATO Electronic Warfare Advisory Committee.

**new blue** Recruit (USAF).

**Newhaven** Visual marking of ground target (RAF WW2).

**new heading** R/T for “that is my next routeing”.

**newton** SI unit of force,  $= 1 \text{ kg m s}^{-2} = 10^5 \text{ dyn} = 7.233 \text{ pdls} = 0.224809 \text{ lbf} = 0.10197 \text{ kgf}$ ; written without initial capital, but symbol N.

**Newtonian flow** That in extremely rarified gas where mean free path is in order of metres and hypersonic body is surrounded by incident arriving molecules passing between those bouncing off surface; also called free-molecule flow.

**Newtonian mechanics** Those based on Newton’s laws of motion, in which mass and energy are unrelated.

**Newtonian speed of sound** Relation  $a = \sqrt{\rho p}$  where p is pressure and  $\rho$  density.

**Newtonian stress** Fundamental shear stress in fluid, given by law  $\tau = \mu \frac{du}{dy}$  where  $\mu$  is fluid viscosity and u is fluid velocity at distance y from fixed surface.

**Newton’s laws** Briefly: (1) body at rest remains at rest unless acted upon by outside force, (2) change in motion (momentum) is proportional to applied force, and (3) to every action (force or change in momentum) there is equal and opposite reaction.

**Newts** Naval electronic-warfare training system (USN).

**Nex, NEX** Next-generation (prefix, DoD).

**Nexcom** Next-generation air/ground communications [P adds program] (FAA).

**Nexrad** Next-generation radar.

**NEXST** Next-generation supersonic transport.

**Next** NASA evolutionary xenon thruster.

**Nexwos** Next-generation weather-observing system (FAA, 1995).

**NEZ** No-escape zone.

**NF** 1 French material specification prefix.  
 2 Night fighter.  
 3 Notched filter.  
 4 Norsk Flygerforbund [ALPA, office Oslo] (Norway).  
**Nf, NF** 1 Fan rpm.  
 2 Relationship between power-turbine speed and gearbox governor.  
**nF** Nanofarad.  
**n.f.** 1 Noise factor (radio).  
 2 Negative feedback.  
**NFA** Near-field aerodynamics and aerodynamics.  
**NFAC** National Full-scale Aerodynamics Complex (NASA Ames).  
**NFCS** Nuclear forces communications satellite.  
**NFCT** Non-Federal control tower (FAA).  
**NFD** National flight data [C adds Center, D Digest, PS processing system] (FAA).  
**NFE** Near-field effects.  
**NFER** Near-field electromagnetic ranging.  
**NFF** No fault found.  
**NNFP** National aeronautical research programme (Sweden).  
**NFG** The Newfoundland Group, airline labour watchdog (US).  
**NFH** NATO frigate helicopter.  
**NFIP** National foreign intelligence program (US).  
**N-fire , NFIRE** Near-field IR experiment (KEI).  
**NFIS** Navigational flight inspection system.  
**N5+** Refractory NiCo alloy used for monocrystal engine parts.  
**NFKK** Women's aero association (J).  
**NFL** No-fly list (TSA).  
**NFLC** National Flying Laboratory Centre [Cranfield], (UK).  
**n.f.m., NFM** Narrow-band FM.  
**NFMS** Navigation and flight-management system.  
**NFN** 1 Near-field noise.  
 2 Naval fires network (USN).  
**NFO** Naval flight officer (USN).  
**NFOV** Narrow field of view.  
**NFP** 1 Net flightpath.  
 2 No-feathering plane, in which an observer would see no variation in helicopter rotor cyclic pitch.  
**NFPA** National Fire Protection Association [office, Boston, MA] (US); many annexes, eg \* 417 specifies resistance of ADB (2) to an external fire.  
**NFRL** Naval Facilities Research Laboratories (USN).  
**NFS** 1 Network file system.  
 2 National Fire Service (UK, WW2).  
 3 Near-field source.  
**NFSN** NATO French-speaking nations.  
**NFT** 1 Night-flying test.  
 2 Navigation flight test.  
**NFTC** NATO flying training in Canada [office, Ottawa K1P 6L7].  
**NFTM** Noise and flight-track monitoring.  
**NFU** Non-formed unit (EAW).  
**NFWS** Navy Fighter Weapons School [NAS Miramar] (US).  
**NFZ** No-fly zone.  
**NG** 1 Natural gas, hence LNG = liquid natural gas.  
 2 Next generation.  
**NG, Ng** Nitroglycerine.  
**Ng** Gas-generator rpm., or number of cycles.

**n<sub>G</sub>** Vertical acceleration due to gust.  
**NGA** National Geospatial-intelligence Agency [until 2004 was NIMA/Nima] (US).  
**NGAGC** See *Nexcom*.  
**NGATM** New-generation air-traffic manager.  
**Ngats** Next-Generation Air Transportation [or Traffic] System (JPDO).  
**NGAUS** National Guard Association of the US.  
**NGB** National Guard Bureau (US).  
**NGC** Nylon/graphite composite.  
**NGCCS** Next-generation command and control system.  
**NGDC** National Geographic Data Center (NOAA).  
**NGDR** Next-generation [broadband] digital receiver.  
**NGE** Non-ground effect.  
**NGEA** Nouvelle génération école/appui [combat-aircraft trainer] (F).  
**NGIFF** New-generation IFF.  
**NGL** Natural-gas liquids.  
**NG-LRS** Next-generation long-range strike.  
**NGLS** Next-generation launch system.  
**NGLT** Next-generation launcher technology.  
**NGM** Nested-grid model [weather computer program].  
**NGO** Non-government organization (US).  
**NGPS** Navstar global positioning system.  
**NGR** 1 Night-goggle readable (ie at IR level).  
 2 Next-generation GPS receiver.  
 3 Nitrogen gas reduction.  
**NGS** 1 Naval gunfire support.  
 2 National Geodetic Survey (NOAA).  
 3 Nitrogen generation system.  
 4 National [computer] Grid Service (UK).  
**NGSA** Next-generation single-aisle.  
**NGSP** National geodetic-satellite program (NASA).  
**NGSST** Next-generation SST.  
**NGST** Next-generation space telescope, following Hubble.  
**NGT** 1 New-generation trainer.  
 2 Night.  
**NGTA** Next-generation twin-aisle.  
**NGTCS** Next-generation target control system.  
**NGTE** National Gas Turbine Establishment (formerly at Pyestock, UK).  
**NGTOS** Next-generation theater observation system (USN).  
**NGV** Nozzle guide vane.  
**NGW** Nuclear gravity weapon.  
**N<sub>H</sub>** HP rpm, engine speed, also written NH or N<sub>2</sub>.  
**NHA** Naval Helicopter Association [office, Coronado, CA92178-0578] (US).  
**NHC** 1 Navigator's hand controller.  
 2 National Hurricane Center (NWS).  
**NHCR** National Flying League (J).  
**NHE** Notes and helps editor.  
**NHGA** National Hang-Gliding Association (UK).  
**NHMF** National Heritage Memorial Fund (UK).  
**NHP** Non-handling pilot.  
**NHR** National Flying Association (J).  
**NHS** National hypersonics strategy (US).  
**NI** Noisiness Index (South Africa, Van Niekerk/Muller, 1969; see *noise*).  
**Ni** Nickel.  
**N<sub>i</sub>** Number of stress reversals to fail specimen.

**NIAC** 1 National Infrastructure Advisory Council [counter-terrorism] (US).

2 Northern Ireland Aerospace Consortium.

3 Navigation interface and autopilot computer.

**NIAG** NATO Industrial Advisory Group.

**Nial** Nickel/aluminide diffusion coating.

**NIAR** 1 National Institute for Aviation Research [Wichita State University, Kansas 67260-0093](US).

2 No inspection after rework.

**NIAST** National Institute for Aeronautics and Systems Technology (South Africa).

**NIAT** 1 MAP-sponsored factory (USSR).

2 National institute for engineering research (R).

**Ni/Au** Nickel gold.

**NIB** Neodymium, iron, boron, permanent-magnet material.

**nib** 1 Any substantially axial fore or aft-pointing fairing, usually with concave surfaces.

2 Aft-pointing fairing between, and projecting behind, two closely spaced jetpipes.

3 Forward-pointing extension at inner end of fixed glove on VG aircraft.

**nibbler** Machine tool for eating away edge of sheet by repeated local vertical shearing, in some cases with ability to impart lateral compression or joggling.

**nibble** An approach to very limit of g-induced stall in air combat, also see next entry.

**nibbles** Stall testing of aircraft in which AOA is increased in small increments at 1 g, culminating in fully developed stalls.

**NIBS** Neutral industry booking system [IG adds interest group].

**NIC** 1 Newly industrializing country.

2 New installation concept.

**Nicad** See *nickel/cadmium*.

**Nicalloy** Nickel-iron alloy, low initial but high maximum permeability for transformers, etc.

**Nicalon** Proprietary SiC alloys.

**Nicap** National Investigation Committee on Aerial Phenomena (US).

**Nicasil** Ni/Cd/Si.

**Ni/Cd, Nicad** Nickel/cadmium electric battery.

**NICE, Nice** 1 NAT(2) implementation manager, or management, cost/effectiveness.

2 NATO internet cryptography equipment.

3 Network-integrated cabin equipment,

**Nicerol** Widely used protein foam compound for fire-fighting.

**Nichols diagram** Plots stability of rigid aeroplane showing open-loop frequency response in each axis following control-surface deflection.

**Nichrome** American heat-resisting alloys (c 85% Ni, 15% Cr), eg for resistance wire.

**nickel** Ni, silver-white magnetic metal important in corrosion-resistant alloys; density 8.9, MPt 1,453°C.

**nickel/cadmium battery** Cell having KOH (potassium hydroxide) electrolyte, positive plates of nickel hydroxide and negative plates of cadmium hydroxide.

**Nicmos** Near-IR camera and multi-object spectrometer.

**NICP** Navy inventory control point (USN).

**Nicral** Nickel/chromium/aluminium plasma spray.

**Nicosil** Ni/Cr/Si.

**NICS, Nics** NATO integrated communications system;

O added “Organization”, MA added ‘Management Agency’; became NACISA.

**NID** National interest determination.

**Nidjam** Nav/ident deception jammer.

**NIDTS** NATO integrated digital transmission system.

**NIE** National Intelligence Estimate[s] (US).

**NIF** 1 National infrastructure forum (UK).

2 National Ignition Facility [laser research] (LLNL).

**NIFA** National Intercollegiate Flying Association [office, Cahokia, IL] (US).

**NIFC** National Inter-Agency Fire Center (US).

**Ni/Fe, Nife** Nickel/iron electric battery.

**NIG** NATS Infringement Group (UK).

**night airglow** See *airglow*.

**night and all-weather** Strictly, interceptor can be used at night or in any weather, seldom true at time this term was in use; more accurately meant night and rain or snow but with acceptable landing minima.

**Night cap, NCAP** Night combat air patrol (DoD).

**night effect** Phenomenon most noticeable near sunrise and sunset when directional radio signals (D/F, radio range, VOR) give false readings thought to be due to variations in ionosphere.

**night fighter** Aircraft intended to intercept other aircraft at night; today implicit in term ‘fighter’ or ‘interceptor’.

**night-flying chart** Special editions of regional charts, usually 1:1,000,000, eliminating all detail unseen at night but emphasising lights, navaids and fields with night facilities (US).

**Night Owl** Night ground-attack mission.

**Night rating** Enables holder of PPL to fly at night as PIC with passenger[s].

**night vision** Human seeing after eyes have had time fully to adapt to near-absence of light, with irises fully open.

**NIH** Not invented here, rejection of foreign developments.

**NIHL** Noise-induced hearing loss.

**NiH<sub>2</sub>** Nickel/hydrogen electric battery.

**NII** 1 Scientific test institute (USSR, R; many, each covering one subject).

2 National, or NATO, information infrastructure.

**NIID** Defence manufacturers association (Netherlands).

**NIIR** Radio engineering research institute (R).

**NIIRS** National imagery interpretability rating scale (US, runs 0 to 9).

**NIL** 1 Code: ‘I have no message for you’ (ICAO).

2 National Information Library (NIMA).

**NILE, Nile** NATO improved link 11.

**NIM** National Imagery & Mapping: A adds Agency, C college (DoD, Bethesda, MD).

**Nima** See previous; now *NGA*.

**nimbostratus, Ns** Thick dark blanket cloud in low/middle band (2,000–6,000 m), mainly ice crystals and supercooled water, large horizontal extent, usually rain.

**nimbus** Not normally used as cloud type but as adjective meaning rain-producing, as in Cb and Ns.

**Nimby** Not in my back yard.

**NIMCIS** New integrated Marines communications and information system.

**Nimocast** British casting alloys, composition akin to Nimonic.

**Nimonic** Family of refractory and anticorrosive alloys based chiefly on nickel, originally Mond patents,

important where creep-resistance essential; Inconel, Hastelloy, Udimet and Waspalloys related.

**NIMS, Nims** National airspace system Infrastructure Management System (FAA).

**90-minute rule** Certification requirement that twin-engined passenger aircraft may fly transoceanic sectors provided they are never more than 90 minutes from an emergency alternate.

**The 99s** US women in aviation educational charity [sometimes spelt out].

**NINST** Non-instrument [runway].

**niobium** Nb, shiny grey metal, density 8.6, MPt 2,468°C.

**NIOSH** National Institute for Occupational Safety and Health (US).

**NIP** Network interface processor.

**nip** 1 Local compression between adjacent components, esp. that used to secure a third part, eg compressor rotor between discs.

2 Local compression caused by deflection under operating conditions, eg axial movement at periphery of conical compressor or turbine disc.

**NIPC** National Infrastructure Protection Center (US).

**NIPP** National Infrastructure Protection Plan [November 2005–] (US).

**Niprnet** Non-classified information protocol router network (DoD).

**NIR** 1 Near infra-red; S adds spectrometer.

2 Network interface router; V adds VHF data-link.

**NIS** 1 NATO identification system.

2 Nose-in stand (airport ramp).

3 Not in stock.

4 Not in service.

**Nisac** National Infrastructure Simulation and Analysis Center (LASL/Sandia, a response to 9-11).

**NISC** National IFF/SSR Committee (CAA).

**Nisil** Ni/Si.

**NISR** Non-traditional intelligence surveillance and reconnaissance.

**NIST** National Institute of Standards and Technology (US, previously NBS).

**nit** Name, not normally used, of SI unit of luminance, cd/m<sup>2</sup>.

**NITE** Night imaging and threat evaluation.

**Nitenol** Alloys of Ni and Ti, variable properties.

**Nite-Op** Night-imaging through electro-optics.

**NITEworks** Pronounced nightworks, network, integration, test and experimentation works (UK, MoD and industry July 2003–).

**NITF** National imagery transmission format.

**Nitralloy** British steels for nitrided parts with small amounts of Cr, Al, Mn, C, Si and possibly Ni and Mo.

**nitrate dope** Aircraft fabric dope comprising cellulose fibres dissolved in nitric acid, plus pigment, thinner, etc.

**nitriding** Surface hardening of steels by prolonged heating in nitrogen-rich atmosphere.

**nitrogen** Generally unreactive gas forming 78.03% by mass of sea-level air, symbol N<sub>2</sub>, BPt -195.8°C, density 1.25 g l<sup>-1</sup>, 0.07807 lb/ft<sup>3</sup>; dry gas important as inert purging medium, liquid LN<sub>2</sub> used as cryogenic heat-transfer fluid.

**nitrogen desaturation** Human condition caused by nitrogen deficiency.

**nitrogen narcosis** Human condition caused by apparent reaction between tissue fats and nitrogen under pressure.

**nitrogen tetroxide** N<sub>2</sub>O<sub>4</sub>, most common storable liquid

oxidant, often called NTO, BPt 21°C, Isp 285 with UDMH, 290 with hydrazine.

**nitroguanidine** Major constituent of many gun propellants, commercial name Picrite.

**Nitrojet** Versatile supersonic jet of LN<sub>2</sub> used for cutting and surface treatment.

**nitromethane** CH<sub>3</sub>NO<sub>2</sub>, oily liquid, monopropellant.

**nitrous oxide** N<sub>2</sub>O ‘laughing gas’, used as source of oxygen in power-boosting piston engines in WW2.

**NIU** 1 Nitrogen inerting unit.

2 Network, or navigation, interface unit.

**NIVO, Nivo** Dark green night-bomber paint, later RDM2 (RAF).

**NIVR** Netherlands Institute for Aerospace Development.

**NIW** Night and in-weather.

**NJ** Noise jamming.

**NJE** Nominal jet edge.

**NJG** Nachtjagdgeschwader, night-fighter group [US = wing] (G, WW2).

**NJSK** Private Pilots’ Association (J).

**NKAP** State commissariat for aviation industry (USSR).

**NKF** Non-kinetic fires.

**NKK** Nihon Koku Kyokai [Aeronautical Association; main office, Tokyo 105-0004] (J).

**NKG** Nihon Kakai Gakkai [Society of Mechanical Engineers; office, Tokyo] (J).

**NKGK** Nihon Koku Gijutsu Kyokai [Society of Aeronautical Engineers; office Tokyo] (J).

**NKO** State commissariat for defence (USSR).

**NKRR** Nihon Kikyu Remmei [Balloon Federation; office Tokyo] (J).

**NKSK** Aero Engineers’ Association (J).

**NKTP** State Commissariat for Defence (USSR, R).

**NKUGK** Society of Aeronautical and Space Sciences (J).

**NKVD** State commissariat for internal affairs (now KGB).

**N/kW** Newtons per kilowatt, fundamental performance measure of Hall-effect thrusters.

**NL** 1 Natural language.

2 Normenstelle Luftfahrt (G).

**NL** 1 LP rpm engine speed [N<sub>1</sub> preferred].

2 Normal load factor.

**NLA** 1 New large aeroplane study group.

2 Noise-level analyser.

**NLAW** Next-generation light anti-armour weapon.

**NLB** Nose loader, or loading, bridge; see *bridge*.

**NLC** Noctilucent cloud.

**NLCM** Non-lethal countermeasures.

**NLES** Navigation land Earth satellite.

**NLF** 1 Natural laminar flow.

2 Normal load factor.

**NLG** 1 Nose landing gear.

2 Noise Liaison Group (UK).

3 Non-linear gearing.

**NLL** No load lubrication.

**NLM** Network-loadable module.

**NLO** No local, or live, operator, also called nulls.

**NLOS** Non-line of sight; CA adds combined arms.

**NLP** Network layer protocol.

**NLR** Nationaal Lucht-en Ruimtevaartlaboratorium [Amsterdam NL-1059] (Netherlands).

- NLRB** National Labor Relations Board (US).
- NLRGC** Aeromedical research centre (Netherlands).
- NLS** New launch system (NASA/USAF).
- NLSIM** Non-linear simulation.
- NLT** Not less than.
- NLUS** Navy League of the US [Arlington, VA22201–3308] (US).
- NLW** Non-lethal weapon.
- NM, n.m., nm** 1 Nautical mile; nm preferred except by ICAO. Note confusion with nanometre.  
2 Network management.
- Nm** SI unit of torque or moment, Newton-metre = 0.73756 lbf·ft.
- nm** 1 Nanometre ( $10^{-9}$ m).  
2 Nautical mile[s], or n.m.
- NMAC** Near mid-air collision.
- NMB** 1 National Mediation Board (US).  
2 No mechanical backup.
- NMC** 1 Naval Missile Center (Pt Mugu, CA).  
2 Not mission-capable.  
3 Naval Materiel Command (USN).  
4 Satellite network management centre.  
5 National Meteorological Center (NWS).  
6 Net[work] monitoring and control.
- NMCC** National Military Command Center (US).
- NMCCD** Network-management category class diagram.
- NMCI** Navy, Marine Corps intranet (US).
- NMCP** Navigator's missile-control panel.
- NMCS** National military command system (US).
- NMD** National missile defense [i.e., against ICBMs], LSI added lead systems integration; in 2002 replaced by GMD.
- NMDPS** Network-management data-processing.
- NMEA** National Marine Electronics Association (US).
- NMF** Network management function.
- NMG** Numerical master geometry.
- NMH** Nickel-metal hydride.
- NMIC** National Military Intelligence Center (US).
- NMIRS** Network management interface requirements specification.
- NMKB** Model Aeronautics Association (J).
- NML** Normal.
- NMM** National mission model (US).
- NMO** National military objectives (US).
- NMOS** Negative (n-type) metal-oxide semiconductor, or silicon.
- NMP** 1 Navigation microfilm projector.  
2 Network management plan.  
3 Non-minimum phase [flight control].
- nmpg** Nautical miles per gallon [gallon not specified].
- NMR** Nuclear magnetic resonance.
- NMRS** Numerous.
- NMS** 1 Navigation, or network, management system.  
2 Noise monitoring system.  
3 Non-motion simulator.
- Nms** SI unit of angular momentum, Newton-metre-second.
- NMSB** Non-modification Service Bulletin.
- NMSI** National Museum of Science and Industry [“the Science Museum”], London.
- NMT** 1 Non-manoeuvring target.  
2 Not more than.  
3 Noise-monitoring terminal.
- NMU** Navigation management unit.
- NN** Network node; see *NNSS*.
- NNA** Neutral and non-aligned.
- NNC** Non- [or not] noise certificated aircraft.
- NNE** Noise and number exposure.
- NNI** 1 Noise and number index (see *noise*).  
2 National nanotechnology initiative (US).
- NNK** Non-nuclear kill.
- NNMSB** Non-nuclear munitions safety board.
- NNP** Neural-network processor (SBIR/USN).
- NNR** Hot-air Balloon League (J).
- NNSA** National Nuclear Security Administration system (US DoE).
- NNSOC** Naval Network and Space Operations Command (USN).
- NNSS** Network-node switching system.
- NNTS** Nevada Nuclear Test Site.
- NO** 1 Nitric oxide, colourless gas.  
2 Normally open.  
3 Not available, not operative.  
4 Notice to Airmen.  
5 Night observation aircraft category (USA 1919–24).
- No** Normal operating [e.g., point on graphical plot].
- N<sub>o</sub>** Characteristic frequency, esp. centroid of power spectral density distribution.
- NO<sub>2</sub>** Nitrogen dioxide (peroxide), pungent brown gas.
- N<sub>2</sub>O<sub>4</sub>** Nitrogen tetroxide.
- NOA** 1 Non-operational aircraft.  
2 Not organizationally assigned (aircraft stored for future use).  
3 New obligation(al) authority (US).
- NOAA** 1 National Oceanic and Atmospheric Administration (US).  
2 New optimisation approaches for air-traffic flow management (Euret).
- NOACT** National Overseas Air-Cargo Terminal (USN).
- NOAX, No-ax** Non-oxide adhesive experimental [repairs in space based on SiC powder].
- Noball** Code name for German flying bombs and rockets, hence \* targets were mainly launch sites.
- no brains** Aircraft handling always predictable, pilot can relax.
- no-break supply** One whose emergency standby system comes on-line instantaneously, in theory without losing one waveform or pulse in coded train.
- NOC** 1 Network operations centre.  
2 Notice of change.
- Nocar** North Atlantic oceanic concept and requirements.
- Nocas** Night-operation[s]-capable avionics system.
- Nocom** No communications (Agars).
- noctilucent cloud** Appearing self-luminous at twilight in high [ $50+^\circ$ ] latitudes, caused by particulate matter at height 75+ km.
- Nocus** North continental US (Loran chain).
- NOD, Nod** Night observation device [LR adds long-range].
- nodalisation** Equipment of helicopter with antivibration couplings between rotor head and fuselage.
- Noda-Matic** Patented vibration-isolation system in which helicopter fuselage is suspended from rotor via arrangement of tuned vibrating masses which cancel out rotor vibrations (Bell).

**nodding**

**nodding** Deflection under vertical acceleration of masses cantilevered ahead of or behind main structure, eg forward fuselage (in flight only) or engine on wing pylon well ahead of leading edge.

**nodding aerial** One oscillating only, or principally, in vertical plane, eg HFR.

**noddy cap** Protective cover for delicate (eg IR-homing) missile nose (RAF, colloq.).

**NODE** National operational [ATC] display equipment.

**node** 1 In structures, location of point where load variation causes only rotation but no linear deflection.

2 Point, line or surface in wave system where some major variable has zero amplitude.

3 In any network, terminal point or point where two channels branch.

4 Intersection of orbit of satellite with plane of orbit of primary.

5 Location in mobility system where movement is originated, processed or terminated (DoD).

**NODLOR** Night observation device, long-range.

**no-draft forging** One forged essentially to finish dimensions, thus needing little if any machining.

**NODS** 1 Night observation and detection system.

2 Near-object detection sensor.

**nodular cast iron** See *SG cast iron*.

**NOE** Nap of the Earth, ie flight as low as possible over undulating terrain.

**noed** Knot (F).

**no-escape zone** In AAM engagement with fast target, often less than 0.25 maximum AAM range.

**NOF** International Notam Office (ICAO).

**no-feathering axis** Axis of swashplate, about which there is no feathering moment or first-harmonic variation of cyclic pitch.

**no-feathering plane** That in which an observer sees no variation in cyclic pitch [helicopter rotor].

**no-flare landing** Aeroplane landing (rarely, other aircraft) in which approach trajectory is continued in essentially straight line until landing gear hits ground.

**no-fly list** Passengers who, for whatever reason, are permanently denied boarding (TSA).

**no-fly zone** Airspace prohibited to the aircraft of that country, and [usually] patrolled by aircraft of a hostile country to ensure compliance.

**NOFORN** No foreign [dissemination of information] (US).

**Nogaps** Navy operational global atmospheric prediction system (USN).

**no-go gauge** One whose linear dimension (between faces, threads or diameter) is just below smallest permitted limit for part.

**no-go item** One whose failure or absence from aircraft prohibits takeoff according to operating rules (though not necessarily rendering it unairworthy).

**NOGS, Nogs** Night observation gunship system.

**NOI** 1 Notice of intention.

2 Notice of Inquiry (US).

3 NCCT operations interface.

**NOISE** National Organization to Insure [*sic*] a Sound-controlled Environment (US).

**noise** 1 Noise in air. Basic unit is decibel, dB, 0.1 bel, measure of sound pressure above local atmosphere on logarithmic scale, usually related to starting reference pressure of  $2 \times 10^{-5}$  Nm<sup>-2</sup>. Sound pressure level L = 10 log

$p^2/p_o^2 = 20 \log (p/p_o)$  where p<sub>o</sub> is reference pressure and p actual measured pressure. Alternative is to use source power level L<sub>w</sub> = 10 log (W/W<sub>o</sub>) dB where W<sub>o</sub> is reference power commonly taken to be 10<sup>-12</sup> W (Watts). Pressure levels are more common, and log scale allows for million-fold increase in human perceived pressures, each 6 dB increment representing doubling of pressure level. Study of aircraft noise from 1952 led to many new measures in attempts to quantify noise nuisance. In 1953 CNR (Community Noise Rating) gave single-number scale based on public response to six generally quantifiable factors, and in 1957 NC (Noise Criteria) curves attempted to portray equal-loudness contours taking into account discrete tones, impulsive nature of some sounds and other variables. By this time many workers had tried to quantify human aural response to different frequencies and tones with mixed frequencies, and curves drawn in 1959 were labelled L<sub>PN</sub> (Perceived Noise Level) in units of dB(PN), sometimes written PNdB. Despite its complexity this gained major foothold, and virtually eliminated traditional measures (phon, relating sound pressure level to standard 1 kHz tone, and sone, loudness corresponding to 40 phons). Various weighted dB measures were introduced for the measures taken by meters with scales adjusted to equal-loudness contours for different overall pressure levels, these being called by various letters (thus, A-weighted = dBA = L<sub>A</sub>). In 1961 a series of surveys measured annoyance according to new measures, L<sub>PN50</sub> or L<sub>PN90</sub> (L<sub>PN</sub> exceeded by 50 or 90 per cent of aircraft), D<sub>85</sub> or D<sub>95</sub> (10 log time in seconds when sound pressure exceeded 85 or 95 dB), and N (number of aircraft 'passing over', latter criterion not being defined); result was single value for location called NNI (Noise and Number Index). Another 1961 unit was derived by splitting noise into one-third-octave bands and assigning each band a Noy rating by comparing with subjective noisiness of random noise centred on 1 kHz; individual Noy figures then added by method allowing for masking of one band by others and presented in PNdB. Further work allowing for particular features – such as intense pure tones, as from compressor blading, in otherwise broadband jet sound – led to use of L<sub>EPN</sub> (Effective Perceived Noise Level) measured in EPNdb (Effective Perceived Noise dB) in first-draft legislation in 1966, which led to FAR Pt 36 and subsequently closely similar ICAO Annex 16. By that time at least 20 national or local authorities had published research, including Australia's AI (Annoyance Index) = L<sub>PN</sub> + 10 log N; German Störindex Q based on dBA; French R-index = L<sub>PN</sub> + 10 log N-30; Dutch Total Noise Rating B based on log of summation of A-weighted pressure levels; American CNR (Community Noise Rating) based on many variables; California's CNEL (Community Noise Equivalent Level) using WECPNLs (Weighted Equivalent Continuous Perceived Noise Levels) varying with time of day and season; American NEF (Noise Exposure Forecast) = L<sub>EPN</sub> + 10 log N-K where K is 88 by day and 76 by night; the European Community's LDEN = noise from all sources [noise density] summed through each 24 h; South Africa's NI (Noisiness Index) = L × 10 log N + 10 log T<sub>a</sub>/T where T<sub>a</sub> and T are times; British TNI (Traffic Noise Index) and resulting L<sub>eq</sub> (Equivalent Average Sound Pressure Level), which led to L<sub>NP</sub> (Noise Pollution Level) = L<sub>eq</sub> + 2.56 σ where σ is standard deviation of dB fluctuations. Further measures

include LAX or  $L_{AX}$ , also called Senel (Single-Event Noise Exposure Level), SIL (Speech Interference Level),  $L_{TPN}$  (Tone-Corrected Perceived Noise Level), QC Quota Count established by London Heathrow, and various octave-band measures such as  $L_{300-600}$  (sound pressure level of band 300–600 Hz). Also see *Approach* \*, *jet* \*, *sideline* \*, *takeoff* \*.

**2** Background noise, that present in electronic amplification, communication or recording system in absence of signal.

**3** Thermal or Johnson noise caused by thermal agitation of charge carriers.

**4** White (Gaussian) noise, constant energy per unit bandwidth.

**5** Shot noise, fluctuation in charge-carrier current.

**6** Random noise (eg white, shot), uniform energy versus frequency distribution.

**noise (electronic)** **1** Effects of unwanted signals, including those generated within the system.

**2** Unwanted signals themselves.

**noise abatement** Deliberate procedures whose objective is minimization of noise perceived at ground. See next.

**noise abatement climb procedure** Maximum power from brakes-release to reach maximum attainable height AGL at point where ground track crosses boundary of built-up area, or location of listening post[s], there cutting back power to predetermined value just sufficient to maintain positive rate of climb [or 2% gross gradient] at  $V_2 + 15$  kt, until either built-up area is passed (some operators add 1 nm margin) or height AGL exceeds FL 50, where all-engines en-route climb is started.

**noise-absorbing material** Wide range of materials, usually used as non-structural linings, containing precisely sized cells which convert impinging sound energy into heat. Most are honeycomb sandwiches whose facesheet is perforated.

**Noise and Number Index** See *noise* (1).

**noise attenuation** Design and/or constructional features whose purpose is to minimise externally perceived noise. Techniques include addition of sound energy-absorbing linings, structural and aerodynamic features to change frequencies (eg of blades passing), mechanical design to reduce noise of bearings and gear teeth, and maximization of jet-nozzle periphery to increase rapidity of jet/atmosphere mixing.

**noise carpet** Area along aircraft track subjected to significant noise nuisance.

**noise certification** Certifying authorities in all but a few states require compliance with noise (and emissions in most cases) legislation for all new civil aircraft. Older aircraft have to comply at specified future dates.

**noise contour** Locus of points on ground at which specified air traffic results in particular perceived noise level, NNI or other noise nuisance. Traffic may be an average of arrivals or departures, a weighted average, a ‘noisiest’ aircraft type or an NNI figure taking frequency of flights into account.

**noise exposure** Not defined but related to noise levels, number of events (though Senel [see *noise* (1)] is one event) and time of day. Hence \*\* forecast.

**noise factor** Ratio of audio to thermal noise at same frequency.

**noise floor** Hypothetical minimum background noise level.

**noise footprint** Outline – generally footprint-shaped – of enclosed region around runway bounded by particular noise contour (often 90 EPNL) resulting from one landing and one takeoff by particular aircraft type operating at MTOW in ISA with measures taken at standard reference points and other locations.

**noise-reduction rating** Quantified measure of effectiveness of ear-defenders and aircraft headsets, unit is dB (EPA).

**noise reference points** In civil aircraft certification, three locations at which noise measures are taken. See *approach noise*, *sideline noise* and *takeoff noise*.

**noise-shield aircraft** One in which basic configuration, by design or as fortuitous bonus, places major portions of structure between main noise sources and ground.

**noise shielding** Portions of aircraft which, by design or fortuitously, are interposed between noise sources and distant observers.

**noise suppression** See *noise attenuation*.

**noise suppressor** Jet nozzle configured to reduce noise by increasing periphery of nozzle(s) and speeding mixing.

**no joy** Air intercept code: ‘I have been unsuccessful, or have no information’.

**NOK** Next of kin.

**NOL** Naval Ordnance Laboratory (USN).

**no lift** Stencilled instruction to ground personnel prohibiting application of lifting forces in local area of airframe.

**no-lift angle** That between no-lift direction and chord.

**no-lift direction** Angle of attack of two-dimensional aerofoil section at which lift is zero at low airspeeds. In practical wing \*\* varies from root to tip.

**no-lift wire** One bracing aerofoil from above; also called anti-lift wire.

**NOLO, nolo** No live, or local, operator, ie RPV is preprogrammed.

**NOM** National Operations Manager (ATCCC).

**Nomad** **1** Naval operations and maintenance aviation deck (USN).

**2** North Sea operations for mutual air defence (Raids).

**Nomex** Family of nylon/phenolic honeycomb structures, core resin-impregnated or coated paper.

**nominal acceleration point** That geographical location at which SST is to begin supersonic acceleration.

**nominal deceleration point** Location, varying with flight level and pitch attitude, at which SST is to begin deceleration to subsonic regime.

**nominal dimension** Various interpretations, typically that indicated on drawing before allowances, fits and tolerances.

**nominal gas capacity** That of gas cells of aerostat under defined conditions of inflation, ambient pressure and flight attitude.

**nominal jet edge** Boundary of discrete high-energy jet [eg from jet engine], conventionally taken as locus of points at which V is 10% of maximum.

**nominal performance** Published, or according to brochure.

**nominal pitch** See *standard pitch*.

**nominal weapon** Nuclear weapon having yield of approximately 20 kT.

**Nomos** Noise-monitoring system.

**NOMSS** National operational meteorological satellite system (NOAA).

# NON

**NON** Unmodulated NDB, transmitting no information.

**non-co-operative scorer** One whose ammunition is not modified, or does not need modification, for scoring purposes (ASCC).

**non-co-operative target** One without emissions, transponder or enhancement device.

**non-destructive testing** Methods of testing structures for integrity, esp. absence of manufacturing flaws or cracks, that do not impair serviceability or future life.

**non-developmental item** For practical purposes = off the shelf.

**non-differential spoilers** Main feature is that in airbrake mode all spoilers remain extended even in demand for roll (see *spoilers*).

**non-directional beacon** ADF ground station sending in 190–550 kHz range with keyed identification carrier.

**non-disclosure agreement** A legal document, signed by both [or all] parties, confirming that particular information, such as details of a bid, will not be transmitted to any non-signatory.

**non-effective sortie** Aircraft which for whatever reason fails to accomplish mission (DoD).

**non-ferrous** Metals and alloys not based on iron; term usually also excludes aluminium alloys and generally means coppers and brasses.

**non-fluff** Lint-free.

**non-flying prototype** Essentially mock-up built to full flight standard but, for whatever reason, not cleared or intended for flight.

**non-frangible wheel** Various techniques applied to design and fabrication of turbine disc to preclude possibility of rupture in overspeed or asymmetric condition.

**non-galvanic corrosion** That due to causes other than formation of electric cells; two important examples are fretting and microbiological.

**non-handling pilot** Member of civil flight crew not actually flying the aircraft.

**non-holding side** That on left side of holding course inbound towards holding fix.

**non-induced drag** Parasite drag.

**non-instrument runway** No ILS.

**non-interchangeable socket** Otherwise standard multi-pin or other sockets on device which ensure correct attachment of several connectors.

**non-kinetic-energy weapons** Lasers, microwaves, radio and similar wave systems.

**non-landing section** That length of runway from original threshold to displaced threshold.

**non-operating active aircraft** Allowance, usually 10%, above UE level to make up for IRAN, modifications and heavy maintenance (USAF).

**NONP** Non-precision approach runway.

**non-precision approach** Without electronic glideslope.

**non-precision instrument runway** Without ILS.

**non-program aircraft** Those in inventory other than active or reserve, eg experimental or withdrawn (DoD).

**non-radar** Self-explanatory, but can mean pilot is not using radar provided.

**non-return-flow tunnel** Simple wind tunnel open at both ends.

**non-rigid airship** Without rigid skeleton or stress-bearing covering around lifting cells which are stabilized by internal pressure.

# normal mode

**non-sched** Non-scheduled, ie not operating to a timetable (colloq.).

**non-structural** Other than primary or secondary structure; physical breakage of part would not imperil continued flight.

**non-traffic stop** Stop by transport aircraft in public service planned in advance for reasons other than to pick up or set down.

**non-volatile** Permanent memory.

**NOO** Naval Oceanographic Office.

**Nopac** North Pacific.

**NOPR** Notice of proposed rulemaking (FAA).

**NOPT, NoPT** No procedure turn required (FAA).

**Nora** Not only radar, for post-2006 Gripen.

**Norad** North American Air Defense Command (US/Canada, ratified 1958).

**Norcote** Spacecraft coatings based on phenolic resin and powdered cork.

**Norda, NORDA** No radio; also NORDO.

**Norden sight** Complex but highly accurate optical bombsight for high-altitude level bombing (US, 1941–49).

**Norden gear** Patented carrier-landing energy-absorption system.

**Nordo, NORDO** Alternative to NORDA, common in UK.

**NOREU** Northern Europe.

**Norfab** Fire-blocking aluminised material incorporating polyamide binder and glassfibre.

**NOR gate** Logic circuit usable as either AND or OR, depending on logic levels chosen to represent 0 or 1.

**NORM, Norm** Not operationally ready, because need for maintenance.

**normal** 1 Perpendicular to.  
2 Maximum continuous, eg engine rating (R).

**normal acceleration** Acceleration in vertical plane relative to aircraft, along OZ axis (eg as result of rotation about OY axis).

**normal axis** Vertical axis (note: may not be vertical but must be at 90° to longitudinal axis in plane of symmetry); also called OZ axis. Positive direction is downward.

**normal flight** Includes all manoeuvres except aerobatics or air combat.

**normal force** That measured on body in fluid flow at 90° to free-stream direction, symbol Z (rarely N).

**normal force coefficient** Dimensionless coefficient  $C_Z$  derived from Z; also written  $C_L \cos \alpha + C_D \sin \alpha$  where  $C_L$  and  $C_D$  are lift/drag coefficients and  $\alpha$  is angle of attack.

**normal glide** That at which glide ratio is maximum.

**normal gross weight** Usually same as MTOW; excluding all overload, emergency or alternate gross weights.

**normal horsepower** Not defined but generally same as rated hp.

**normalizing** Stress-relieving heat treatment usually comprising heating to above critical temperature followed by cooling in atmosphere.

**normal landing** For tailwheel aeroplane, three-point landing.

**normal load factor** That measured along normal axis [the usual meaning].

**normal loop** Loop, as distinct from inverted loop, starting and finishing in straight and level flight in upright attitude.

**normally aspirated** Unsupercharged.

**normal mode** Free vibration of undamped system.

## normal outsize cargo

## notch aerial

**normal outsize cargo** That having cross-section greater than  $9 \text{ ft} \times 10 \text{ ft}$ , which is C-130 or C-141 size (DoD).

**normal pressure drag**  $C_{Dp}$ , downwind resultant force coefficient.

**normal propeller state** Usual condition for helicopter under power, with rotor thrust in opposition to flow direction through disc.

**normal rating** Maximum continuous (R).

**normal shock** Shockwave at  $90^\circ$  to fluid flow direction.

**normal spin** Intentional spin entered from upright attitude and recoverable by centralizing controls or applying opposite rudder (US usually adds ‘within two turns’).

**normal turn** Procedure turn through  $360^\circ$  in two minutes.

**normal velocity** “The component velocity along the normal axis relative to the air”, (B.S., 1940).

**Normand theorem** On tephigram a dry-adiabatic line drawn through dry-bulb temperature, saturated-adiabatic through wet-bulb temperature, and dewpoint line through dewpoint temperature all meet at point which represents condensation level.

**NORS, Nors** Not operationally ready, spare parts (or supply, as an order).

**Norse** Nuclear, optical and radar [or radiation] signature evaluation [or estimation].

**Norte** Pronounced ‘nortay’, cold, dry north wind over Gulf of Mexico.

**northerly turning error** Transient errors in magnetic-compass reading caused by vertical component of magnetic field, at maximum when turning off northerly or southerly course. In N hemisphere compass is sluggish and lags behind when turning to L or R through northerly heading and races ahead when turning L or R through southerly. In US usually called magnetic turning error.

**north mode** Display, eg Automap or moving-map, has N at top.

**nor-wester** Line squalls [Bengal Assam].

**NOS** 1 Night observation sight, or surveillance.

2 National Ocean Service.

3 New old stock [obsolete but never used].

**NOSC** 1 NATO operations support cell.

2 Network operations and security center (USAF).

**nose** 1 Foremost part of vehicle, measured relative to direction of travel, excluding secondary structures or probes.

2 Leading portion of aerofoil, hence D-\*, \* rib.

**nose art** Decorative painting on aircraft forward fuselage or nose.

**nose battens** Radial stiffeners around nose of airship.

**nose-cap** 1 Removable nose, usually body of revolution, forming forward extremity of larger forebody.

2 Small spinner not extending further aft than front of blade roots.

3 Bow cap.

**nosecone** Essentially conical nose of high-speed vehicle, esp. fairing over re-entry vehicle.

**nose-dive** Dive at very steep (near-vertical) angle.

**nose down** 1 To push over from level flight into glide or dive.

2 To fly with fuselage in \*\* attitude, though not necessarily losing height.

**nose drive** Shaft drive to auxiliaries taken off front of gas-turbine engine along axis of symmetry, eg \*\* generator.

**nose entry** Shape of aircraft nose evaluated from aerodynamic and aesthetic viewpoints.

**nose gear** Forward unit of tricycle landing gear, no matter how far location is from nose.

**nose gearbox** Gearbox mounted on front (usually on centreline) of gas-turbine engine to drive auxiliaries, helicopter shafting or propeller (ie, turboprop); not mounted remotely on struts.

**nose-heavy** Tending to rotate nose-down when controls released.

**nose in** 1 To taxi and park facing terminal building or finger.

2 Aircraft thus parked (see *Agnis*, *Safeway*, *sidemarker*).

**nose landing gear** *Nose gear*.

**nose leg** Main leg of nose gear.

**nose over** To overturn (eg after landing tailwheel-type aircraft on soft ground) by rotating tail-up to inverted position.

**noseplane** Canard foreplane mounted at or ahead of nose; not applicable to conventional modern canards.

**noseplate** Metal plate on centreline of hang glider linking leading-edge tubes.

**nose radar** Radar whose aerials (antennas) are in nose of aircraft pointing ahead, esp. for use against targets ahead of aircraft.

**nose radiator** Piston-engine radiator immediately behind propeller or, esp., on front of pusher nacelle.

**nose ribs** Ribs along leading edge extending chordwise only as far as front spar.

**nose slice** Maximum-rate yaw induced by rudder.

**nose slots** Apertures in low-pressure region of high velocity around nose for discharge of fluid flow, eg cooling air.

**nose tow** Standard US Navy method of catapult link for accelerated carrier takeoff by pulling on nose leg.

**nose up** To rotate in pitch from level flight to climb.

**nosewheel** Wheel(s) of nose gear.

**no-show** Airline passenger who has booked ticket but fails to check in for flight.

**Nosig** No significant meteorological change (ICAO).

**NOSS** National Ocean Surveillance System (NRO).

**NO STEP** Stencilled warning on aircraft: do not put weight on this area.

**NOT** Naczelnia Organizacja Techniczna (Polish federation of engineering associations).

**Notal** Not to all.

**Notam, NOTAM** Notice[s] to Airmen, identified as notice or as Airmen Advisory, disseminated by all means to give information on establishment, condition or change in any aeronautical facility, service, procedure or hazard; suffix D distant [wide dissemination], L local (ICAO).

**Notam code** Standard code for transmitting Notams; eg QAUED 3 MC 5813 142359 is interpreted as ‘Met com operating frequency of 3 MHz will be changed to 5,813 kHz on 14th of this month at 23.59’.

**Notar** No tail rotor, torque reaction supplied by offset thrust from air blown through slit in tail boom (Hughes, then McDonnell Douglas, now Boeing).

**notch** Essentially chordwise or streamwise sawcut or groove over nose of aerofoil.

**notch aerial** Formed by cutout in skin of vehicle, leaving aperture matched to wavelength (usually in HF com. band) and covered with dielectric skin to original profile.

**notched cone nozzle**

**notched cone nozzle** Promising primary nozzle in ejector-lift system in which primary flow is discharged through row(s) of fishtail (lozenge-section) nozzles generating plumes orthogonal to long axis of duct.

**notched elevators** Cut away at trailing edge for rudder movement.

**notch effect** Shortcoming of early (1960s) all-flying tailplanes or slab tails in which demands tended to be in noticeable increments [pilot often reverted to flying on trimmer].

**notch flap** Leading-edge flap extended from fuselage.

**notifiable accident** One which cannot legally go unreported, where any person suffers injury, third-party property is damaged or public are in any way put at risk; variable rules governing scale of damage to aircraft.

**no-transgression zone** Airspace where aircraft under positive electronic IFR control must not penetrate, esp. region 900+ m/2,000+ ft wide between aircraft making ILS approaches on to parallel runways.

**NOTS** Naval Ordnance Test Station [China Lake, Inyokern, etc, now NWC] (USN).

**Notus** Notice to users (Arinc).

**Nourishment** Key word which, in extremes [following failure of other communications] would launch an attack with NW (UK 1953–77).

**Nova** Networked open versatile architecture.

**NOV-AB** Non-persistent Toxic-B gas bomb (USSR).

**Novcam** Non-volatile charge-addressed memory.

**NOVE** Networked operations in a virtual environment.

**Novoview** Range of CGI(2) visual systems, some textured (Rediffusion).

**Novram** Non-volatile RAM.

**Nowcast** Report on current weather.

**no-wind position** Geographical position aircraft would have occupied had wind velocity been zero.

**NO<sub>x</sub>, NOX** Nitrogen/oxygen breathing mixture (normally means supplied in absence of atmosphere).

**NO<sub>x</sub>** Shorthand for all oxides of nitrogen resulting from combustion of fuel in air.

**nøy, Noy** Subjective measure of noisiness in bandwidths of one-third octave (see *noise*).

**NOZ** No operating zone.

**nozpos** Nozzle position[s], ie angle.

**nozzle** 1 In jet-propulsion or reaction-jet control, aperture through which fluid escapes from system to atmosphere and in which as much energy as possible is converted to kinetic energy (see *choked*, *con/di*).  
2 Wind-tunnel section immediately upstream of working section.

3 Primary aperture through which fuel is injected into gas-turbine engine combustion chamber [US usage].

4 Section of fluid flow duct upstream of axial turbine, in which flow is controlled to enter turbine at favourable direction, pressure and velocity. Form depends on whether turbine is impulse/reaction or pure impulse.

5 Incorrectly, nozzle guide vane.

**nozzle blade** See *nozzle guide vane*.

**nozzle block** See *nozzle* (2).

**nozzle box** Assembly of nozzle guide vanes (all, or a group filling portion of periphery) and surrounding walls of gas duct.

**nozzle bucket** See *nozzle guide vane*.

**nozzle contraction ratio** Ratio of flow cross-section area

at inlet or start of nozzle (esp. con/di or rocket) to area at throat.

**nozzle diaphragm** Nozzle (4) as complete assembly.

**nozzle efficiency** Usually ratio of actual change in kinetic energy across nozzle to ideal value for given inlet conditions.

**nozzle exit area** Area of cross-section of flow at exit.

**nozzle expansion ratio** In supersonic nozzle, ratio of exit area to throat area.

**nozzle guide vane** Radial aerofoils upstream of axial gas turbine, convergent passages between which form nozzle (4) through which gas is directed on to turbine rotor blades. Also called turbine stator.

**nozzle insert** Small blocking body fixed inside nozzle (1) to trim exit area; colloq. = mice.

**nozzle ring** Complete 360° assembly of nozzle guide vanes.

**nozzle throat** Region of con/di nozzle having smallest cross-section area.

**nozzle thrust coefficient** Usually defined as actual achieved thrust divided by product of chamber pressure and throat area (rocket).

**NP** 1 Noise-preferential.

2 North Pacific region (ICAO).

3 Noisy phenotype [optimization variables].

**N/P** Navigator plotter.

**N<sub>p</sub>** 1 Number of passengers.

2 Speed (rpm) of power turbine or, confusingly, propeller.

3 Power-turbine number of cycles.

**np̄** Yawing moment coefficient due to rolling.

**NPA** 1 Notice of proposed amendment (FAA, JARs).

2 National Packaging Authority (UK).

3 National Pilots' Association [trade union; office, Washington, DC] (US).

4 Non-precision approach.

**NPB** 1 Nuclear-powered (or propelled) bomber.

2 Nadge Policy Board.

**NPC** 1 No-paper cockpit.

2 National Petroleum Council (US).

**NPD** Need and planning documents.

**NPDU** Network protocol data unit.

**NPE** Navy preliminary evaluation (USN).

**NPF** Net propulsive force.

**NPG** 1 No performance group type aircraft (CAA).

2 Nuclear planning group.

3 Non-unit personnel generator.

**NPI** Non-precision instrument.

**NPIAS** National Plan of Integrated Airport Systems (US).

**NPL** National Physical Laboratory [1899–; Teddington TW11 0LW] (UK).

**n<sub>pl</sub>** Positive load limit, maximum permissible load factor.

**NPLOs** NATO production and logistics organizations.

**NPL tunnel** A closed-jet tunnel, original \* = return flow, standard \* = non-return flow.

**NPO** Scientific production union (USSR, R).

**NPOESS** National, later (2002) changed to New, polar-orbiting operational environmental satellite system (NASA, NOAA, USAF).

**NPP** 1 Research and production enterprise (R).

2 NPOESS preparatory project.

**NPPL** National Private Pilot's Licence [proposed, VFR only] (UK).

**NPR** 1 No power recovery.

- 2 Nozzle pressure ratio.
- 3 Nuclear posture review (US).
- 4 Noise preferential route.

**NPRM** Notice of proposed rulemaking (FAA).

**NPRS** Non-persistent.

**NPS** 1 Non-prior service.

- 2 Naval Post-graduate School (USN).
- 3 Nuclear profiled sortie.
- 4 Nitrogen purge system.

**NPT** Non-proliferation treaty, 1 July 1968.

**NPTA** National Passenger Traffic Association, [office, New York] (US).

**NPTR** 1 National Parachute Test Range.

- 2 No procedure turn required.

**NPU** Navigation processor unit.

**NQA** National Quality Assurance [certification authority] (UK).

**NQIS** Navigation-quality inertial sensor.

**NQP** Night Quota Period [usually 23.00–07.00] (airport noise).

**NQR** Nuclear quadrupole resonance.

**NR, Nr** 1 Helicopter main-rotor rpm.

- 2 Network router.

**N/R** Navigator, radar.

**nr** Yawing moment coefficient due to yawing.

**Nr** Number (FAA).

**N<sub>r</sub>** 1 Helicopter main-rotor rpm.

**NRA** 1 Nuclear reaction analysis, ion-beam technique for light elements.

- 2 NASA Research Announcement; hence NRAs, plural.

**NRAG** Non-metallics research advisory group (MRCC).

**NRAL** Nuffield Radio Astronomy Laboratory [Jodrell Bank, SK11 9DL] (UK).

**NRC** 1 National Research Council [office, Washington DC20418] (US).

- 2 National Research Council of Canada [office, Ottawa, Ontario K1A 0R6] (Canada).
- 3 Nuclear reporting cell.
- 4 Nuclear Regulatory Commission [1974 onwards] (US).
- 5 Non-routine card.
- 6 Non-recurring cost[s].

**NRCS** Normalized radar cross-section.

**NRD** Network routing domain.

**NRDC** 1 National Research Development Corporation (UK).

- 2 Natural Resources Defense Council (US).

**NRDS** Nuclear rocket development station (Jackass Flats, US).

**NRE** Non-recurring engineering.

**NRF** NATO Response Force, also called NATO Reaction Force (2002–).

**NRH** No reply heard.

**NRI** Net radio interface.

**NRMET** Nanjing Research Institute of Electronic Technology (China).

**NRJC** Non-routine job card.

**NRL** Naval Research Laboratory (USN).

**NRMM** Navaids remote maintenance and monitoring.

**NRO** National Reconnaissance Office (US).

**NROSS, Nross** Navy remote ocean sensing system or satellite (spacecraft, USN).

**NROTC** Naval Reserve Officer Training Corps (US).

**NRP** 1 Normal rated power.

- 2 Narrow programmable receiver.
- 3 National Route Program, or Plan (US).
- 4 Non-return point.

**NRPA** Net return on productive assets.

**NRPB** National Radiological Protection Board.

**NRR** Noise-reduction rating (EPA).

**NRRC** Nuclear-Risk Reduction Centers (1987).

**NRSC** National Remote Sensing Centre (in civil enclave at former RAE Farnborough, UK).

**NRST** Nearest.

**NRT** Near real time [DF adds data fusion, RAS resource allocation system].

**NRTC** National Rotorcraft Test Center (US).

**NRTF** National Radar Test Facility (US).

**NRTS** Not repairable this station (USAF).

**nrv** Non-return valve.

**NRZ** Non-return to zero.

**NS** 1 Non-skid.

- 2 Network service.

**Ns** 1 Nimbostratus.

- 2 Newton-second, also N·s.

**ns** Nanosecond[s] ( $10^{-9}$ s).

**n<sub>s</sub>** Maximum sustained normal acceleration.

**NSA** 1 National Security Agency (US).

- 2 National Standards Association [Washington, DC] (US).

**NSAP** Network service access point.

**NSAU** National Space Agency of Ukraine.

**NSAR** North Sea air-combat manoeuvring instrumented range.

**NSAWC** Naval Strike and Air Warfare Center (USN).

**NSC** 1 National Security Council (US).

- 2 No significant cloud.
- 3 New Scottish [ATC] Centre, Prestwick.
- 4 National Safety Council [office, Itasca, IL 60143–3201] (US).
- 5 National Space Club [association of manufacturers; office, Washington, DC] (US).

**NSCA** National Safety Council of America.

**NSDA** National Space Development Agency (J).

**NSDU** Network service data unit.

**NSE** Near-synchronous equatorial.

**NSEU** Neutron single-event upset.

**NSF** National Science Foundation (US).

**NSFAC** Non-Scheduled Flying Advisory Committee (CAA, 1945).

**NSG** 1 NATO Standardization Group.

- 2 North-seeking gyrocompass.

**NSGr** Night close-support group (G, WW2).

**NSIA** National Security Industrial Association [office, Washington, DC] (US).

**NSIU** Navigation switching interface unit.

**NSKK** Ag-aviation association [office, Tokyo] (J).

**NSM** Non-contact stress measurement.

**NSMS** Non-intrusive stress-monitoring [or measurement] system.

**NSMV** Near-space maneuvering vehicle (USAF).

**NSN** National [or NATO] stock number[s].

**NSNF** Non-strategic nuclear forces.

**NSO** Navigation/systems operator.

**NSOC** Naval Satellite Operations Center (Pt Mugu, CA).

**NSP** 1 Normal sea-level power.  
2 Night surveillance payload.  
3 National Simulator Program; O adds Office (FAA).

**NSPE** National Society of Professional Engineers (US).

**NSPOL** Non-scheduled policy (ECAC).

**NSR** 1 No scheduled removal.  
2 Naval [or NATO] Staff Requirement.

**NSRI** National Soil Resources Institute (U. of Cranfield).

**NSRL** National Space Radiation Laboratory (BNL).

**NSRP** National Search and Rescue Plan (US).

**NSS** 1 National seismic station (US).  
2 Near-source simulation.  
3 Navigation subsystem.  
4 National Security Space (US).  
5 National Space Society (US).

**NSSA** 1 National Safe Skies Alliance (US).  
2 National Space Society of Australia [office, Sydney].

**NSSC** Naval Ship Systems Command (USN).

**NSSFC** National Severe Storms Forecast Center (Kansas City).

**NSSI** 1 National Security Space Integration; O adds Office (DoD).  
2 National Security Space Institute [Petersen AFB, CO, 18 October 2004–] (US).

**NSSL** National Severe Storms Laboratory [Oklahoma] (US).

**NSSO** National Security Space Office [White House] (US).

**NSSS** Naval Space Surveillance System [1959–2004] (USN).

**NST** 1 NATO Staff Target.  
2 Noise, spikes and transients.

**NSTAC** National Security Telecommunications Advisory Council [White House] (US).

**NSTAP** National strategic technology acquisition plan (UK).

**NSTB** National satellite testbed.

**NSTD** Non-standard.

**NSTL** 1 National Space Technology Laboratories (NASA, previously MTF, now SSC (4)).  
2 National security threat list (US).

**NSTO** Near single stage to orbit.

**NSTP** National space technology programme (DTI, UK).

**N-strut** Interplane or other bracing system having general shape of N.

**NSVN** NATO secure voice network.

**NSW** 1 Nominal specification weight.  
2 No significant weather [TAF or Metar].

**NSWC** Naval Surface Warfare Center (USN).

**NSWP** Non-Soviet Warsaw Pact.

**NT** Non-traditional (ISR2).

**nT** Nanotesla; terrestrial field varies from c 25,000 (magnetic equator) to c 70,000 nT (poles), vertical component usually being measured in geophysical prospecting and ASW.

**nt** Nit (name not usually used).

**NTAOCH** Notice to AOC holders (CAA).

**NTAP** Notice to Airmen publication (USGPO).

**NTAS** Norad tactical Autovon system (USAF).

**NTAT** Near-term Acme technology.

**NTB** 1 National test bed (US, SDI).  
2 Nuclear test ban; T adds Treaty.

**NTC** 1 National Training Center (US DoD).  
2 Numerator time constant.  
3 Notice.

**NTD** National Test Director (ISS).

**NTDD** Normalized total departure delay.

**N/TDR** Near-term data radio (USA).

**NTDS** Naval tactical data, or distribution, system.

**NTE** 1 Not to exceed.  
2 Northerly turning error.

**NTF** 1 No trouble found.  
2 NATO task force.

**NTFWTC** NATO Tactical Fighter and Weapons Training Centre.

**NTG** Nachrichtentechnische Gesellschaft im VDE (G).

**Nth country** Next power to possess nuclear weapons (DoD).

**NTI** Next [runway] turn indicator.

**NTIA** National Telecommunications and Information Administration (US).

**NTIS** National Technical Information Service (US).

**NTISR** Non-traditional intelligence, surveillance and reconnaissance; also written NTI STAR.

**NTK** Scientific and technical committee (many in USSR, R).

**NTM** 1 National technical means, of verification of MBFR and precise Earth mapping.  
2 NDT manual.  
3 NATO Tiger Meet.

**NTMV** National technical means of verification.

**NTNF** Royal Norwegian council for scientific and industrial research.

**NTO** 1 Nitrogen tetroxide.  
2 Notice to operators.  
3 No technical objection[s].  
4 Nitrotriazolone [explosive].

**NTOS** No time on station.

**NTP** Normal (ie standard) temperature and pressure.

**NTPD** NTP dry (gas bottle capacities).

**NTPS** National Test Pilot School [Mojave, CA] (US).

**NTS** 1 Negative-torque signal.  
2 Navigation technology satellite (USN).  
3 Night targeting system.

**NTSB** National Transportation Safety Board (US, from 1966).

**NTSC** National Television Standards Committee (US).

**NTT** Non-threat traffic.

**NTTC** National Technology Transfer Center (NASA).

**NTU** 1 State technical administration (USSR, R).  
2 Navigation training unit.  
3 New-threat upgrade.  
4 Not taken up [civil registration].

**NTW** Navy theater-wide; /BMD adds ballistic-missile defense (USN).

**N<sub>2</sub>** Speed of HP shaft.

**N<sub>2</sub>O<sub>4</sub>** Nitrogen tetroxide.

**NTWS** New threat-warning system.

**NTZ** No-transgression zone.

**NU** 1 Nose-up.  
2 Not usable.

**Nu** Nusselt number.

**Nuac, NUAC** Nordic upper air, or area, control centre.

**Nucap** Nadcap Users Compliance and Audit Program (Int.).

**nuclear airburst** Explosion at height AGL greater than maximum radius of fireball.

**nuclear bomber** Ambiguous but generally taken to mean aircraft able to deliver nuclear weapons.

**nuclear capable** Nuclear bomber.

**nuclear cloud** All-inclusive term for volume of hot gas, dust, smoke, and other particulate matter from nuclear bomb and environment carried aloft with fireball (DoD, NATO).

**nuclear column** Hollow cylinder of water and spray thrown up from underwater nuclear explosion through which hot high-pressure gases escape to atmosphere (DoD, NATO).

**nuclear defence** Defence against attack by nuclear or radiological weapons.

**nuclear dud** NW which after being triggered fails to provide any explosion of that portion designed to produce nuclear yield (DoD).

**nuclear emulsion** Thick layer used on photo-type plates for recording tracks of energetic particles.

**nuclear energy** That liberated by fission; more rarely, that liberated by fusion reaction, and some definitions include radioactive decay.

**nuclear explosive** Material designed to achieve greatest uncontrolled fission or fission + fusion reaction.

**nuclear/heater propulsion** Using nuclear reactor to heat working fluid for rocket propulsion.

**nuclear incident** Unexpected event short of NWA but resulting in damage to NW or associated facilities or increase in possibility of explosion or radioactive contamination (DoD).

**nuclear radiation** All EM and particulate radiations from nuclear processes.

**nuclear reactor** Device for containing controlled nuclear fission (rarely, fusion) reaction.

**nuclear rocket** Usually one whose working fluid is heated in nuclear reactor.

**nuclear safety line** Line drawn (if possible through prominent topographic features) on map to serve as reference in describing levels of protective measures, degrees of damage and limits allowed for effects of friendly NW.

**nuclear surface burst** One in which centre of fireball is below that height equal to maximum radius.

**nuclear underground burst** One in which centre of detonation lies below original ground level.

**nuclear weapon** One in which almost all released energy results from fission, fusion or both; abb. NW. Original 1945 designs used chain-reaction triggered by critical mass of uranium with unnaturally high concentration of isotope U-235. Second form was based on plutonium Pu-239. Loosely called atomic, or fission, bomb. See *hydrogen bomb*.

**nuclear-weapon(s) accident** Unplanned occurrence resulting in loss of, or serious damage to, nuclear weapons or components resulting in actual or potential hazard to life or property (DoD, NATO).

**nuclear-weapon degradation** Degeneration of NW to such extent that anticipated yield is reduced.

**nuclear-weapon employment time** Reaction time of NW.

**nuclear-weapon exercise** Exercises involving real NW but excluding launching or flying operations.

**nuclear yield** Energy released in detonation of NW

measured in terms of mass of TNT required to liberate same amount: categorized as very low (less than 1 kT), low (1–10 kT), medium (10–50 kT), high (50–500 kT) and very high (over 500 kT).

**nucleating agent** The material released into the atmosphere in cloud seeding, such as silver iodide.

**nucleon** Particle of atomic nucleus, eg neutron, proton.

**nucleonics** Science of applications of nucleons and atomic emissions.

**nucleus** 1 Particle upon which atmospheric water vapour can condense and/or freeze.

2 Positively charged core of atom.

**nuclide** Member of family of atoms distinguished by having same nucleus (immediately decaying nuclear states are excluded).

**Nudets** Nuclear detonation detection and reporting system; system for surveillance of friendly target areas and immediately providing place, ground zero, burst height and yield of nuclear explosions (DoD, NATO).

**Nufas** NATO uhf frequency-assignment system.

**Nugget** First-tour aviator (USN).

**nugget** Obturator (US, colloq.).

**NUGP** Nominal unit ground pressure.

**NUI** Network-user identification.

**nuisance malfunction** One caused by failure of safety system, eg auto-disconnect of AFCS, main system being serviceable throughout.

**nuisance message** Sent by central maintenance computer even though no such fault exists.

**nuke** Nuclear weapon [colloq.].

**null** 1 Orientation of receiver aerial [antenna] (eg ADF) in which no signal is heard.

2 In DLC, angular setting (usually about 7°) about which spoilers oscillate.

3 Location in space where, at any moment, gravitational forces cancel out (eg five centres of libration near Earth/Moon system).

**nullo** Flown without human on board [cockpit-equipped target or other RPV], from 'no live, or local, operator'.

**null position** See *null* (2).

**NUM** Nuova unita maggiore, future aircraft carrier (Italy).

**Numast** National Union of Marine, Aviation and Shipping Transport officers [London E11 3BB] (UK).

**No 1 engine** Port outer: engines numbered across aircraft port to starboard.

**numbers** 1 Runway designator.

2 Piano keys, to land on the \*.

3 Any numerical data needed for flight, as 'have \*'.

**numerator time constant** Controls rate at which attitude changes result in flight-path changes, symbol  $T\theta$ .

**numerical control** Control of system, esp. machine tool, by series of commands expressed in numeric (digital) terms giving locations, directions and speeds, and secondary information (eg cutter speed) in correct sequence. Software usually punched paper or magnetic tape.

**numerical weather prediction** Repeatedly refined methods in which powerful computers solve equations and simulate local atmosphere, hence numerical forecast, numerical model.

**Nunio** Network universal input/output [local Ethernet].

**NURBS** Non-uniform national B-spline[s].

**NURK** Astronautics Society (J).

**nurse balloon** Fabric gas container used as reservoir or to maintain constant inflation pressure in aerostat on ground.

**Nusselt number** Non-dimensional parameter  $\text{Nu} = qD/\lambda\delta T$  where  $q$  is quantity of heat,  $D$  is typical length,  $\lambda$  is thermal conductivity and  $\delta T$  is temperature difference.

**Nut** Near-unity probability.

**nutating feed** Microwave feed to tracking radar in which beam oscillates in one plane while plane of polarization (and usually aerial [antenna] reflector) remains fixed.

**nutation** 1 Oscillation of axis of rotating body (eg gyro).

2 Irregularities in precession of equinoxes and other effects and of rotary precession of Earth's axis in period of 18.6 years (\* period) with maximum displacement of 9.21 s (constant of \*).

**nutator** Drive mechanism causing dipole or aerial [antenna] feed horn to gyrate about focus of paraboloidal aerial without changing plane of polarization.

**nutcracker** V/STOL aeroplane whose fuselage hinges near mid-length to vector main-engine thrust.

**nut plate, nutplate** Nut, esp. elastic stop nut, provided with flat-plate base attached permanently to airframe to provide anchor into which attachment bolt can be screwed for securing access panel or other removable item.

**nut runner** Large nut threaded on screwjack so that when either \*\* or screw is rotated a linear motion results (eg to drive tailplane).

**NV** 1 Naamloze Vennootschap (Netherlands, Belgium, company constitution).

2 National Variants, to FAR-25 and similar.

3 Night vision.

4 Non-volatile.

**NVCA** National Venture Capital Association (US).

**NVCD** Night-vision cueing and display.

**NVD** Night-vision device[s].

**NVE** Night-vision equipment.

**NVEO** Night-vision electro-optics.

**NVESD** Night Vision Enhanced [or and Electronic] Sensors Directorate (USA).

**NVG** Night-vision goggles; T adds training.

**NVIS** 1 Near-vertical incident skywave.

2 Night-vision imaging system.

**NVL** Nederlandse Vereeniging voor Luchttransport, Netherlands air transport association [office, Amsterdam].

**NVLP** Netherlands Aerospace Writers Association [office, NL-2514 s'Gravenhage].

**NVM** 1 Non-volatile memory.

2 Night vision, monocular.

**NVPS** Night-vision pilotage [or piloting] system.

**NVQ** National Vocational Qualification (UK).

**NVR** Netherlands astronautical society [NL-3512 Utrecht].

**NVRAM** Non-volatile RAM.

**NVS** 1 Night-vision system.

2 Noise and vibration suppression [or simulation].

**nvt** Neutron volts, measure of ionising radiation.

**NV thrust** Nominal vacuum thrust.

**NVTS** Night-vision targeting sight.

**NvVl** Nederlandse Vereniging voor Luchtvaarttechniek.

**NW** 1 Nuclear weapon, or warfare.

2 Nosewheel.

**NWA** Nuclear-weapon(s) accident.

**NWAA** North West Aerospace Alliance; 180+ companies [office, Nelson BB9 9BT] (UK).

**NWC** 1 Naval Weapons Center (China Lake, USN).

2 National War College (US).

**NWCITF** Nuclear weapons complex infrastructure task force [post-2002] (US Congress).

**NWDC** Navy Warfare Development Command (USN).

**NWDS** Navigation and weapons-delivery system.

**NWEF** Naval Weapons Evaluation Facility (Albuquerque, USN).

**NWMTA** North Wales military training area.

**NWP** Numerical weather prediction.

**NW plans** Plan A governed use of NW under the SIOP, i.e., against counterforce such as ICBMs and ADD airfields. Plan B spelt out the use of NW against counter-value targets, especially cities (UK, US, 1953–c1980).

**NWPRA** National Women's Pylon Racing Association (US, from 1964).

**NWS** 1 National Weather Service (NOAA, US).

2 Nosewheel steering.

3 North[ern] Warning System (former Dew Line).

4 NW (1) state, or status.

5 Navigation and weapons system.

**NWSSG** Nuclear weapon system safety group.

**NWT** Natural work team.

**NWTS** Naval Weapon Test Squadron (NAS Point Mugu).

**NWV** New World Vistas (USAF).

**NXT** Next [K adds track].

**Ny** Longitudinal acceleration.

**ny** Yawing moment coefficient due to sideslip.

**Nycote** Nylon lacquer protective coating.

**nylon** Long-chain synthetic polymer amide with recurrent amide groups distributed along chain (some definitions add 'capable of being drawn into filament whose structure is oriented along fibre'). Large family, now often used for 3-D mouldings and many structural purposes (formerly TM for Du Pont de Nemours).

**nylon letdown** Parachute.

**NYO** Not yet operating.

**Nz** 1 Normal acceleration, or load factor, ie along OZ axis.

2 AMSU normal-acceleration ouput.

**NZAA** NZ Airwomen's Association (1959–), [see NZAWA].

**NZAF** New Zealand Aviation Federation Inc. [office, Wellington].

**NZAFA** NZ Airfreight Forwarders Association [office, Auckland].

**NZAPA** The NZ Airline Pilots' Association [office, Wellington].

**NZAT** NZ Airport Technologies (trade association, 19 members).

**NZAWA** NZ Association of Women in Aviation; NZAA renamed in 1998 [office, Wellington].

**NZCA** NZ College of Aviation [Papakura].

**NZDF** NZ Defence Force.

**NZG** Near-zero growth (tyres).

**NZGA** NZ Gliding Association [office, Wellington].

**NZMAA** NZ Model Aeronautical Association.

**NZMS** NZ Meteorological service.

**NZRA** NZ Rotorcraft Association.

**NZSFA** NZ Space Flight Association Ltd.

# O

**O** 1 Opposed configuration (US piston engine designation).

2 Operating cost over given period.

3 Ground speed 'on' (onwards from critical point).

4 Observation aircraft category (US services from 1922).

5 Aircraft category: hang gliders and paragliders (FAA).

6 Instantaneous e.m.f., unit volt.

7 Origin of axes or graphical plot.

8 Omni-directional.

9 Other meanings include odd, over, oxygen and optional.

**o** Lateral acceleration.

**O<sub>2</sub>** Oxygen.

**O<sub>3</sub>** Ozone.

**O-ring** Flexible fluid-sealing ring having O-section in free state.

**OA** 1 Output axis.

2 Operational analysis.

3 Observation amphibian (USAAC, USAAF, 1925–47).

**O/A** On or about.

**OOAA** 1 Orient Airlines Association.

2 Open Aviation Area.

**OOAN** Organismo Autónomo Aeropuertos Nacionales (Spain).

**OAB** Outer air battle.

**OAC** 1 Operations Advisory Committee (UK CAA).

2 Oceanic Area Control [C adds Centre].

3 Oesterreichischer aero club [office, Vienna] (Austria).

**OACE** Open-architecture computing environment.

**OACI** ICAO (F).

**OACS** Optically active coding system.

**OAD** Office of Aviation Development [CAA, 1949 on].

**OADF** Overseas Aircraft Delivery Flight (RAF).

**OADS** Omnidirectional air-data system (helicopter).

**OAE** Optimized after erosion (helicopter blade profile).

**OAF** Optical-alignment facility.

**OAFS** Open apron, free-standing (ie, no air-bridge).

**OAFU** Observers advanced flying unit.

**OAG** 1 Operational Advisory Group (BATA, USN).

2 Official Airline Guide.

**OAI** Office of Accident Investigation (FAA).

**OAIRMS** Open-architecture integrated radio management system.

**OALC** Ogden Air Logistics Center (Hill AFB, Utah).

**OALT** Operationally acceptable level of traffic.

**OAM** 1 Office of Aviation Medicine (FAA).

2 Oil/air mist.

**OAMCM** Organic airborne mine countermeasures.

**OAMO** Office of Air and Marine Operations (ICE8).

**OAMP** Optical airborne measurement platform.

**OAMS** Orbital attitude and manoeuvre system.

**O&C** Operations and checkout.

**O&D** Origin and destination.

**O&I** Operations and integration.

**O&M** Operations & maintenance [CM adds configuration management].

**O&O** Organizational and operational (RPV).

**O&S** 1 Operational, or operating, and support (costs).

2 Operations & Sustainment, of hardware in service (USAF).

**OANS** Observers air navigation school.

**OAO** 1 Orbiting astronomical observatory.

2 Out-of-area operations.

**OAOI** On-and-off instruments.

**OAP** 1 Organizzazione dell'Aviazione Privata e d'Affari (I).

2 Offset aiming point.

3 On-board attitude processor.

**OAPD** Online airline product database (IATA).

**OAPEC** Organization of Arab Petroleum Exporting Countries.

**OAPP** Office of Aviation Policy and Plans (FAA 1).

**OAPS** Oblique air photograph strip.

**OAR** Office of Aerospace Research (USAF and FAA/DoT).

**OARB** Orient airlines research bureau.

**OARF** Outdoor Aerodynamic Research Facility (NASA, Ames).

**OARN** Off-airways R-nav.

**OART** Office of Advanced Research & Technology (NASA; now AST).

**OAS** 1 Offensive avionics system.

2 Offensive air support (air support directly linked to land operations, US).

3 Omnidirectional airspeed system (helo).

4 Open-access service.

5 Optimal aircraft scheduling.

6 Obstacle assessment surface.

7 Office of Aviation Safety (CAA).

8 On active service.

9 Oceanic Automation System (FAA/USN).

**OASC** Officer and Aircrew Selection Centre, [Biggin Hill, now Cranwell] (RAF).

**OASD** Office of the Assistant SecDef (US).

**OASF** Orbiting astronomical support facility.

**Oasis** 1 Oceanic and atmospheric scientific information system (NOAA).

2 Operational application of special intelligence system (AAFCE).

3 Omnidirectional approach-slope indicator system.

4 Operational and supportability implementation system (USAF/FAA).

5 Organic airborne and surface-influence sweep [sea mines] (USN).

6 Oceanic Area system improvement study.

7 On-board aircraft server and information system.

8 Opto-electronic application-specific integrated subsystem.

9 Trade name (du Pont) for sandwich for aerospace wiring, red/white fluoropolymers on polyamide core.

**OASPL** Overall sound pressure level.

**OAST** Office of Aeronautics and Space Technology (NASA), more usually AST.

**Oasys** Obstacle-avoidance, or awareness, system.

**OAT** 1 Outside air temperature.

## OATA

- 2 Operational acceptance test.
- 3 Operational air traffic (ie military).
- 4 Oxide aligned transistor.
- 5 Operational, or optional, auxiliary terminal (Agars).
- 6 Operational airfield test set.
- 7 Orbit and attitude tracking; S adds system.
- 8 One at a time [experiments].

**OATA** Overall ATM/CNS target architecture (Eurocae, Eurocontrol).

**OAV** Organic air vehicle.

**OAVUK** Society for aviation and gliding of Ukraine and Crimea.

**OB** 1 Outbound.

- 2 Balloon club (Austria).

- 3 Off-boresight.

- 4 Operations base (USA).

- 5 Operational Bulletin.

**O/B** 1 Outbound.

- 2 Outboard.

**OBA** Outbound boom avoidance (SST).

**OBAP** 1 Organization of Black Airline Pilots (US).

- 2 Off-boresight angle.

**OBC** 1 Optical barrel, or BAR, camera.

- 2 On-board computer.

**OBCO(S)** On-board cargo operations (system).

**Ob.dL** Oberkommando der Luftwaffe (G).

**OBDMS** On-board data-monitoring systems.

**OBE** 1 Off-board expendables.

- 2 Overtaken by events.

**OBEWS** 1 On-board electronic warfare simulation.

- 2 On-board EW system(s).

**OBFM** Offensive basic flight manoeuvres.

**OBI** Omni-bearing indicator.

**Obiggs** On-board inert gas generating system.

**OBIS** On-board information system.

**objective** 1 Normally, in optical, EO or IR system, first lens or lens group to receive incoming radiation.

2 Military target for capture or other action by surface forces; not used for target for aerial attack.

**oblique** Oblique photograph.

**oblique camera** One mounted in aircraft with axis between vertical and horizontal.

**oblique flying wing** Aeroplane [airplane] designed to fly with wing set diagonally, one side swept forward, the other back.

**oblique photograph** One taken by oblique camera; subdivided into high \* in which apparent horizon appears and low \* in which it does not.

**oblique projection** Map projection with axis inclined at oblique angle (say, 20° to 60°) to plane of Equator.

**oblique-shock inlet** Inlet designed for use in supersonic vehicle and provided with centrebody, wedge or other projecting portion intended to focus oblique shockwave on opposite lip.

**oblique shockwave** Inclined shock formed whenever supersonic flow has to turn through finite angle in compressive direction.

**oblique wing** 1 Wing arranged to pivot at mid-point as single unit so that, as one half is swept back, other half is swept forwards. Also called slew wing.

- 2 See *oblique flying wing*.

**OBLMS** On-board life-monitoring system.

**OBMS** On-board medical site.

**Oboe** WW2 precision navaid of SSR type with Cat

## obstruction angle

station near Dover and Mouse station in Norfolk sending synchronized pulses which formed continuous note along correct flightpath over distant target; Mouse operators also sent signals to tell aircrew when to release bombs or TIs.

**Obogs** On-board oxygen generation, or generating, system.

**OBP** 1 On-board processor, or processing [satcom].

- 2 Omnidirectional ball panel.

- 3 Operational build plan.

**OBPR** Office of Biological and Physical Research (NASA).

**OBR** Optical beam rider, or riding.

**OBRC** Operating budget review committee.

**OBRM** On-board replacement module.

**OBS** 1 Omni-bearing selector.

- 2 Observe/observed/observing (ICAO).

- 3 On-board simulation.

- 4 Organizational breakdown structure.

- 5 Optical bypass switch.

- 6 Observation-balloon system (tethered near major highway).

**obs** 1 Obstruction lights.

- 2 Observe[d], observation.

- 3 Obstacle.

**Obsc, OBSC** Obscure/obscured/obscuring (ICAO).

**obscuration methods** Instrument techniques for measuring visible smoke (eg from jet engine) such as HSU and PSU where cutoff of calibrated light beam is measured over known distance.

**observation** 1 Many military definitions, most agreeing that \* platform is for gathering all possible tactical information about an enemy. Increasingly [1942–, and especially in Korea and SE Asia] US \* aircraft guided tactical aircraft to point targets.

2 Complete set of meteorological readings at one place and time.

**observation balloon** In bygone wars, tethered balloon carrying human who reported on fall of shot and on enemy activity.

**observation balloon system** In US, usually tethered at airfield to monitor potentially conflicting road traffic, eg at runway crossing.

**observation mirror** A horizontal mirror with superimposed graticule used in the same way as a camera obscura.

**observed value** Measured, not calculated.

**observer** Common title for second crew member in two-seat military (especially combat) aircraft whose functions may include navigation, systems management, electronic warfare, command guidance of weapons and other tasks; title is traditional and may bear no relation to actual duties.

**OBSS** Orbiter boom sensor system.

**OBST, obst** Obstruction, obstacle.

**obstacle clearance height** Lowest height above runway threshold or aerodrome elevation used to establish compliance with obstacle clearance criteria in instrument approach.

**obstn** Obstruction (FAA).

**obstruction** Also called obstacle, a real or notional solid body forming hazard to aircraft on or near runway or flight path. For certification purposes has height of 10.7 mm (35 ft) or 15 m (50 ft).

**obstruction angle** Angle between horizontal and line

## obstruction clearance surface

joining highest point of object in flightway [ie, approach path] to nearest point of appropriate runway.

**obstruction clearance surface** Surface in form of plane or flat cone sloping at obstruction angle.

**obstruction-free zone** Free from all fixed obstacles except light frangibly mounted navaids.

**obstruction light** Red light visible 360° on top of object dangerous to moving aircraft in air or on ground.

**obstruction marker** Object of approved shape or colour marking obstruction or boundary of hazardous surface on airfield.

**OBT** Off-block[s] time.

**OBTD** On-board training device.

**Obtex** Off-board targeting experiment[s].

**obturator** Rigid or flexible body tailored to preventing escape of gas under pressure from particular orifice or other leakage path.

**obturator ring** Piston ring of L-section intended to be gastight.

**OBW** 1 On-board wheelchair (for disabled pax).

2 Off-boresight weapon.

**OC, O/C** 1 O'clock.

2 Officer commanding.

3 Over-current.

4 Obstacle clearance (ICAO panel).

5 Optical communications.

6 Obstruction chart.

7 Officer candidate.

8 Oil consumption.

9 On course.

10 Operational conversion, see OCF, OCU.

11 Overcast.

12 Operational Clearance [followed by number 1 or 2].

**OCA** 1 Obstacle clearance altitude [suffix H<sub>fm</sub>, height for finals and straight missed approach; H<sub>ps</sub>, height for precision segment].

2 Oceanic control area.

3 Offensive counter-air.

4 Old Cranwellians Association.

5 Oil-cooler augmentation.

**OCALC** Oklahoma City Air Logistics Center (Tinker AFB).

**OCAMS, Ocams** On-board checkout and monitoring system.

**OCC** 1 Operation[s] [or Oceanic] control centre.

2 Occulting.

3 Occupied [telephone line].

4 Operator control console.

**Occar** Organisme Conjointe de Co-opération en Matière d'Armément (Int.).

**occluded front** Warm air mass forced aloft by overtaking cold front.

**occlusion** 1 Atmospheric region in which cold front has overtaken slow or stationary warm front and forced warm air mass upwards.

2 Trapping of gas bubbles in solidifying material or by molecular adhesion on surface, esp. removal of gas in high-vacuum technology by a getter.

**OCCM** Optical counter-countermeasures.

**OCCS** Operations control-center software.

**occultation** Complete disappearance of body, esp. source of illumination such as star or aircraft lights, behind another object of much larger apparent size.

## octane number

**occulting** Flashing, but with illuminated periods clearly predominant.

**OCD** 1 Operational concept demonstration.

2 Oceanic clearance delivery.

3 Office of Civilian Defense (US, 1941).

4 On-chip debug.

**oceanic airspace** Controlled airspace over ocean areas.

**oceanic clearance** Clearance delivery to enter oceanic airspace.

**oceanic navigation error report** Filed when surveillance monitor observes aircraft exiting oceanic airspace seriously off track.

**ocean spatial spectrum** Readout of the topography of the oceanic surface, measured by a WSOA.

**OCF** 1 Occluded frontal passage.

2 Operational Conversion Flight (RAF).

**OCFNT** Operational Conversion Flight (RAF). Occluded front.

**OCH** Obstacle clearance height.

**OCI** 1 Outside of clearance indicator (MLS).

2 Out-of-coverage indicator (nav aids).

**OCIG** Oceanic communications improvement group.

**OCIP** Offensive capability improvement program.

**OCL** 1 Obstacle [or obstruction] clearance limit.

2 Optimum cruising level.

**OCLD** Occlude.

**OCLL** Height [usually in thousands of feet a.m.s.l.] of overcast.

**OCLN** Occlusion.

**OCM** 1 On-condition maintenance.

2 Optical countermeasures.

3 Optimal control model.

4 Organizational control manual.

**OCNL** Occasional [OCNLY, occasionally].

**OCNR** Office of the Chief of Naval Research (USN).

**Oconus** Offshore, or outside, the US.

**OCP** 1 Omnidirectional control pattern.

2 Oceanic clearance processor.

**OCR** 1 Optical-character recognition, or reading.

2 Oceanic control region.

3 On-condition replacement.

4 Office of Commitments and Requirements.

5 Occur.

**OCS** 1 Optimum-cost speed.

2 Officer Candidate School (US).

3 Oceanic Control System (NZ).

4 Obstacle clearance surface.

5 Operational control segment.

6 Officers Command School (RAF Henlow).

**oct** Octane (FAA).

**octa** Unit of visible sky area representing one-eighth of total area visible to celestial horizon, now *okta*.

**Octagon** Trade-name of a range of de-icing fluids, including potassium and sodium acetates, sodium formate and propylene glycol.

**octal** 1 Standard base for electronic device having eight connector pins.

2 Counting system to base 8.

**octane number** Standard system for expressing resistance of hydrocarbon or other fuel to detonation in piston engine, ranging from 0 (equivalent to n-heptane) through 100 (iso-octane) upwards to about 150. Measures are taken with lean mixture and with rich, latter giving higher values. Also called knock rating (strictly, anti-

**octane rating**

knock) or performance number, esp. when above 100. See *MON, RON*.

**octane rating** See *octane number*.

**octane test** Standard test in which sample of fuel is used to run special variable-compression single-cylinder engine and compared with mixtures of n-heptane and iso-octane, or (above 100 performance number) with other reference fuels.

**octant** Bubble sextant able to measure angles to 90°.

**octave** Interval between any two frequencies having ratio 1:2.

**octet** Complete set of four pairs of electrons forming layers 2 and 3 (in all noble gases except He, outer shell).

**Octol** HE warhead filling, HMX/TNT.

**Octopus** Operational and certified takeoff and landing performance universal software.

**Octu** Officer Cadet Training Unit (UK).

**OCU** 1 Operational Conversion Unit (UK).

2 Optical coupler, or control, unit.

3 Operational capabilities upgrade.

4 Operator control unit (IRCM).

**oculogyral illusion** Apparent movement of fixed objects seen under high-g.

**OCV** Organisme de Contrôle en Vol (F).

**OCXO** Oven-compensated crystal oscillator.

**OD** 1 Outside diameter.

2 Ordnance delivery.

3 Olive drab colour.

4 Optical disk.

**ODA** Overseas Development Administration (UK).

**Odads** Omnidirectional air-data system.

**Odals, ODALS** Omnidirectional approach lighting system.

**Odapi** Omnidirectional approach-path indicator.

**Odaps** Oceanic display and processing [or planning] system.

**ODC** Office of Defense Co-operation (US DoD office in Germany).

**ODEs** Ordinary differential equation[s].

**ODF** Operational degradation factor.

**ODFDMU** Optical disk flight-data management unit.

**ODID, Odid** Operational display and input development.

**Odin** Operational data interface.

**Odis** Operational data interface system.

**ODL** Optical, or Oceanic, data-link.

**ODM** 1 Ministry of Overseas Development (UK).

2 Operating data manual.

3 Operational development model.

4 Ordnance deployment manager.

5 Optical driver modem.

6 Original design manufacturer.

**ODMS** 1 Oil-debris monitoring system.

2 Operational data-management system (ATC).

**odometer** Digital readout of numerical quantity, esp. distance, as in DME.

**ODP** Office of Defense Plants (US 1945).

**ODR** 1 Overland downlook radar.

2 Operator difference requirements.

3 Overnight defect rectification.

**ODS** 1 Oxide-dispersion strengthened.

2 Operational debrief station.

3 Optical-disk system.

4 Ozone-depleting substance[s].

5 Operator, or operator input [and], display system (also OIDS).

6 Office of Defense Supplies (US).

7 Orbit-determination system.

**ODSI** Orbital deep-space imager, system for fine-detail investigation of orbital objects (USAF).

**ODT** 1 Overland downlook technology.

2 Omnidirectional transmitter or transmission.

3 Office of Defense Transportation (US).

**ODTC** Office of Defence Trade Controls (US).

**ODU** Optical display unit.

**ODVF** Society of friends of the air fleet (USSR).

**ODW** Optimum-drag windmilling.

**OE** 1 Opto-electronic (not necessarily synonymous with EO).

2 Over-excitation.

**OEANC** Optical and electronic aiming and navigation complex.

**OEB** Operations engineering bulletin.

**OEC** Operational emergency clearance.

**OECD** Organization for Economic Co-operation and Development (19 member countries).

**OED** 1 Operational evaluation demonstration.

2 Operator-workstation embedded disk.

3 Operational-employment date (UK).

**OED/D** Operational error/deviation[s]/

**OEI** One engine inoperative.

**OEIM** Organisme Egyptien pour l'Industrie Militaire.

**OELD** Organic electroluminescent display.

**OEM** 1 Original equipment manufacturer; RO adds repair and overhaul.

2 Office of Emergency Management (US).

**OEO** Operational equipment objective.

**OEP** 1 Office of Emergency Preparedness (US).

2 Operational evolution plan, or partnership (FAA).

3 Oil[s], extreme pressure.

**OER** 1 Operational effectiveness rate.

2 Officer effectiveness report.

**orersted** Non-SI unit of magnetic field strength, = 79.577 A/m, exact conversion is 1,000/4π.

**OEST** Outline European staff target.

**OEU** 1 Operational Evaluation Unit (RAF).

2 Overhead electronics unit[s].

**OEW** Operating empty weight [OWE is preferred].

**OEX** Orbiter experiment; SS adds support system[s] (NASA).

**OF** 1 Over-frequency.

2 Objective Force, major long-term program (USA).

3 Ocean Flight [tower system]; DVPS adds data visual and processing system.

4 Owner-flown [esp. relevant to executive aircraft].

**O/F** Oxidizer (oxidant)-to-fuel ratio.

**OF<sub>2</sub>** Oxygen difluoride rocket propellant.

**OFA** 1 Office Fédéral de l'Air (Switzerland).

2 Organization of Flying Adjusters [office, Corpus Christi, TX] (US).

**OFAB** HE fragmentation (bomb, USSR, R).

**OFAM** Office Fédéral des Aérodromes Militaires (Switzerland).

**OFCM** Office of the Federal Co-ordinator for Meteorological Services and Supporting Research (US Dept. of Commerce).

**OFCR** Overhead flight-crew rest, in normal wide-body unused above-ceiling volume.

**OFDM** 1 Operational flight-data monitoring.

2 Orthogonal frequency-division [or domain] multiplexing.

**OFDPS** Oceanic flight-data processing system.

**OFE** Oil-free engine.

**OFEMA, Ofema** Office Français d'Exportation des Matériels Aéronautiques.

**OFF, Off** Officer.

**off-block[s] time** When aircraft leaves gate [probably travelling backwards] or starts to taxi.

**offboard** Released or ejected from the platform [aircraft or ship], usually as decoy.

**offboard data** Supplied by sensors outside the aircraft.

**off-design** 1 Any operating condition other than that or those [defined numerically] for which equipment was intended.

2 Less common definition: at or near stall or buffet boundary, or in severe turbulence.

**offensive avionics** Those carried in attacking aircraft to assist fulfilment of mission, eg by providing navigation, target sensing and weapon guidance.

**offensive sweep** Low-level flight by fighters over enemy territory looking for targets of opportunity.

**office** Cockpit or flight deck (colloq.).

**off-line** 1 Connected to computer but not forming part of dedicated controlled system.

2 Computer peripheral not directly communicating with central processor.

3 Not on airline's route network (eg Western Airlines has an \* office in Washington DC).

4 Computer or EDP (4) installation which stores input data for processing when commanded.

5 No longer supplying power [usually electric] to system.

**off-mounted** SSR aerial [antenna] not mounted on primary radar but on its own turning gear, and can thus be either synchronized to primary radar or rotated at predetermined data rate.

**offset** 1 In major international purchase, eg of quantity of combat aircraft, agreement in reverse direction in which purchasing country is awarded one or more contracts for products which may or may not be connected with original hardware. This kind of \* may be (1) purely window dressing to render costly import less unpalatable, (2) important commercial deal to benefit original importing country, (3) designed to bolster ailing home industry, or (4) important vehicle for transfer of advanced technology to importer.

2 Linear distances, usually small, measured from baseline to joggled or tapered edge, bevel, flange at angle other than 90°, or similar part dimension.

3 Precisely defined point on ground in surface attack (see \* bombing) or in space in air interception (see \* point).

4 Linear or angular difference between major axis (eg of aircraft or engine) and axis of drive shaft from gearbox.

5 In fir-tree root, distance between teeth measured parallel to major axis of blade.

6 Length of normal common to landing-gear castor axis and wheel axle [can be zero].

7 Lateral and vertical distances from desired G/S and runway centreline of (a) an actual landing aircraft, or (b) ILS beam (locus of peak signal strength).

8 Bearing/distance to runway threshold from point navaid, eg Tacan.

9 See \* factor).

10 See next.

**offset angle** 1 Angle in vertical plane between horizontal through tug and line joining tug to glider, tow-target or other towed body.

2 Offset (4).

**offset attack** See offset bombing.

**offset bombing** Any surface-attack procedure which employs aiming or reference point other than target.

**offset distance** 1 See offset (2).

2 Distance from desired ground zero or actual ground zero to point target or centre of area target (DoD, NATO).

**offset factor** In parafoil delivery, distance divided by drop altitude.

**offset frequency simplex** Two stations transmit to each other on slightly different frequencies.

**offset frontal** Meeting between two DA (3) aircraft and two hostiles (7–10 miles ahead) on reciprocal, such that no aircraft will pass between opposing pair.

**offset hinge** Helicopter main-rotor hinge at substantial radial distance from axis of rotation.

**offshore procurement** Procurement by direct obligation of MAP funds of materiel outside US territory; may include common items financed by other appropriations (DoD). In other words, US taxpayers paid for aircraft made in Europe, to assist industrial recovery 1951–55.

**offst** Offset track.

**offtake** Route through which power-source physical output is extracted, notably pipe for hot bleed air or shaft for rotary power.

**off the shelf** Already fully developed to military or commercial standards and available from industry for procurement without change to meet military requirement.

**off-wing** With the engine removed from the aircraft [not necessarily an under-wing installation].

**off-wing slide** Emergency escape slide well ahead of or behind wing.

**OFHC** Oxygen-free high-conductivity copper.

**OFIC** Oceanic Flight Information Centre.

**OFIS, Ofis** Operational Flight Information Service (ICAO).

**OF/INT** Operational flight/navigation trainer (USN).

**OFO** Orbiting frog otolith [programme].

**OPF** 1 Operational flight program; LS adds loading system (USAF).

2 Occluded frontal passage.

**OPFP** Office of Procurement and Policy (DoD).

**OFS** Operational flying school (RN).

**OFSHR** Offshore.

**OFT** 1 Operational flight trainer.

2 Operational flight test.

3 Operational flying training.

4 Orbital flight test.

5 Office of Fair Trading (UK).

6 Outer-fix time.

7 Office of Force Transformation (DoD).

8 Occupied flight time (fractional ownership).

**Oftcom** Office of Transport and Communications (UK).

**OFTS** Operational flight and tactics simulator.

**OFU** Overseas Ferry Unit (RAF, WW2).

**OFV** Outflow valve.

**OFW** Oblique flying wing.

**OFZ** Obstacle-free zone.

**OG** 1 Observation group (USAAC, USAAF).

2 Operations Group (USAF).

**OGA** 1 Outer gimbal angle.

2 Office Général de l'Air (F, export distribution).

**OGE** 1 Out of ground effect; supported by lifting rotor(s) in free air with no land surface in proximity.

2 Operational ground equipment.

**ogee** See *ogive*.

**OGEL** Open General Export Licence (UK).

**oggins, the** The sea (RN colloq.).

**ogive** 1 Loosely, any shape formed by planar curve whose radius increases until it becomes straight line.

2 Wing plan having approximate form of curve becoming straight line parallel to longitudinal axis on each side of centreline; so-called 'Gothic window' shape.

3 Body of revolution formed by rotation of curve as in (1) about axis parallel to line on same side of line as curve.

4 Any of various other shapes such as conical \* (body formed by rotation of two straight lines forming cone/cylinder), tangent \* (circular arc tangent to line) or secant \* (circular arc meeting line at angle).

5 Common definition is 'surface of revolution generated when circular arc and line segment are rotated about axis parallel to line'; this is incorrect since curve need not be circular arc and shape can be planar and not body of revolution.

**OGO** Orbiting geophysical observatory.

**OGV** Outlet guide vane, or straightener vane.

**OGW** Space agency (Austria).

**OH** 1 Overhaul.

2 Overhead.

**O/H** 1 Overheat.

2 Overhead.

**OHA** Operating hazard analysis.

**OHAR** Overhead attendant rest (above ceiling of wide-body centre fuselage).

**OHC** 1 Operating hours counter.

2 Overhauled condition.

3 Overhead camshaft.

**OHD** Overhead.

**OHM** Office of Hazardous Materials (US Dept of Transportation).

**ohm** 1 SI unit of electric resistance, defined as that of conductor across which potential difference of 1 V produces current of 1 A; symbol  $\Omega$ .

2 By analogy with (1), mechanical measure of resistance derived by dividing applied force by velocity; has dimensions of g/s.

**Ohmist, OHMIST** Offshore helicopter meteorological information self-briefing terminal.

**ohmmeter** Usually, compact instrument for giving quick approximate indication of resistance of circuit to direct current.

**OHP** Overhead projector, or projection.

**OHRCA** Occupational Health Research Consortium in Aviation (US).

**OHS** Office of Homeland Security (US, DoD, created 2001).

**OHU, Ohud** Optical head, or overhead, unit of HUD.

**OHV** Overhead valve[s].

**OI** 1 Operational interruption.

2 Office of Information.

3 On instruments.

4 Operating instruction.

**OIA** Office of International Aviation (US).

**OIB** Orbit-insertion burn.

**OIC** 1 Organized immigration crime.

2 Officer in charge.

**OICRs** Operational intelligence collection requirements.

**OID** 1 Optical incremental digitiser.

2 Outline installation drawing.

3 Operator input and display; S adds system.

**OIDT** Operator interactive display terminal.

**OIG** Office of Inspector-General (US, eg NASA).

**oil** Vague term which could mean crude petroleum, hydrocarbon-based lubricant or other 'oil-like' materials. Even ester- and polyester-based synthetic lubricants are often marketed as turbine oils.

**oil bottle** Container of lubricating oil fed by air/gas pressure or even spring-loaded plunger, to short-life engine, eg of cruise missile.

**Oil Burner routes** Published routes within continental US along which USAF, USN and USMC conduct high-speed training missions at low level in VFR and IFR.

**oil-can** Noun and verb, portion of metal skin where compressive stress imposed in manufacture has resulted in slight local bulge between rows of rivets or other attachment which, when subjected to pressure difference or perpendicular force at centre, can suddenly spring inwards noisily; potential fatigue hazard with thin skin.

**oil control ring(s)** Piston rings whose main purpose is to prevent loss of lubricating oil from cylinder wall up into combustion chamber; usually one or two, below main compression rings.

**oil cooler** Heat exchanger whose purpose is to remove heat from lubricating-oil circuit; usually cooled by air or fuel flow.

**oil coring** See *coring*.

**oil dilution** Mixing petrol with lubricating oil to reduce viscosity to facilitate starting large piston engine at very low temperature.

**oil drive** Hydraulic drive, usually signifying infinitely variable ratio.

**oil-free engine** The principal route to this objective is use of active magnetic bearings.

**oil jet** Fine nozzle through which lubricating oil is projected, either as liquid or a fine spray.

**oil radiator** See *oil cooler*.

**oil ring** Scraper ring.

**oil trough** Small cup surrounding lowest teeth of a gear-wheel into which oil drains after shutdown, providing lubrication during the first few seconds of engine start.

**OIML** Organisation Internationale de la Métrologie Légale (Int.).

**OIN** 1 Organisation Internationale de Normalisation (Int.).

2 Overhaul information notice.

**OIP** Optimum implementation plan.

**OIPC** Organisation Internationale de Protection Civile [= ICDO] (Int.).

**OIPS** Optical imagery presentation system[s].

**OIRI** French for CCIR.

**OIS** 1 Obstacle identification surface.

2 On-board information system.

3 Orbit improvement system.

<b>OIT</b>	1 Operator-information telex. 2 On-board information terminal.	4 Other management.
<b>OITS</b>	Organización Internacional de Telecomunicaciones por Satélites (Int.).	5 Over maximum (often O/M).
<b>OIU</b>	1 Orientation/introduction unit. 2 Operator interface unit.	6 Occupational medicine. 7 Operations module. 8 Out [of use] for maintenance. 9 Oil[s], mineral.
<b>OJCS</b>	Organization (or Office) of the Joint Chiefs of Staff (US).	<b>OMAG</b> Independent naval aviation group (USSR).
<b>OJT</b>	On the job training (DoD).	<b>OMAR</b> Optical microwave approach and ranging (UAV all-weather landing).
<b>OKB</b>	Experimental construction bureau, where aircraft are designed and developed (USSR, R).	<b>OMB</b> 1 Office of Management & Budget (US, White House).
<b>OKC</b>	Over [a named radio station].	2 Oilless magnetic bearing. 3 Organic-media blasting.
<b>OKL</b>	Oberkommando der Luftwaffe (G).	<b>OMC</b> Organic-matrix composite.
<b>OKO</b>	Experimental construction section (various, USSR).	<b>Omcads</b> Oil movement control and distribution system, manages fuel [not lubricating oil] installation at airport including separation of contaminants.
<b>okta</b>	Unit of sky area equal to one-eighth of total sky visible to celestial horizon [previously octa].	<b>OMCFP</b> Optimized MAC computer flight plan.
<b>OL</b>	1 Operating location. 2 Oesterreichischer Luftfahrtverband [Austrian air-transport association, Vienna].	<b>OMCM</b> Operational and maintenance configuration management (software).
<b>OLAN</b>	On-board local area network.	<b>OMD</b> 1 On-board maintenance documentation. 2 Oils minerals detergent.
<b>OLBR</b>	Operational laser-beam recorder.	<b>OME</b> 1 Operating mass empty, usually same as OWE. 2 Operational mission environment.
<b>OLC</b>	Operational level of capability, marked by achievement of different Phases.	<b>Omega</b> Accurate long-range radio navaid of VLF hyperbolic type, covering entire Earth from eight ground stations and usable down to SL or underwater.
<b>OLDI</b>	On-line data interchange.	<b>omega (<math>\omega</math>)</b> 1 Angular velocity (SI unit is rad/s). 2 Angular frequency.
<b>OLDP</b>	On-line data processing (or processor).	3 Any generalized frequency, thus $\omega_n$ is natural frequency and $\omega_r$ is undamped natural frequency of rth mode.
<b>OLED</b>	Organic light-emitting diode.	<b>OMEV</b> Independent naval helicopter squadron, Bulgaria's naval air unit, previously OPLEV.
<b>OLEEA</b>	On-line exhaust emissions analysis.	<b>OMG</b> Operational manoeuvre group (USSR).
<b>oleo</b>	Telescopic strut which absorbs energy of compressive loads by allowing hydraulic oil or other fluid to escape under pressure through small restrictor orifice, usually controlled by one-way valve to reduce rebound.	<b>OMI</b> Omnbearing magnetic indicator.
<b>oleo-pneumatic</b>	Absorbing shock by combination of air compression and forcing liquid through an orifice.	<b>OMIS</b> Operations-management information system.
<b>OLEV</b>	Orbital life-extension vehicle.	<b>OMM</b> 1 Organisation Météorologique Mondiale = WMO (Int.). 2 Oxygen-mask microphone.
<b>OLF</b>	Outlying field.	<b>OMMS</b> Oxygen-mask-mounted sight.
<b>OLGS</b>	Operational-level ground station [OLTGS adds Tactical].	<b>Omni</b> VOR (colloq.).
<b>olive</b>	Small ellipsoid resembling an olive threaded on cable either to act as bearing surface in tubular guideway, or in continuous row separated by small spheres located in recesses in olive ends, to provide two-way push/pull mechanical interconnection (eg in Bloctube system).	<b>omni-axial nozzle</b> Rocket motor nozzle capable of being vectored to any angle within prescribed limits about pivot point defined by intersection of axes of symmetry of propelling system and nozzle.
<b>Olive Branch route</b>	Lo-Level routes for B-52 training in continental US.	<b>omni-bearing indicator</b> VOR panel instrument.
<b>OLM</b>	1 On-line, or operational loads, monitoring, or measurement. 2 Off-line mapper. 3 Organizational-level maintenance. 4 Octane lean mixture.	<b>omni-bearing selector, OBS</b> Knob on most VOR/ILS indicators which is turned to each required VOR bearing, which appears in a three-digit window display, left/right needle thereafter showing difference from required heading.
<b>Ologs</b>	Open-loop oxygen generating system.	<b>omnidirectional aerial</b> Antenna emitting to all points of compass (assumed equal signal strength throughout 360°).
<b>OLOS, Olos</b>	Out of line of sight.	<b>omnidirectional ball panel</b> Removable floor panel containing free-running balls on which cargo containers are moved.
<b>OLP</b>	Open-loop phase.	<b>omnidirectional beacon</b> Fixed ground radio station giving non-directional signals for airborne DF receivers (obs).
<b>OLR</b>	Offload route[s].	<b>omniflash beacon</b> Airborne flashing (strobe) light visible equally through 360° in azimuth.
<b>OLRT</b>	On-line, real time.	<b>omni-range</b> See <i>VOR</i> .
<b>OLS</b>	1 Optical landing system. 2 Operational linescan, or linescan system.	
<b>OLTE</b>	Optical-line termination equipment.	
<b>OLTF</b>	Open-loop transfer function.	
<b>OLTGS</b>	See <i>OLGS</i> .	
<b>OLTS</b>	Oil-level and temperature sensor.	
<b>OM</b>	1 Outer marker. 2 Organizational maintenance. 3 Operation & Maintenance (USAF).	

**omnivision**

- omnivision** Uninterrupted view through 360°.
- OMNTS** Over mountains; also OMTNS.
- OMOS** Department of experimental marine aircraft construction (USSR, defunct).
- OMPS** Ozone-mapping and profiler sensor, or suite.
- OMS** 1 Crew chief (USAF).
- 2 Orbital manoeuvring system, or subsystem.
  - 3 Organisation Mondiale de la Santé (Int.).
  - 4 On-board maintenance system.
  - 5 Order, or operating, or operational, management system.
  - 6 On-board monitoring system.
- OMT** 1 Other military targets.
- 2 On-board maintenance terminal.
  - 3 Object modelling [US modeling] technique.
  - 4 Optical modular technology.
- OMV** Orbital manoeuvring vehicle.
- ON** 1 Omega navigation.
- 2 Octane number.
- ONA** 1 Office of Noise Abatement (FAA).
- 2 Operational net assessment.
- ONAC** Office of Noise Abatement and Control (EPA, US).
- on-block[s] time** Parked at gate.
- on-board aircraft server** Integrates flight deck, cabin, maintenance and ground-based operations into seamless system, each aircraft being a LAN.
- on-board cargo operations system** Microprocessor-based system which automatically positions each item for correct c.g. and best structural integrity.
- on-board EW simulator** Internally [ie, passively] simulates external threats as seen by on-board sensors [all likely wavelengths].
- on-board oxygen generation** Usually removes nitrogen from bleed air by Zeolite molecular sieve.
- ONC** Operational navigation chart[s].
- on call** Ready for prearranged mission to be requested.
- on-call target** Planned nuclear target to be attacked not at specific time but on request.
- on-condition maintenance** Performed only when condition of item demands, instead of at scheduled intervals.
- on-course signal** Electronic signal indicating receiver is on desired course, usually in form of steady note created by two superimposed coded signals.
- OND** Optical neural device.
- 1½-stage** Vehicle configuration, esp. ballistic rocket, in which single set of propellant tanks feed two or more thrust chambers, one or more of which is jettisoned in flight.
- one-dimensional flow** Flow through duct in which all parameters are, or are assumed to be, constant throughout any section normal to the direction of flow.
- one-dot error** One scale division from centre on ILS/VOR needle or similar-type instrument, usually equal to 0.5°.
- 1553B** Standard military databus highway, comprising a twisted pair of conductor wires; full designation MIL-STD-1553 (1973), 1553A (1975), 1553B (1978) (US/NATO).
- 180°-approach** Any of several standard approach procedures involving downwind leg and 180° turn; variations include 180° accuracy landing, 180° spot landing, 180° U-turn approach and 180° semicircular approach.

- 180° error** Misreading compass by flying reciprocal of desired course, formerly avoided by rule 'red on red'.
- 1-min turn** Procedure turn through 360° (rarely, 180°) taking one minute to complete; bank angle is about 30°.
- one-off** Aircraft of which only a single example is constructed.
- 1179** The form used when adding a new type to a provisional pilot's licence (CAA, UK).
- one-on-one** Classical air combat by two opposing aircraft.
- ONER** Oceanic navigation error report.
- ONERA** Office National d'Etudes et de Recherches Aéronautiques [F-92322 Châtillon] (F).
- One-star** Becoming colloquial alternative to Air Commodore (RAF).
- one-shot lubrication** 1 In a short-life engine (e.g., for a cruise missile) a measured volume of lubricant supplied under pressure throughout the mission.
- 2 In an engine for manned aircraft, a metered dose of oil injected into the splines of a shaft joint or propeller drive on engine startup.
- ONFA** Opera Nazionale per i Figli degli Aviatori (I).
- onglet** Leading-edge root fillet.
- on-line** 1 Of computer of EDP (1) system, automatically receiving and instantly processing information and sending output data to required destination.
- 2 Of EDP (1) peripherals, operating under direct control of central processor.
- on-mounted** Indicates that SSR aerial [antenna], ECM aerial or similar ancillary device is mounted on, and oscillates or rotates with, main radar.
- ONN** Optical neural net.
- ONR** Office of Naval Research [Arlington, VA22217] (USN).
- ONS** Omega navigation system.
- ONSHR** Onshore.
- ONST** Outline NATO staff target.
- on the beam** Correctly aligned on ILS glidepath or other guidance beam. Today has come to mean 'on the right track' in most general sense.
- on the deck** At minimum safe altitude (colloq.).
- on the fizzier, on the hooks** On a charge, facing disciplinary action (RAF colloq.).
- on top** 1 Above unbroken cloud, with CAVU environment.
- 2 Directly above operating sonobuoy or indicated submarine position.
- Ontrac II** American VLF navaid of rho-rho type.
- ONVL** Over-the-nose vision line, lower limit in side elevation of pilot's FOV.
- on-wing** With the engine installed in the aircraft [not necessarily hung on a wing].
- OOA** 1 Object-oriented analysis.
- 2 Out of area.
  - 3 Offshore Operators' Association (UK).
- OOB** Order of battle.
- OOC** On-orbit checkout.
- OOD** 1 Object-oriented design, or development.
- 2 Officer of the day.
- OODA** Observe[r]-orientation-decision-action; hence Ooda-loop.
- OODB** Object-oriented data-base; MS adds management system.
- OOF** Out of flatness (machined plate).

<b>OOH</b>	Out of operating hours.	<b>open rate</b>
<b>OOK</b>	Department of special constructions (USSR, obs).	
<b>OOOI</b>	Out [from gate], off [T-O], on [landed], in [at gate] (Agars).	
<b>OOP</b>	Object-oriented programming.	
<b>OOR</b>	Out of region.	
<b>OORA</b>	Object-oriented requirements analysis.	
<b>OOS</b>	1 Department of special aircraft construction (USSR, obs).	
	2 Out of service.	
<b>OOSA</b>	Office for Outer Space Affairs (UN).	
<b>OOTW</b>	Operations other than war.	
<b>OOV</b>	Objects of verification.	
<b>OWW</b>	Out of window, simulator depicts external scene.	
<b>OP</b>	1 Observation post, position or point.	
	2 Oil pressure.	
	3 Operating procedure.	
	4 Overhead panel.	
<b>op</b>	An operational flight, hence ops.	
<b>OPA</b>	1 Component of GB Sarin, isopropylamine plus isopropylalcohol.	
	2 Office of Price Administration (US).	
	3 Opaque (icing).	
	4 Open planar array.	
	5 Optionally piloted aircraft.	
<b>OPAC</b>	Operations of aircraft [ECAC working group].	
<b>OPACI, Opaci</b>	Opera Pionieri e Anziani dell'Aviazione Civile Italiana.	
<b>opacity</b>	In optical systems or photographic film, reciprocal of transmittance ( $\log O = \text{density } d$ ); term absorbance is now recommended.	
<b>OPAL, Opal</b>	1 Order processing automated line.	
	2 Orbiting picosat automated launcher.	
<b>Opale</b>	Optical piloted aircraft long-endurance.	
<b>opaque plasma</b>	One through which EM signals cannot pass; generally plasma is opaque for EM frequencies below plasma frequency.	
<b>opaque rime</b>	White icing of porous form caused by rapid freezing of small droplets.	
<b>OPAS, Opas</b>	1 Overhead-panel Arinc-629 system.	
	2 Operational assignment (ICAO).	
<b>OPAT</b>	Office des Ports Aériens de Tunisie.	
<b>Opats</b>	Object-position and tracking sensor.	
<b>OPB</b>	Oxygen preburner.	
<b>OPBC</b>	Overhead-panel bus controller.	
<b>Op By</b>	Operating authority.	
<b>OPC</b>	1 Operational control (ICAO).	
	2 Optical-phase conjugation.	
<b>Opcom</b>	Operational command.	
<b>OPCW</b>	Organizaton for the Prohibition of Chemical Weapons.	
<b>OPD</b>	Oil-pressure diffuser.	
<b>Opdef</b>	Operational defect.	
<b>OPEC, Opec</b>	Organisation of Petroleum Exporting Countries.	
<b>open</b>	1 Aircraft has * cockpit with no canopy.	
	2 With normal control path disconnected; such failure interrupts or seriously distorts signal passing along that channel.	
	3 Another meaning is that customer has not yet decided something, such as which of two competing engines to select for new fleet.	
<b>open angle</b>	Angle of mating part slightly greater than 90°	
	or other angle of edge of metal structure such as angle section; fault condition in sheet metalwork.	
	<b>open architecture</b> Easily added to or modified.	
	<b>Open Aviation Area</b> Proposed [from 2003] EU-US agreement on N Atlantic carriers, covering ownership, sabotage and many other issues.	
	<b>open-bladed</b> Not enclosed in a shroud or duct.	
	<b>open-centre system</b> Hydraulic system without an accumulator.	
	<b>open circuit</b> 1 Electrical, circuit interrupted.	
	2 Wind tunnel, one having no return path.	
	<b>Open Class</b> FAI/CIVV categories for competition sailplanes, in one case with Standard Class span of 15 m and alternatively with span unrestricted but usually 17 to 20 m. In each case all refinements such as flaps are permitted.	
	<b>open cockpit</b> Not provided with a canopy, leaving occupant's head [and possibly upper torso] in slipstream.	
	<b>open-coil armature</b> Ends of each coil connected to different bars of commutator.	
	<b>open competition</b> Industrial competition in which all proposals, promises or offers are communicated to all participants.	
	<b>open cycle</b> Thermodynamic cycle in which the working fluid passes through the system once, then being discharged to atmosphere. All existing aero engines are of this type.	
	<b>open delta</b> Three-phase transformer comprising two single-phase transformers linking three lines.	
	<b>open-ended</b> Spaceflight continued until either all possible information has been gained, and mission objectives met, or spacecraft systems run low or become faulty.	
	<b>open-gore</b> Parachute in which fabric is absent from one gore to assist trajectory control.	
	<b>open-hearth</b> Principal method of high-quality steel-making in many countries, using shallow regenerative furnace with or without oxygen.	
	<b>open improved site</b> Open-air site for military storage whose surface has been graded and surfaced with topping or hard paving.	
	<b>open items</b> 1 Work done on sections of airframe at location away from assembly line prior to major join.	
	2 The sections worked on in [1].	
	3 Parts or procedures inadvertently omitted during manufacture.	
	<b>open-jaw ticket</b> Generally, airline booking out by one route and return by another or over return route to different destination.	
	<b>open-jet tunnel</b> Wind tunnel in which working section is open and has no tunnel walls.	
	<b>open-link ammunition</b> Rounds are held in clips that do not encircle each case, which can be pushed out diagonally instead of removed only to rear.	
	<b>Open List</b> List of military aircraft on which nothing was secret (RAF 1918 – c1960).	
	<b>open loop</b> Servomechanism or other system comprising control path only, with no measurement of result or feedback to give self-correcting action.	
	<b>open production line</b> Inactive, but in a state ready to resume production should further aircraft be required.	
	<b>open propfan</b> Propfan or UDF without a surrounding shroud.	
	<b>open rate</b> Situation in which fares on particular air-carrier route are fixed by each operator independently.	

## open rotor

**open rotor** *Open propfan.*

**open section** Structural member devoid of closed and thus uninspectable surface.

**Open Skies** Country allows unlimited traffic rights to foreign carriers, usually reciprocal.

**open system** Using stored food/oxygen and discarding all body wastes.

**oper** Operate (FAA).

**operand** EDP (1) quantity entering or arising in instruction; can assume many forms, from argument to address code; generally a word on which operation is to be performed.

**operating active aircraft** Those for which funds are provided, as distinct from non-operating active aircraft (DoD).

**operating envelope** Plot of extreme boundaries of conditions to which hardware is subject, eg acceleration/temperature, or (in case of aircraft) altitude/Mach or V/n gust envelope.

**operating expenditure** Airline's total costs of generating ATMs.

**operating ratio** Airline operating revenue divided by operating expenditure.

**operating revenue** Gross income from an airline's air-carrier operations, normally excluding other activities and any state subsidy.

**operating speed** Traditionally 87.5 per cent of rated rpm for light piston engine (US, obs.).

**operating weight empty** Total mass of aircraft ready for flight, including oil, water, food and bar stocks, passenger consumable stores, flight and cabin crews and their baggage and, according to most definitions, empty baggage containers where appropriate, but excluding fuel and payload. In case of military aircraft, ADI fluid and drop tanks are excluded but EW pods are included.

**operation** 1 A military action, or carrying out of mission.

2 Operational flight, recorded by individual's logbook; if enemy opposition was weak, a completed \* might count as only ½ in assessing individual's total.

**operational** Ready to accomplish mission.

**operational agility** 'The ability to adapt and respond rapidly and precisely with safety and poise to maximise mission effectiveness', also defined as 'airframe agility + systems agility + weapons agility'.

**operational aircraft** In British usage, one intended and ready for combat missions, as distinct from transport or training.

**operational air traffic** Generally, that which cannot conform to requirements of flights within airways or controlled airspace.

**Operational Bulletin** Issued when necessary, eg following difficulty or technical failure, giving advice, especially to flight crews [but not giving mandatory instructions].

**operational characteristics** Those numerically specified parameters describing system performance; system can be aircraft, radar, etc.

**operational command** Normally synonymous with operational control, and covers all functions involving composition of forces, assignment of tasks, designation of objectives and direction of mission; does not include such matters as administration, discipline or training.

## operational performance categories

**operational control** 1 Authority granted a commander to direct forces to accomplish missions (NATO, etc).

2 Exercise of authority over initiation, continuation, diversion and termination of a flight (ICAO).

**operational control communications** Communications required for operational control (2) between aircraft and operating agencies.

**operational control segment** That portion of communications link of GPS or Navstar used to transmit commands.

**Operational Conversion Unit** Turned qualified pilots and other crew members into crews fit for operations (RAF WW2 and later).

**operational development model** Almost same as a prototype, but to evaluate hardware for a new or modified mission, eg an AEW/AWACS airship.

**operational effect rate** Usually, flying rate.

**operational error/deviation[s]** Action by an air-traffic controller that results in reduced separation [of anything, including on ground].

**operational evaluation** Test and analysis of system under operational conditions, with consideration of capability offered, manning and cost, potential enemy accomplishments and alternatives, to form basis for decision on quantity production. In practice \*\* is often not accomplished until long after production decision.

**operational factors** Those exercising constraints on flightplan, notably ATC (1), pilot workload, available aids, specified refuelling locations, etc.

**operational flight** In the face of the enemy, carrying weapons or cameras or troops or food parcels or towing glider, etc, and underlined in red in logbook. US = combat mission.

**operational flightplan** Operator's plan for safe conduct of particular flight.

**operational interchangeability** Ability to substitute one item for another of different composition or origin without loss of effectiveness or performance.

**operational interruption** Period during which an item is unserviceable.

**operational load measurement** On-going structural audit to establish safe fatigue life, esp. of fighter or military trainer.

**operational loss or damage** Loss or damage to military item caused by reason other than combat.

**operational manoeuvrability ceiling** Maximum height at which, for any given weight, aeroplane can sustain specified load factor (vertical acceleration) at onset of buffet.

**operational meal** Special treat for aircrew returned from an operational mission; key element: a fried egg (RAF, WW2).

**operational mission** Many definitions, all faulty; suggested: a military flight in furtherance of armed conflict. Aircraft need not be armed, and need not encounter enemy.

**operational mode** Any of selectable alternative methods of operation for functioning system, eg computer-controlled, automatic with feedback, automatic open-loop, semi-automatic and manual.

**operational net assessment** Study of a hostile country from economic, military, political and diplomatic viewpoints, and potential for fomenting revolution (US).

**operational performance categories** Categories I to IIIC

## operational phase

defining ILS and blind (automatic) landing installation performance. See *Categories (3)*.

**operational phase** Period from acceptance by first user to elimination from inventory.

**operational readiness** Capability of unit or hardware to perform assigned missions or functions. Hence \*\* inspection.

**operational readiness platform** Ramp where aircraft at various ready states (including alert states) are parked, with all required connections (eg telebrief) in place.

**operational readiness training** Consolidated instructional period wherein qualified personnel for operational units are given integrated training in operational mode.

**operational research** Generally, analytical study of problems to provide numerical (some definitions say "scientific") basis for decision-taking; in US often called operations research.

**operational test and evaluation** Test and analysis of system under operational conditions, promulgation of associated doctrines and procedures, and continuing evaluation against new threats or changed environment or circumstances.

**operations** Engaged in operational flying.

**operations manual** Usually, definitive handbook for user of system, as distinct from engineering, repair or design manuals; for aircraft called flight manual.

**operations room** Too many meanings to define. In a modern airline it undertakes real-time monitoring of engines and systems and ensures that required repair or maintenance can begin as soon as an aircraft is parked. See *ops room*.

**operative** 1 Able to operate; in true fail-\* system there is no loss in performance (though there may be in integrity) after failure.

2 Employee engaged in routine operation of tool or machine on production work.

**operator** 1 Person, organization or enterprise engaged in or offering to engage in aircraft operation (ICAO).

2 Licensed air carrier.

3 American term for employee other than foreman or manager.

**operator's local representative** Agent located to obtain meteorological information for operational purposes and to provide operational information to local met. office.

**Opeval** Operational evaluation.

**OPF** Orbiter processing facility.

**Opfor** The opposing force[s] [tactical simulation].

**Op.Hr.** Operating hours.

**OPIAR** Association of aerospace companies (Romania).

**OPLE** Omega position-locating equipment; synchronous satellite providing control beyond LOS.

**OPLEV** See *OMEV*.

**OPM** 1 Office of Personnel Management.

2 Operation performance monitor.

3 Operations Policy Manual (JARs).

**Opmet** Operational meteorological information or service.

**OPN** Optimised-profile navigation.

**opn** Operation, open, opening.

**Opoc, OPOC** Opposed piston[s], opposed cylinder[s].

**Opos** Open purchase order summary.

**OPOV** Oxygen preburner oxidiser valve.

**opportunity servicing** Servicing carried out at any conve-

## optical instrumentation

nient time, within specified flight or operating-time intervals.

**opportunity target** See *target of opportunity*.

**opposed engine** Piston engine having left and right rows of (usually horizontal) cylinders either exactly or approximately opposite to each other, with crankshaft on centreline.

**opposed-piston engine** Piston engine, usually of two-cycle compression-ignition type, in which each cylinder has central combustion space and two pistons working in opposition and driving crankshafts at opposite extremities.

**opposition manoeuvres** Two aircraft perform in unison, one flying the mirror image of the other's manoeuvres.

**OPR** 1 Overall engine pressure ratio.

2 Office of Primary Responsibility (DoD).

3 Operate, operation[s], operating, operator, operational, etc.

4 Operational preference.

5 Once per revolution [or o.p.r.]

**O<sub>pr</sub>** Operator.

**OPS** 1 Operational performance standards.

2 Operations per second [or o.p.s.]

3 Operational program software (Adiru).

**Ops, ops** Operations; an individual might complete 25 \* and still be on \* (RAF WW2).

**OPSA** Oxford Air Training School Past Students Association (UK).

**opsec** Operational security.

**OPSP** Operations Panel (ICAO).

**Opspecs** Operational specifications.

**ops room** Operations room, in this case a specific meaning: the room in an operational station from which missions are directed [but distinct from briefing room].

**OPT** 1 Optional.

2 Optimum.

**Optempo** Operations, or operational, tempo (USN).

**optical barrel camera** Precise long-focus camera for SR-71 aircraft.

**optical communications** Systems using coherent (laser) light, usually channelled along optical fibres; owing to extremely high frequencies such systems have enormous information-rate capacity.

**optical countermeasures** ECM in visible range of EM spectrum.

**optical display unit** The optical element of a HUD, also called optical head unit.

**optical electronics** One meaning is use of optics to focus IR on sensitive detector in search for electronic emitter.

**optical fibre** Filament drawn from two kinds of glass having different refractive indices, in form of core and sheath; light entering at one end is reflected each time it encounters core/sheath boundary until it emerges at other end.

**optical guidance** Usually, passive guidance based on sensitive photocells which sense presence of target and cause vehicle to home on it.

**optical gyro** Fibre-optic gyro.

**optical head unit** See *optical display*.

**optical instrumentation** Use of optical systems (telescope, theodolite, precision graticules and marking on vehicle) in conjunction with cameras and TV to provide stored information of location in three dimensions,

velocities and other parameters of hardware or phenomena.

**optical landing system** Refined form of mirror sight in which gyrostabilized light beams indicate to approaching pilot deviation from glidepath (USN, USMC).

**optical line of sight** LOS through atmosphere, which in precision measures is not to be regarded as straight.

**optical linescan** Term used for various line-by-line scanning at optical wavelengths, including RBV (video).

**optically flat panel** Window used in visual sighting systems through which light passes with near-zero distortion.

**optical maser** See *laser*.

**optical Mems** Mem operating at optical wavelengths.

**optical pyrometer** Instrument giving numerical readout of temperature of hot surface by measuring incandescent brightness.

**optical reference point** Index mark on canopy or elsewhere providing pilot with sightline guidance in vertical or near-vertical landing.

**optical turbulence** Fluctuating distortion of light rays caused by time-varying gradients of refractive index.

**optimal control model** The most recent [1970] model of a pilot [for example], based on the assumption that "a well-trained well-motivated operator behaves in a near-optimal manner, subject to his inherent limitations, constraints and task."

**optimized profile** Flight trajectory calculated to minimize energy consumption throughout flight (but for operational reasons seldom attainable).

**optimum angle of attack** That giving maximum L/D and thus highest cruise efficiency.

**optimum angle of glide** That at which *glide ratio* is a maximum.

**optimum coupling** Matched radio impedance in which load equals output of amplifier or transmission line, for maximum power transfer.

**optimum height** Height of air burst or conventional explosion producing maximum effect against given target.

**option** 1 Acquisition of particular place in aircraft or other major equipment item production programme, with or without deposit and without agreement to purchase.

2 Variation in standard of product offering customer choice, eg avionic fit, long-range tankage, de-icers etc.

3 Alternative decisions open to commander engaged in battle.

**optional, or optimal, yield management** Determining traffic mix by class code and fare type to maximize revenue.

**opto-electronic** Combining optical and electronic subsystems in single device; term appears to be used synonymously with EO.

**optronics** Technology of systems using wavelengths from optical to electronic. *Appendix 4*.

**optrotheodolite** Doubtful designation for precision position-correlating instrument combining laser and video camera.

**OPU** Overspeed protection unit.

**Opute** Operational utility evaluation (Pads, 4).

**OPV** Optionally [or operationally] piloted vehicle; some of this class are helicopter UAVs.

**OQAR** Optical quick-access recorder.

**OQPSK** Offset quadrature phase-shift keyed, or keying.

**OR** 1 Operational research.

2 Operational requirement[s] (UK).

3 Operational readiness; also (1985) operationally ready (DoD).

4 See *OR gate*.

5 Open rotor.

6 Other ranks.

7 On request.

8 Over-run lights.

9 Operational reliability.

**O/R, or** On request.

**Oracle** 1 Operational research and critical-link evaluation.

2 Optical and RF combined-link experiment (USAF).

**Orads** Optical ranging and detecting systems (USA).

**Oralloy** Classified metal alloy, not necessarily based on U-235, used as preferred primary fissile material in NW, with or without tritium.

**Orange** Could be friendly or hostile, uncertain.

**Orange Force** Simulated hostile force during exercise (NATO, IADB).

**oranges** Weather (RAF, WW2).

**Oranges Sour** Air-intercept code: weather unsuitable for mission (DoD).

**Oranges Sweet** Air-intercept code: weather suitable for mission (DoD).

**Orasis** Optical real-time adaptive spectral identification system.

**ORB, Orb** 1 Operations record book (RAF).

2 Omnidirectional radio beacon.

**orbit** Order of battle.

**orbit** 1 Closed elliptical or quasi-circular path of body revolving around source of gravitational attraction balanced by its own centrifugal force.

2 Closed pattern, usually circular or racetrack, followed repeatedly by aircraft, eg in air-intercept loiter or when holding.

3 To follow an \* as in (1) or (2).

**orbit[all] decay** Decay (1).

**orbital elements** See *orbital parameters*.

**orbital manoeuvring vehicle** Used from Shuttle and later from space station to position and retrieve satellites about 1,000 miles distant (NASA).

**orbital parameters** Basic numerical values describing orbit, such as apogee, perigee, inclination and period.

**orbital period** Time to complete one revolution (relative to space, ignoring such irrelevancies as rotation of primary body); symbol P, whose square is always proportional to cube of semi-major axis of orbit (distance from centre of primary to apogee).

**orbital rendezvous** See *rendezvous*.

**orbital transfer vehicle** 1 The first \* was a reusable tug shuttling between a planetary or lunar orbiter and higher orbits.

2 Part of the planned MSP, a vehicle for orbit transfers and servicing, potentially reducing spacecraft weight and extending on-orbit life.

**orbit determination** Calculation of orbital parameters of unknown satellite.

**orbiter** 1 Portion of spaceflight system designed to orbit, as distinct from booster stages, tanks, etc.

2 In particular, bus to inspect planetary body from a distance, with or without probes.

## orbit improvement system

**orbit improvement system** Suppresses yo-yo of VLF antenna.

**orbit point** Geographically or electronically defined location above Earth's surface used as reference in stationing orbiting aircraft.

**ORC** Oversight and review committee.

**Orca** 1 Optimized raster chart analyzer [*sic*].

2 Optical-relay com. architecture.

**Orchidée** Observatoire radar cohérent heliporté, d'investigation des éléments ennemis; name means orchid (F).

**Orcofilm** Proprietary films based on PET3.

**Orcon** Fire-resistant insulation batting using RK carbon fibre.

**ORD** 1 Order.

2 Operational, or operations, Requirement[s] Document.

3 Operational readiness demonstration.

4 Optional retirement date (RAF).

**Ordalt** Ordnance alteration.

**order book** Real or symbolic book containing list of customers for major equipment item, esp. commercial transport, broken down into firm orders, options, leases, etc, and fading from importance with programme's maturity and second-hand customers.

**order of battle** 1 Complete list of all combat units in a given command.

2 Schedule of individual unit status: (e.g., RAF, historically) available (typically 15 min); readiness (5 min); cockpit readiness (2 or 1 min); released,

**ordinate** 1 Vertical axis on graph or other geometric plot.

2 Vertical distances measured from datum, eg from chord line to upper/lower surfaces of aerofoil.

**ordnance** Explosives, chemicals and pyrotechnics for use against an enemy, including nuclear, together with directly associated hardware such as guns, rocket launchers, etc.

**ordnance alteration** Change [usually last-minute] to load carried by attack aircraft.

**ordnance devices** Explosive or pyrotechnic parts of spacecraft, RPV or other [especially non-weapon] system.

**ordnance work rate** Various measures intended to offer single numerical value of rate of application of ordnance in particular theatre or against one target.

**ORDT** Objectives/requirements. definition team (NASA).

**ORE** Operational Readiness Exercise.

**Orel** Omnidirectional runway-edge lights/lighting.

**Oreos, OREOS** Optical radar/EO [electro-optical] sensor.

**Orex** Orbital re-entry experiment.

**ORF** Optical and radio frequencies; CLE adds combined-link experiment (USAF).

**ORGALIME, Orgalime** Organization for liaison between European electrical and mechanical engineering industries.

**organic** 1 Originally, living material; today broadened to cover all compounds of carbon and hydrogen, and often with other elements.

2 Assigned to, and forming essential part of, military formation.

3 In many applications involving heat exchange (eg \* reactor, \* Rankine cycle), use of organic (1) fluid, often mixture of polyphenyls.

## orthogonal biplane

**organic air vehicle** Organic(2) aircraft; but the first meaning is a small UAV controlled by a squad of infantry (SOF, USA).

**organizational-level maintenance** Performed on a squadron or other operator unit, eg on an installed or backed-off engine.

**organometallic** Compound having metal atom attached to organic radical.

**OR gate** Logic device which, whenever a voltage (eg a 1) appears at any input, responds with voltage at output).

**ORHE** On-ramp handling equipment.

**ORI** Operational readiness inspection.

**orientation** 1 Determination of approximate position or attitude by external visual reference.

2 Turning of instrument or map until datum point or meridian is aligned with datum point or true meridian on Earth (ASCC).

3 Direction of fibres in lay-up, preprep or finished FRC part.

**orifice meter** Fluid-flow measuring technique where pressure is measured upstream and downstream of transverse plate with calibrated hole.

**origin** 1 Point 0,0 on cartesian graph.

2 Base from which map projection is drawn.

**originator** Command by whose authority a message is sent.

**ORLA** Optimum repair-level analysis.

**ornithopter** Aerodyne intended to fly by means of wings flapping or oscillating about any axis, but not in continuous rotation.

**Oroca** Off-route obstruction-clearance altitude.

**orographic uplift** Large-scale uplift and cooling of air mass caused by mountains; hence \* rain or precipitation. Generally synonymous with mountain-wave turbulence.

**Oronite** High-temperature hydraulic fluid; principal type for up to M2.5 \*M2V (California Chemical).

**OROS, Oros** Optical read-only storage.

**ORP** 1 Optical reference point.

2 On-request reporting point.

3 Operational readiness platform.

**ORRP** On-request reporting point.

**ORS** 1 Off-range site.

2 Offensive radar system.

3 Occurrence reporting system.

4 Operational Research Section.

5 Operationally responsive space[lift]. [Space Command] (USAF).

**ORT** 1 Optical relay tube (TADS).

2 Optical resonance transfer.

3 Operational readiness test.

**ORTA** Office of Research and Technology Assessment.

**orthicon** Camera tube with secondary emission reduced or eliminated by using low-velocity electrons to scan two-sided sensitive mosaic, one side scanned and reverse face illuminated, resulting in stored charges on mosaic being removed by beam and generating output signal.

**orthodrome** Great circle, hence orthodromic course.

**orthogonal** Originally meant perpendicular; today blurred, as shown below.

**orthogonal aerial** Pair of transmitting and receiving aerials [antennas], or single T/R aerial, designed to measure difference in polarization between radiated signal and echo from target.

**orthogonal biplane** One without stagger.

## orthogonal scanning

**orthogonal scanning** Use of combined axial and lateral magnetic fields to control low-velocity electron beam in camera tubes.

**orthographic** Rectilinear projection of solid objects on two-dimensional sheet by use of parallel rays, in contrast to conical perspective rays; result is six possible views (left, right, front, rear, top, bottom), of which four (front, top, left, right) are normally used (in different relative positions in Europe and N America, see *third-angle projection*), each representing appearance of object as seen from infinitely large distance.

**orthomorphic** Map projection in which meridians and parallels cross at right angles, all angles are correct and distortion of scale is equal in all directions from any point; several variations are in use, chief being Lambert's conformal and Mercator's.

**orthotropic** Solid material property of strength along a single axis.

**ORTL** Optical resonance transfer laser.

**ORU** Orbital replacement unit.

**OS** 1 Observation squadron.

2 Operating system(s).

3 Observation scout, ship-based aircraft category (USN 1935–45).

4 Also O/S, ordnance server [UCAVs and simulation].

5 Oil[s] synthetic.

**O/S** Overspeed.

**OSA** 1 Operational support aircraft.

2 Official Secrets Act.

3 Open-systems architecture.

**OSACOM** Written thus though said as a word, Operational Support Airlift Command (USA).

**OSAD** Outer-Space Affairs Division (UN, Int.).

**OSAF** Office of the Secretary of the Air Force (US).

**OSAMC** Open-systems architecture mission computer.

**OSB** Option-select button.

**OSBV** One-shot bonding verfahren (G).

**OSC** 1 Overhead stowage compartment(s) for carry-on baggage.

2 Optical sensor converter.

**Oscar** 1 Open-systems core-, or commercial-, avionics requirements.

2 Orbiting satellite[s] carrying amateur radio.

**OSCE** Organization for Security and Co-operation in Europe (Vienna, many Permanent Missions and delegations).

**oscillation** Repeated fluctuation of quantity on each side of mean value.

**oscillator** Device for converting direct current into alternating current to give control or carrier frequency, using not rotating mechanism but transistor or thermionic valves.

**oscillogram** Hard-copy (eg photographic) record of oscilloscope output.

**oscillograph** Sensitive electromechanical device translating varying electrical quantities into visible trace on paper or film (generally superseded by oscilloscope).

**Oscillogyro** Patented (Ferranti) gyro having unique property of measuring displacements about two axes.

**oscilloscope** Device translating varying electric quantities into visible traces on screen of CRT or similar display.

**OSD** 1 Office of the Secretary of Defense (US).

2 Out of service date.

3 On-screen display.

## OSTA

**OSDBU** Office of Small and Disadvantaged Business Utilization (NASA).

**OSDS** Oceanic system development support (FAA).

**OSE** 1 Optical shaft encoder.

2 Office of Systems Engineering (DoT, US).

3 Operations support equipment.

**Oseen flow** See *viscous flow*.

**OSEM** Office of Systems Engineering and Management (FAA, US).

**OSF** 1 Optronique secteur frontale, fighter EO sensor (F).

2 Open-systems foundation.

3 Oil squeeze film.

**OSHA** Occupational Safety and Health Act [or Administration] (US).

**OSI** Open systems, or standard, interconnection, or interface.

**OSIA** On-Site Inspection Agency (INF Treaty).

**OSIE** OSI environment.

**Osint** Open-source intelligence: newspapers, technical press, radio/TV etc.

**OSI-RM** OSI reference model.

**OSK** Department of special construction (USSR, obs.).

**OSM** Optical support measures, eg laser threat warning.

**osmium** Hard, heavy, corrosion-resistant silvery metal, MPt 3,054°C, densest element (at 20°C = 22.588), symbol Os.

**OSO** 1 Orbiting solar observatory [Nos 1–8].

2 Overspeed shut-off.

**Osoaviakhim** Society for the support of defence, aviation and chemical industries (USSR).

**OSP** 1 Offshore procurement.

2 Orbital/suborbital program (USAF).

3 Optical surveillance platform.

4 Operational special program (JTIDS).

5 Orbital Space Plane (NASA).

6 On-board signal processing (Immarsat).

7 Overspeed probe [engine shaft].

**OSPF** Open shortest path first.

**OSR** 1 Optical solar reflector.

2 On-site repair.

3 Order status report.

**OSRD** Office of Scientific Research and Development (US, from 1941).

**OSS** 1 Office of Strategic Services (US 1942, became CIA 1947).

2 Department of experimental landplane construction (USSR, defunct).

3 Omega sensor system.

4 On-site support.

5 Office of Space Sciences (US).

6 Ocean spatial spectrum.

**OSSAI** Organisation Scientifique et Sportive d'Aérostation Internationale.

**OS-SAP** Operations and support special-access program.

**OST** 1 Outline staff target (UK).

2 Operational suitability test (DoD).

3 Office of Strategic Trade (US).

4 Outer Space Treaty (1967).

5 Office of the Secretary of Transportation (US).

**OSTA** Office of Space and Terrestrial Applications (NASA).

- OSTD** Office of SST Development (DoT, US).
- OSTIV** Organisation Scientifique et Technique Internationale du Vol à Voile [gliding; office, NL-2629 Delft] (Int.).
- OSTM** Ocean-surface topography mission.
- OSTP** Office of Science and Technology Policy [White House] (US).
- OSTR** Optimum- speed tilt-rotor.
- OSU** Omega/vlf sensor unit.
- OSV** Ocean station vessel.
- Oswatitsch inlet** Supersonic inlet/diffuser in form of body of revolution having pointed conical centrebody of progressively increasing semi-angle, thus generating succession of inclined shocks at increasingly coarse angles all focused on peripheral lip.
- OT**
- 1 Oil temperature.
  - 2 Other times, or over time.
  - 3 Operational test.
- oft** Other times.
- OTA**
- 1 Office of Technology Assessment (Congress, US, from 1972).
  - 2 Orbital transfer assembly.
  - 3 Over the [or overflight] top attack.
  - 4 Other transaction agreement[s].
- OTAA** Office of Trade Adjustment Assistance (US).
- OTAEF** Operational Test & Evaluation Force (but see OTE, OT&E).
- OTAES** Optical technology Apollo extension system.
- OTAN** NATO (F).
- OT&E** Operational test and evaluation.
- OTAR** Over-the-air re-keying.
- OTAS** On top and smooth.
- OTC**
- 1 Operational training course (USAF).
  - 2 One-stop tour charter.
  - 3 Overseas Telecommunications Commission of Australia.
  - 4 Operational [or official] test centre.
  - 5 Officer in Tactical Command.
- OTCIXS** Officer in tactical command information exchange system.
- OTD**
- 1 Origin to destination.
  - 2 Optimal terminal descent.
  - 3 Optical-transient detector.
  - 4 Other training devices.
- OTDA** Office of Tracking and Data-Acquisition (NASA).
- OTDF** Outlet temperature distribution factor.
- OTE** National telecommunications organisation (Greece).
- OTE, OT&E** Operational test and evaluation [A adds Agency, C adds Command] (USA).
- OTER** Over-temperature emergency rating.
- Otevfor** Operational test and evaluation for operational requirements (USN).
- OTFP** Operational traffic flow planning.
- OTH**
- 1 Over the horizon; hence \* radar.
  - 2 Other.
- OTH-B** Over the horizon, backscatter.
- other ranks** Soldiers who are not yet NCOs, army equivalent of airmen (UK).
- OTH-R** Over the horizon, radar.
- OTH-SW** Over the horizon, surface wave.
- OTH-T, OTHT** Over the horizon, target[ting].
- OTIS**
- 1 Optronic tracking and identification system.
  - 2 Optimal trajectories by implicit simulation.
- OTLK** Outlook.
- OTN** Optical transport network.
- otolith** Organ of inner ear sensitive to attitude and acceleration.
- OTP**
- 1 Office of Telecommunications Policy (White House, US).
  - 2 On-top position [ie, above submerged submarine].
  - 3 Operation[al] test programme [S adds set].
- OTPI** On-top position indicator.
- OTPS** Oceanic traffic-planning system (FAA).
- OTQ** Over-temperature qualification.
- OTR**
- 1 Operational turn-round.
  - 2 Oceanic transition route.
  - 3 Other.
  - 4 Overberg Test Range (S Africa).
  - 5 Operational Test and Readiness; R adds Review.
- OTS**
- 1 Over the shoulder.
  - 2 Orbital test satellite.
  - 3 Out of service.
  - 4 Organized track system[s].
  - 5 Off the shelf.
  - 6 One-man ticketing system, or structure.
- OTSC** Optical transmissive star copier.
- OTSI** Operating time since inspection.
- OTT** Operational Test Team (DoD).
- Otto cycle** General name for four-stroke spark-ignition cycle for piston engine.
- OTU** Operational training unit.
- OTV**
- 1 Orbital transfer vehicle.
  - 2 Obstruction to vision.
- OTW**
- 1 On the wing; hence \* replacement of engine module.
  - 2 Over the wing; B adds bridge.
- OTWD** Out-the-window display (simulator).
- OU** Operations unit.
- OUBD** Outbound.
- OUE** Operational utility evaluation.
- ounce** Imperial mass, contrary to SI: 28.3495 g; reciprocal 0.0352739; abb. oz.
- OUSD** Office of the Under-Secretary of Defense (US).
- out**
- 1 Radio procedure word: conversation is completed.
  - 2 Unserviceable.
  - 3 When applied to airbrake[s], normally means in use, not out of use.
- outage**
- 1 Loosely, failure to function, especially of communications.
  - 2 Period during which communications station is faulty.
- outboard**
- 1 In direction from centreline to wingtip.
  - 2 Further from centreline (eg \* engine, in relation to other[s] on same side).
  - 3 Carried outside main structure.
- outbound**
- 1 Towards destination; hence VOR \* radial.
  - 2 Away from Conus (US military usage).
  - 3 In holding pattern, side opposite to inbound (which heads towards holding fix).
- outbound bearing** That of outbound leg of holding pattern or of VOR radial en route to destination or next waypoint.
- outbound radial** That linking fix or beacon to next waypoint.
- outbrief** Short list of key items which captain runs

## outburst

through on way to aircraft; can include authorization and Notams.

**outburst** Lateral spread across surface of air arriving in downburst.

**outer** Further from aircraft centreline, but see \* wing.

**outer air battle** Taking place 100 nm or more from surface fleet Battle Force, beyond radius of ship-to-air weapons.

**outer area** Defined region around airport within which height of building is severely limited.

**outer cover** External skin of rigid airship.

**outer fix** Fix in destination terminal area, other than approach fix, to which aircraft are normally cleared by ATC and from which they are cleared to approach for final approach fix (FAA).

**outer loop** FCS in autopilot mode, human pilot being inner loop.

**outer marker** ILS marker beacon normally on approach centreline approximately 4½ nm (8.3 km) from threshold; usually identified by 400 Hz aural dashes and synchronized blue panel light.

**outer panel** Left or right wing outboard of centre section.

**outer wing** Apart from obvious meaning: in a turn, that pointing away from centre of turn, experiencing increased airspeed.

**outfall valve** Usually synonymous with outflow valve.

**outflow** 1 Violent low-level wind radiating out from downburst, or created beneath hovering VTOL aircraft.

2 Slipstream [confusing].

**outflow pattern** Isobar pattern above wing at positive angles of attack.

**outflow valve** That incorporated in isobaric cabin-pressure regulator through which air is allowed to escape to atmosphere during climb to isobaric altitude.

**outgassing** Emission of gas from metals and other materials in high-vacuum conditions.

**outlet guide vanes** A ring of fixed [rarely, variable] stator vanes downstream of a fan or compressor. Their purpose is to remove swirl and produce a truly axial flow.

**outlet temperature distribution factor** Combustion chamber outlet peak temperature (T) minus outlet mean T divided by mean combustion chamber T rise.

**out of alignment** In case of propeller or rotor blade, having incorrect sweep (bent forward or back in plane of rotation).

**out-of-control lights** Two superimposed red lights 6 ft (2 m) apart hoisted at night on mast of marine aircraft whose engines have failed and which is not anchored.

**out of phase** Not synchronized; two or more cycles or wavetrains which have same frequencies but pass through maxima and minima at different times.

**out of pitch** In case of propeller or rotor blade, having blade angle different from that of remaining blades.

**out of step** Not synchronized; two or more series of digital pulse trains or other discrete phenomena having essentially same frequency but occurring at different times.

**out of the box** First entry to service of new product.

**out of track** In case of propeller or helicopter rotor blade, having incorrect tilt so that particular tip does not lie on tip-path plane.

**output** 1 Total product or yield from system, eg tonne-km for airline.

## overall length

2 Delivery from computer, as hard copy or graphics display.

3 One of five basic functional sections of most EDP(1) systems.

4 Signal from transducer or other instrumentation.

5 Power developed by engine or other prime mover.

6 Shaft at which power is extracted from shaft-drive engine.

7 Verb, to deliver an \* (2), hence outputting.

**outriggers** 1 Primary structural members carrying tail of aeroplane with short fuselage, nacelle or boat hull, also called booms.

2 Ancillary landing gear near wingtip or at other location well outboard from centreline on aircraft with bicycle or other type of centreline landing gear.

**outshop** To complete manufacture, or at least a stage of manufacture; hence outshopped.

**outside air temperature** 1 Free-air static temperature (UK).

2 The uncorrected reading of the OAT instrument, requiring corrections [e.g., for kinetic heating] to obtain true static temperature (US).

**outside loop** Inverted loop, performed with aircraft upper surface outwards and thus under negative g.

**outside roll** One started from negative g, esp. from inverted attitude.

**outside wing** That on outer side of spin, having greater airspeed than inside wing.

**outsourcing** 1 Subcontractor brings in someone else to help.

2 Airline subcontracts aircraft maintenance.

**outspin** On outer side of spin, hence \* aileron or rudder.

**outspin yaw** Yaw inevitably present in normal spin, usually function of pitch attitude.

**outturn** What actually happened, or a measured value [as distinct from prediction].

**outyears** Period during which item is in operational service (USAF, later general use).

**OUV** Oskar-Ursinus Vereinigung, association of amateur aircraft constructors (G).

**OV** 1 Over-voltage.

2 Aircraft mission code, observation V/StOL (DoD).

3 Outside vendor.

4 Location (ICAO).

5 Orbiting vehicle.

**OVA** Overside vision angle.

**OVAC** Main office of national aero club [Vienna A-1040] (Austria).

**ovalisation** Structural distortion such that circular parts become ovals, esp. on pylon-mounted turbofans.

**oval office** The President of the United States; thus \* green = his authority to proceed.

**OVC** Overcast.

**ovenise** To bake electronic device to simulate overload test condition.

**over** Radio procedure word: 'My transmission is ended and I expect a response from you'.

**overall efficiency** In case of aircraft propulsion system, usually thermal efficiency multiplied by propulsive (Froude) efficiency.  $\eta_o = \eta_p \eta_T$ .

**overall length** Most definitions for aircraft stipulate in flying attitude; distance between local perpendiculars aligned with extremities of basic airframe (but usually

## overall pressure ratio

excluding pitot or instrument probes, static wicks etc). See *length*.

**overall pressure ratio** OPR, ratio of total pressure at delivery to combustion chamber to that at engine inlet [the latter taken as unity, so OPR 26:1 can be written as 26]; in a turbofan  $OPR = FPR \times \text{compressor PR}$ .

**overbalanced** Provided with excessive balancing mass, aerodynamic area or other source of control-surface moment assisting pilot, so that control surface has little feel (and in extreme case can move by itself to hard-over deflection).

**overboard bleed** From compressor to assist starting, not used in normal running.

**overbooking** Practice of selling more tickets for a particular flight than there are seats, to compensate for (1) no-shows and (2) individual pax or agents making multiple reservations for one journey.

**overbuilt** Made stronger than necessary, usually to allow for future development.

**overburn** Operation of rocket or other space propulsion system for too long a period (0.1 s can be significant), resulting in incorrect cutoff velocity and/or trajectory.

**overcast** Means 0.9+ cloud cover except IWC =  $\frac{1}{8} + [= 0.875 +]$ . One authority insists "8 oktas", = 100%.

**overcontrol** To apply more control deflection than necessary, commonly resulting in succession of excursions on each side of desired flight condition.

**overdesigned** 1 Stronger than necessary to meet requirements.

2 More refined than necessary, usually resulting in lighter structure at expense of high cost and complexity.

**overexpanded nozzle** One in which jet leaves at below ambient pressure.

**overfin** Fin added above high [T-type] horizontal tail.

**overflight** Flight over particular route, esp. across unfriendly territory.

**overflight top attack** Class of missiles which detonate shaped charges downwards as they pass over armoured vehicle.

**overfly** To fly over.

**overhang** 1 Spanwise distance from junction of wing and bracing struts to tip; length of cantilever mainplane.

2 Spanwise distance to tip of upper wing of biplane from point vertically above tip of lower wing.

3 See next.

**overhang balance** Mass distributed along leading edge of control surface, as distinct from horn balance.

**overhaul** Regularly scheduled procedure of dismantling (the extent varying with which \*), inspection, replacement of parts if necessary and return to service. For large aircraft a major \* can take weeks and involve refurbishing and exterior repaint.

**overhaul period** Also called TBO, the time between consecutive overhauls. For aircraft or engine or other functioning item \* is actual operating time in hours. For missile and some other items such as ejection seat it is total elapsed time.

**overhead** 1 Apart from normal meanings, involving the use of one or more satellites.

2 As a noun, a panel for controls and instruments mounted above the windscreen or in the cockpit roof.

**overhead approach** Landing procedure in which pilot flies downwind over point of touchdown and then makes

## overshoot

descending circular pattern centred on extended landing centreline; also called 360° landing.

**overhead camshaft** In upright cylinder, above the head; thus, beyond horizontal cylinder, below an inverted cylinder.

**overhead stick** Control column pivoted to cockpit roof.

**overhead stowage** Provision in passenger transport for hand baggage and other rigid or heavy items to be stowed in latched bins above seats.

**overhead suspension** Docked rigid airship hung from roof of shed.

**overhung** 1 Cantilevered beyond last point of support, esp. applied to fan, compressor or turbine stages mounted at extremity of shaft system beyond nearest bearing.

2 Projecting beyond tip of fixed surface, adjective normally applied to aileron or elevator.

**overlap** 1 Percentage of photograph duplicated on next frame of same film (see *lap*).

2 See *overlap zone*.

**overlap tell** Transfer of information to adjacent air-defence facility of (normally hostile or unidentified) tracks in latter's region.

**overlap zone** Designated area on each side of boundary between adjacent tactical air control or defence regions wherein co-ordination and interaction are required.

**overlay** Upper (exoatmospheric) layer of layered defence system (SDI).

**overload report** Filed by ATC controller when workload could lead to safety being compromised.

**overload response** Procedures designed to enable an inadequate ATC system to handle traffic at peak periods (UK).

**overload weight** 1 Alternate MTO weight authorized only in unusual circumstances.

2 Any takeoff weight exceeding permitted maximum.

**overpressure** 1 Limiting values reached above and below normal atmospheric pressure during passage of blast wave of explosion (nuclear or conventional).

2 Peak positive pressure reached during passage of boom from supersonic aircraft.

**override** Facility for bypassing or overcoming normal limit on command action to obtain exceptional response, usually in emergency (eg \* boost).

**override boost** Emergency higher boost pressure available in exceptional circumstances such as overload takeoff or in combat.

**overrun** 1 To fail to stop within available landing distance.

2 Control facility causing camera to continue operating for preset number of frames or seconds after cutoff of control.

**overrun area** Paved area beyond end of runway which for any reason is not in use; usually marked with herringbone pattern.

**overrun barrier** Layer of material beyond end of runway provided to arrest overrunning aircraft with minimal damage; PFA is preferred to gravel.

**overrunning clutch** One allowing driven member (eg helicopter rotor) to run ahead of drive system.

**overseer** Common term for software used in managerial role in large system.

**overshoe** Externally attached de-icer of pulsating-rubber mechanical type; also called boot.

**overshoot** 1 To abandon landing and make fresh

## overshoot area

approach; in US called missed approach or *go-around*, a term fast becoming universal.

2 To land too far across available landing area and make uncontrolled excursion into region beyond.

3 To exceed desired IAS, altitude, heading, bank angle or other flight condition.

4 In an interception, to pass through enemy aircraft's future flight path in plane of symmetry.

**overshoot area** Designated area of semi-prepared ground available to overshooting (2) aircraft (usually GA only) from which they may taxi relatively undamaged.

**overside vision angle** Maximum angle between horizontal and pilot's lateral field of view downwards.

**overspeed condition** Normally applied to rotating machinery, and permissible for brief specified period and within specified limit. An exceptional and usually undesired condition, and in no way synonymous (as claimed in one source) with takeoff rpm.

**oversquare** 1 Of an aeroplane [airplane], having length greater than the span.

2 Of a piston engine, having the bore greater than the stroke.

**overstow position** Inoperative position of target-type reverser with geometry which precludes inadvertent operation in flight.

**overstrain** Quantitative extension of material stretched beyond yield point.

**overstress** Application of load which could cause structural failure [particularly positive or negative pitch input which could break wing].

**oversweep** Ultra-acute setting of VG pivoted wings [eg, to make carrier-based F-14 aircraft more compact when parked].

**overswing** Undesired azimuth excursion by aircraft with long, heavy body during fast turn while taxiing, esp. on slippery surface.

**overtake velocity** Excess speed over that of aerial target ahead.

**over the fence** Immediately before touchdown (colloq., normally GA).

**over the horizon** Beyond the visible or LOS horizon; region accessible only to particular species of radar.

**over-the-shoulder delivery** See *toss bombing*.

**over the top** *On top* (1).

**over the weather** At pressurized cruising levels; basic meaning is free from turbulence except CAT, but cloud may still be present and cu-nims must be avoided.

**over the wing** Aeroplane configuration in which turbofan is located above wing to give USB powered lift but without surface scrubbing losses.

**overtip leakage** Escape of high-pressure fluid around the small gap between the tips of turbine blades and the surrounding casing.

**overturn boundary** Limiting sea state for safe operation of float or pontoon-mounted helicopter.

**overturn pylon** Strong structure to protect occupants of small aircraft in overturn on ground.

**overwater** Particular provisions apply to commercial transports for use on sea crossings where power-off glide to land is not possible. Adjective also applied to extended-range versions, irrespective of actual intended routes.

**OVHD** Overhead.

**OVHT** Overheat.

## oxygen mask

**OVI** Department for war inventions (of RKKA, USSR, defunct).

**OVR, ovr** Over.

**ovrd** Override.

**OVRN, ovrn** Overrun.

**OVS** Overhead video system.

**OVT** Vectored thrust (R).

**OVTR** Optical videotape recorder.

**OW** Oblique (slew) wing.

**OWB** Over-the-wing bridge (passenger loading).

**OWE** Operating weight empty.

**OWF** Optimum working frequency.

**OWL** 1 On-wing life (main engine).

2 Obstacle-warning ladar.

3 Over water and land.

4 On-target weapon, long-range.

**OWLD** Obstacle warning, location and detection.

**OWM** One-way mission.

**OWP** Outer wing panel.

**OWRM** Other war reserve materiel (US).

**OWS** 1 Orbital workshop.

2 Obstacle warning system (helo).

3 Optical weapon sight.

4 Ocean Weather Station.

**OWSF** Oblique-wing single fuselage.

**OWSPS** Operational weather squadron production system (USAF).

**OWTF** Oblique-wing twin fuselage.

**OWWS** Operational windshear warning system.

**OX, Ox** 1 Longitudinal axis about which aircraft rolls; confusingly, some authorities now make Ox the pitch [transverse] axis.

2 Oxygen: OX1 HP gaseous, OX2 LP gaseous, OX3 HP replacement bottles, OX4 LP bottles, no code for liquid.

3 Oil[s] miscellaneous [not covered by OEP, OM or OMD].

**oxidant** Chemical carried as rocket propellant for combination with fuel; examples are lox, nitrogen tetroxide, nitric acid and mixtures of fluorine and oxygen (flox).

**oxidation** 1 Removal of electron from atom or atomic group.

2 Combination with oxygen, as in burning or rusting.

**oxidiser** Oxidant (N American usage).

**oxidising flame** In gas welding or cutting, one having excess oxygen.

**oximeter** Instrument giving numerical readout of blood oxygen concentration.

**OXRB** Oxygen replacement bottles available.

**oxy** Oxygen.

**oxygen** O<sub>2</sub>, odourless gas, vital to life, density 1.43 gl<sup>-1</sup>, 0.089212 lb/ft<sup>3</sup>; liquid [lox] density 1.1, MPt -218°C, BPt -183°C. For aircraft breathing purposes, Grade A mandatory, 99.5% pure, many other requirements including water ≤0.005 mg/l. In US OX1/2/3/4 are respectively HP gas, LP gas, HP replacement bottle and LP replacement bottle.

**oxygen bottle** Container for gaseous oxygen under pressure.

**oxygen converter** Liquid oxygen converter (ie boiler) supplying gox to breathing system.

**oxygen mask** Face mask for supplying gaseous oxygen to wearer, usually on demand, and separating exhaled breath.

## **oxygen microphone**

**oxygen microphone** Microphone fitted to oxygen mask (probably arch.).

**OY** Option Year.

**OY, Oy** Lateral axis about which aircraft pitches; confusingly, some authorities now make this the roll [longitudinal] axis.

**OYM** Optional yield management.

**OZ, Oz** Vertical axis about which aircraft yaws.

**oz** Ounce,  $\frac{1}{16}$  lb = 28.35 g.

**OZB** Civil aviation directory, under Ministry of Works (Austria).

## **ozonosphere**

**ozone** O<sub>3</sub>, allotropic form of oxygen present in minute quantities in air, liquid faintly bluish, very reactive, BPt -182.97°C.

**ozone layer** See *ozonosphere*.

**ozonosphere** Layer of upper atmosphere, roughly at 20–40 km altitude, where ozone concentration is much higher than at SL and ozone plays major role in establishing radiation balance.

# P

- P**
- 1 Generalized symbol for force, or a point load.
  - 2 Power, esp. bhp of shaft engine, or peak power of transmitted signal; unit, watt.
  - 3 Aircraft category, pursuit (USA, USAS, USAAC, USAAF, 1925–47, USN 1923), and patrol (USN from 1923, USAF from 1962).
  - 4 Prohibited area.
  - 5 Poise [see entry]
  - 6 Period, eg orbital.
  - 7 Aircraft designation suffix, photographic (USN, to 1962).
  - 8 Pressure; normally p but gas-turbine pressures normally written P<sub>1</sub>, P<sub>2</sub> etc.
  - 9 Pulsed, or pulse (eg with suffix numeral P1, P2 etc).
  - 10 Pilot, with numerical suffix 1, 2, 3 etc to show hierarchical ranking of pilots in same crew.
  - 11 Prefix, plus (wind component).
  - 12 Production cost.
  - 13 Ratio of full-scale length to model length, esp. in radio aerials and related fields.
  - 14 Probability.
  - 15 Telecom code: aircraft has Tacan only and 4096-code transponder.
  - 16 Radar (JETDS).
  - 17 Missile launch environment: soft pad (DoD).
  - 18 Phosphorus.
  - 19 Provisional.
  - 20 Aerospace craft (FAI category).
  - 21 Primary, primary frequency, or winding.
  - 22 Precision (DME, GPS, MLS).
  - 23 Packet (TDM mode).
  - 24 Paved surface.
  - 25 Prefix peta = 10<sup>15</sup>, thousand million million.
  - 26 Airport with instrument-approach procedure; also means PAPI.
  - 27 Number of persons on board.
  - 28 Polar air.
  - 29 Positive.
  - 30 Precipitation.
  - 31 Prototype.
  - 32 Propeller pitch.
  - 33 Polarization [electric].
  - 34 Wing planform shape parameter, S/bl, where S is area, b span and l chord from LE at root to TE at tip.
  - 35 Spectral density [covariance] matrix.
  - p 1 Prefix pico, = × 10<sup>-12</sup>.
  - 2 Generalized symbol for pressure.
  - 3 Structural pitch.
  - 4 Structural stress.
  - 5 Pound mass (ambiguous, eg psi, see next).
  - 6 Per (ambiguous, eg lb psi).
  - 7 Parts (eg ppm, parts per million).
  - 8 Port (ie, left).
  - 9 Pentode.
  - 10 Pulse-modulated radio emission.
  - 11 Plate (electrical).
  - 12 Generalized symbol for positive or positive values, eg \*-type semiconductor.
  - 13 Angular velocity in roll; roll-rate output.
  - 14 Momentum.
  - 15 Helicopter-rotor blade spanwise, location of maximum camber.
  - 16 Laplace variable.
  - 17 Subscript, parasitic.
  - Ȑ 1 Average pressure difference across upper/lower surfaces of aerofoil.
  - 2 Specific weight (air-breathing jet engine).
  - 3 Average rocket-motor chamber pressure.
  - 4 Generalized symbol for averaged pressures.
  - 5 Non-dimensional rate of roll, p13/Ω.
  - P<sub>0</sub> Total static pressure head; stagnation pressure.
  - P<sub>1</sub> 1 Compressor inlet total pressure.
  - 2 First pilot, captain of aircraft.
  - P<sub>12</sub>, P<sub>½</sub> Fan inlet pressure.
  - P<sub>2</sub> 1 Compressor delivery pressure (single-spool) or fan delivery.
  - 2 Copilot.
  - 3 Two PAPIs.
  - P2P Confusingly, peer-to-peer.
  - P<sub>3</sub> Compressor delivery pressure (two-spool).
  - P<sup>3</sup> 1 Public/private partnership.
  - 2 Pulse-pair processing.
  - P<sup>3</sup>I Pre-planned, or preprogrammed, product [or program for] improvement (pronounced P-cubed I).
  - P4 Runway has 4 PAPIs.
  - P.4, P.6 Standard magnetic compasses (UK, 1930–50).
  - pα Free-stream pressure, esp. around jet engine.
  - P-alt Pressure altitude.
  - P-band Frequency band, 225–390 MHz (Appendix 2).
  - P-channel Packet-mode channel, in two forms, Pd and Psnc.
  - P-charge Projectile-charge warhead (SAM).
  - P-clamp For ordinary electric/electronic cables.
  - P-clip For convoluted conduit with raised rib to prevent lateral movement.
  - P-code Precise or protected navigation code, billions of pseudo-random numbers on 10.23 MHz repeating each 267 days, each 168-h (one week) segment unique to particular GPS satellite.
  - P-display Radar display of PPI type.
  - P-factor 1 Asymmetric propeller loading.
  - 2 Effect on propeller aircraft of spiral slipstream[s].
  - P-lead Primary (switch) cable of magneto.
  - P-line Electric cross-country power line.
  - P-time Proposed departure time.
  - p-type semiconductor One in which majority of charge-carriers are holes (electron absences).
  - PA 1 Public, or passenger, address.
  - 2 Performance appraisal.
  - 3 Public affairs.
  - 4 Proposal architecture.
  - 5 Product assurance (especially software).
  - 6 Precision attitude.
  - 7 Pilot's associate, or assistant.
  - 8 Porte avions, aircraft carrier (F).
  - 9 Pressure altitude.
  - 10 Pursuit, aircooled (USA 1919–24).
  - 11 Power[ed] approach [esp. to carrier].

- 12** Power amplifier.
- 13** Precision approach, suffixes 1/2/3 for Categories I/II/III.
- 14** Point Arguello, CA, US.
- 15** Pad abort.
- 16** Pilot awareness.
- 17** The Pathfinder Association [East Molesey KT8 9AF] (UK).
- P<sub>A</sub>** Total power available.
- P/A** Payload/altitude curve (sounding rocket).
- Pa** 1 Pascal, SI unit of pressure.
- 2** Polar Atlantic.
- Pa** Action-time average chamber pressure; sometimes abb. Pc.
- pa, p.a.** Power amplifier.
- PAA** 1 Partial air alert.
- 2** Primary aircraft authorization, or authorized.
- 3** Passenger-address amplifier.
- 4** Phased-array antenna.
- 5** Parts assessment area [maintenance].
- PAAG** Portable aircraft arresting gear.
- PAAMS** Principal anti-air missile system.
- PA&E** Program analysis and evaluation (DoD).
- PAASM** Precision-attack air-to-surface missile.
- PAB** Probe and boom.
- PABST** Primary adhesively bonded structure technology.
- PABX** Private automatic branch exchange.
- PAC** 1 Parachute and cable (rocket-launched 'SAM', WW2).
- 2** Public Accounts Committee (UK, House of Commons).
- 3** Programmable armament control.
- 4** Photometrical airfield calibration.
- 5** Path attenuation compensation.
- 6** Pacific Region (ICAO).
- 7** Penetration-aid[s] carrier.
- 8** Precision attitude control.
- 9** Public-address control.
- 10** Poste aérienne de commande (F).
- 11** Presidential Advisory Committee (US).
- 12** Pulley and cable [flight control].
- PACA** 1 Precision attitude control augmentation; /IAGSS adds improved air/ground sight system.
- 2** Programmed adaptive clutter attenuator.
- PACAF, Pacaf** Pacific Air Forces (USAF).
- PACCS** Post-attack command and control system.
- Pacer** Portable aircraft condition evaluation recorder.
- PACF** Performance assessment and checkout facility [satellites] (ICAO).
- PA/CI** Passenger address and cabin [or communications] interphone [S adds system].
- pacing item** Task whose time for accomplishment determines overall time for programme; any major item on critical path.
- PACIS** Pilot aid and close-in surveillance.
- pack** 1 Bag in which parachute is packed. Other authorities insist that this term includes the complete parachute, contained inside the \* cover.
- 2** Complete system in demountable package which may be attached inside or outside aircraft, eg for multi-sensor reconnaissance, rocket thrust-boost, gun and ammunition, or air-conditioning.
- 3** In particular, ECS air-conditioning unit comprising bootstrap ACM(1) plus air/air heat exchanger.
- package** 1 See pack (1).
- 2** Complete offer of international contract covering either collaborative development or manufacture of aircraft complete with associated offsets, loans, training and other attractions, and with agreed share to each partner of overall effort and/or cost.
- 3** Complete offer of international contract covering sale of aircraft with associated offers of offsets, training, service support, construction of support facilities, etc.
- 4** Assembly of attack aircraft, tankers, EW jammers, etc, to carry out a mission.
- package aircraft** Subject of package (2, 3) deal.
- packaged** 1 Of petroleum products – eg POL, jet fuel – contained in drums having capacity not greater than 55 US gal (208.2 l).
- 2** Of electric generating plant, nuclear reactor, etc, mounted on skids and transportable thereon as operative unit.
- packaged propellant** Rocket motor fed by liquid propellant(s) sealed in container forming single unit with thrust chamber.
- package gun** One mounted in fairing outside aircraft fuselage, usually fixed.
- package programme** Timetable for package (2, 3).
- packet** 1 Single pulse of radar, digitized signal or other coded EM emission.
- 2** Repacked quantity of chaff, either pre-cut or as roving, for loading into dispenser.
- 3** Discrete parcel of data sent through multiple network channels and reassembled at point of delivery.
- packet mode** TDM mode for signalling, control and data com. See *Pd* and *Psmc* (GPS).
- pack hardening** Nitriding by heating inside loose pack of carbonaceous material.
- packing** Folding a parachute and inserting it within its pack.
- PACS** 1 Passive attitude control system, eg gravity gradient.
- 2** Pitch-augmentation control system.
- PACT** 1 Portable automatic calibration tracker.
- 2** Precision aircraft control technology (CCV).
- Pactec** Partners in aviation and communications technology, non-profit humanitarian organization working in developing countries.
- Acts** Parliamentary Advisory Council for Transport Security (UK, 2002).
- PAD** 1 Picture assembly device.
- 2** Point air defence; T adds trainer.
- 3** Persistent area-denial, or dominance.
- 4** Precision aerial delivery (USAF), or air drop (QinetiQ).
- 5** Packet assembler/disassembler.
- 6** Primary Awacs display.
- 7** Pad-abort demonstrator, or demonstration.
- 8** Probe and drogue.
- PADA** Phased-array downlink antenna.
- pad** 1 Platform for launch of vehicle, usually of ballistic or unmanned nature (colloq. and becoming arch.).
- 2** Platform for operation of helicopter, esp. on surface vessel.
- 3** Attachment face on engine or other energy source for accessory, usually with central shaft drive.

## pad abort

**4** Network of resistances or impedances to couple to transmission lines effectively.

**pad abort** Abort before launch from pad (1).

**padder** See *padding capacitor*.

**padding capacitor** In series with superhet. local-oscillator tuning capacitor to match exactly to frequency.

**paddle** In a rate gyro, damping drag surfaces which generate angular difference proportional to first-order rate term.

**paddle blade** Propeller blade having unusually wide chord maintained to tip.

**paddleplane** See *cyclogiro*.

**paddle switch** Ambiguously used to denote electrical switches operated by dynamic air pressure, dynamic water pressure in ditching and various other activation sources.

**PADIS, Padis** Procedures for analysing the design of interactive solutions (fire-control software).

**Padlocked** "I have my vision fixed on bogies/bandits and will not look away".

**PADM** Persistant area-dominance munition.

**pad output** Power rating of shaft at each pad (3) location on engine, APU or MEPU.

**PADR** Product-assurance design review.

**PADS, Pads** **1** Passive advanced sonobuoy.

**2** Position and azimuth determining system.

**3** Precision automatic dependent surveillance.

**4** Precision airdrop system (MIT/USAF).

**PADUS** Principal Assistant Deputy Under-Secretary (US).

**PAF** **1** Parabolic aircraft flight.

**2** Police de l'Air et des Frontières (F).

**3** Potassium acetate fluid (de-icer).

**4** Portuguese air force [UK usage].

**PAFAM, Pam** Performance and failure assessment monitor (independent flight guidance with flight-deck displays during autolandings).

**PAFU** Pilots' advanced flying unit.

**PAG** **1** Programmable automatic gauge, for NC dimensional checking.

**2** Portable arrester gear.

**3** Presidential Airlift Group (USAF).

**Pageos** Passive GEOS [Geodynamic experimental ocean satellite(s)].

**PAH** **1** Anti-tank helicopter (G).

**2** Polycyclic aromatic hydrocarbon.

**3** Production approval holder (FAA).

**PAI** Parachute Association of Ireland Ltd.

**Paid, PAID** Parked-aircraft intrusion detector.

**paint** To create blip on radar display, esp. one giving position of aircraft or other object.

**paintless aircraft** Instead of usual finishes, covered with protective film of appliqué materials, saving weight, cost and support requirements.

**paint-on bag** Flexible vacuum bag formed in place to cover layup of composite material fabrication and seal tool in prototype moulding of large parts.

**paint-stripe loading** Vertical stripes inside cargo aircraft to assist loaders in achieving correct load distribution, esp. with regard to c.g.

**PAIR, Pair** Precision-approach interferometer radar.

**pair** Section of two fighters operating together.

**paired channels** Selecting Vortac or ILS frequency automatically also selects a DME.

**PaK** Anti-armour cannon (G).

## palsar

**PAK-FA** Future air complex for tactical aviation, loosely = next-generation fighter (R).

**PAL** **1** Passive augmenting (or augmentation) lens, eg Luneberg.

**2** Standard German TV/video system; from phase alternation, or alternating, line.

**3** Permissive action link.

**4** Portable airfield lighting; S adds set.

**5** Programmable array logic.

**6** Propulseur d'appoint liquide (F).

**7** Preprocessor assignment logic.

**8** Peripheral station.

**9** Protuberance air load.

**PALC** Point Arguello Launch Complex.

**Palea** Philippine Airlines Employees Association.

**PALF** Partly aloft (precipitation not reaching ground).

**palisade** Large hinged flight-deck barrier (RN carriers 1919–32).

**palladium** Pd, silvery malleable metal, density 12.0, MPt 1,552°C.

**pallet** **1** Standard platform for air freight, eg (Imperial measures are still used) 88 in × 125 in, 88 in × 108 in and 96 in × 125 in.

**2** Flat base, not necessarily of above dimensions, for combining stores or carrying single item to form unit load, in some cases retained as temporary or permanent base in operation.

**3** Standard-dimension base on which can be assembled experiments, ancillaries and other payloads, eg for Spacelab.

**4** Standard-dimension base carrying work-pieces in mechanized and automated manufacturing.

**5** Configured (shape-matching) payload carrier for attachment close against airframe exterior, eg fuel \* (FAST Pack).

**pallet net** Webbing or rope net for restraining a pallet or igloo.

**pallette** Subsystems.

**palletized bladder** Flexible container for liquid mounted on pallet (1) for airfreighting.

**palletrolley** Pallet (2) with wheels for ground transport, eg for Sea Skua missile.

**Palma** Protection of aircraft against man-portable air defence systems.

**Palmachim** On coast south of Tel Aviv, base for spaceflight, IRBM, ABM (Israel).

**Palmer scan** Radar scanning technique in which conical scan is superimposed on some other, eg Palmer-sector (beam oscillates to and fro over azimuth sector while continuously making small-angle conical scan), Palmer-raster, Palmer-circular etc.

**palm tree** Upward bomb burst (formation aerobatics).

**Palnut** Thin nut, usually pressed steel, screwed tightly above ordinary nut to prevent loosening of latter.

**PALPA** Pakistan ALPA [Karachi].

**PALS, Pals** **1** Precision approach and landing system.

**2** Precision approach light[ing] system; -1 adds with sequenced approach Cat 1; -2 adds with red barrettes and sequenced flashing lights in ILS Cat 2 configuration.

**3** Portable airfield light set (USAF).

**4** Positioning and locating system.

**5** Performace-based agile logistics support.

**palsar** Phased-array L-band SAR.

**PAM, p.a.m.** 1 Pulse-amplitude modulation; also, confusingly, phase-amplitude modulation.

- 2 Payload assist module.
- 3 Picture assembly multiplexer.
- 4 Plasma-arc machining.
- 5 Precision attack missile.
- 6 Peripheral adapter module.
- 7 Portable automated mesonet (weather).

**PAMA** Professional Aviation Maintenance (formerly Mechanics) Association [office, St Ann, MO] (US).

**PAMC** Provisional acceptable means of compliance (ICAO).

**Pamela** 1 Process abstraction method for embedded large applications.

2 Process for advanced management of end-of-life aircraft (Airbus).

**Pamir** 1 Passive airborne modular IR.

- 2 Phased-array multifunction imaging radar.

**Pampero** Stormy line squalls (Argentina, Uruguay).

**PAMR** Public-access mobile radio.

**PAMS** Point anti-missile system.

**PAN** 1 Polyacrylonitrile, precursor of carbon fibre in most processes.

2 Originating station has urgent message to transmit concerning safety of vehicle or occupant(s) (DoD); see Pan.

- 3 Porte avions nucléaires (F).

**Pan** Radio code indicating uncertainty or alert, general broadcast to widest area but not yet at level of Mayday.

**pan** 1 Base of seat tailored to pilot with seat-type pack.

- 2 Paved dispersal point for single aircraft.

- 3 Carrier for air-drop parachuted load.

4 Drum-type magazine for automatic weapon [vertical axis] (chiefly WWJ).

**pancake** 1 Vague term supposedly indicating landing at abnormally low forward speed and high sink rate (arch.).

2 Air-intercept code: "I wish to land", usually followed by word giving reason, eg \* fuel (DoD).

- 3 Verb, to land (arch.).

- 4 Flat-topped fuselage regarded as a lifting surface.

**pancam** Panoramic camera (planetary lander).

**P&A** Priorities and allocations.

**Panda** Personnel and administration.

**P&ES** Personnel and equipment supply.

**P&F** Particles and fields.

**P&I** Paint and interior.

**P&O** Plant and operations.

**P&P** 1 Plans and programs (DoD).

- 2 Payments and progress (NATO).

**P&SS** Provost and Security Service (RAF).

**P&T** Priorities and traffic.

**P&TC** Personnel and Training Command (RAF).

**panel** 1 Single piece of aircraft skin, eg fuselage \*.

2 Major section of wing as finished component, eg outer \*.

- 3 Essentially planar base carrying instruments.

4 Complete portion of stressed-skin structure, sandwich or, rarely, other constructional form, used for fatigue or static test purposes; not necessarily portion of actual aircraft.

5 Subdivision of parachute canopy, or aerostat gasbag, either complete gore or portion thereof.

- 6 Body of experts, eg examining \*.

- 7 Marking panel.

**panel code** Standard code for visual ground/air communication (IADB).

**panel elements** Items mounted on panel (3) such as instruments, switches and displays.

**panel fill factor** The percentage of the complete instrument panel facing the pilot that is occupied by multifunction displays.

**panelled** Equipped with instruments and avionics, thus well \* (colloq.).

**panhandle** Aircraft dispersal of frying-pan shape.

**pan-handle** Ejection-seat firing handle on seat pan.

**pan-head screw** One having thin, large head with slightly convex upper surface.

**panic button** Gives emergency recovery to unaccelerated horizontal flight with wings level (USAF).

**PANNI** Psychological assessment of noise and number index [see noise].

**pannier** 1 Small 1-, 2- or 4-tube rocket launcher added to CBLS or other stores carrier.

2 Common meaning, removable container for cargo of any kind.

**panoramic camera** One which by means of system of oscillating or rotating optics or mirrors scans wide strip of terrain usually from horizon to horizon. Mounted vertically or obliquely to scan across or along line of flight.

**PANS, Pans** Procedures for Air-Navigation Services; /OPS adds aircraft operations, /RAC adds radio com. procedures.

**PANS-ABS** PANS abbreviations and codes.

**Pantera** Precision attack navigation and targeting with extended range acquisition.

**panting** In/out springy movement of thin skin under compressive stress; generally similar to oil-can effect.

**pantobase** Landing gear designed for land, water, snow and possibly other surfaces.

**pantry** Aircraft kitchen without provision for heating prepacked meals.

**pants** Fixed fairing over landing gear leg and, esp., wheels; generally similar to spats but chiefly US usage.

**pants duct** Large-diameter Y-piece forming junction or bifurcation in duct system.

**PANYNJ** Port Authority of New York and New Jersey.

**PAO** Poly-alpha olefin.

**PAP** 1 Precision approach path.

- 2 Plug and play (transport a/c fuselage).

- 3 Paintless aircraft programme.

4 Propulsion [or propulseur] d'appoint à poudre [= solid booster rocket].

- 5 Pierced, or perforated, aluminium plank[ing].

**Papa** Parallax aircraft-parking aid.

**paperless** Totally on computer; thus \* cockpit, in which all paper is replaced by EFB.

**paper returns** Written lists of [military] aircraft at readiness, serviceable, unserviceable and written off, possibly adjusted for political reasons.

**PAPI, Papi** Precision approach path indicator.

**PAPM, p.a.p.m.** Pulse amplitude and phase modification; narrows signal bandwidth to quadruple carrying capacity per channel.

**Paprica** Passenger relief in co-operation with airlines.

**PAPS, Paps** 1 Periodic armaments planning system (NATO).

- 2 Phased armaments programme systems.

**3** Precision-airdrop planning software, or system (USAF).

**PAR** *1* Precision approach radar, [strictly, should be PA(R)].

*2* Progressive aircraft rework (USAF, USN).

*3* Phased-array radar, ie electronically steered instead of mechanically scanned.

*4* Perimeter-acquisition radar (ABM).

*5* Pulse-acquisition radar (SAM).

*6* Program(me) appraisal and review.

*7* Preferential, or preferred, arrival route.

*8* Power analyser and recorder.

*9* Parachute/airbag recovery.

*10* Parallel.

*11* Physiological ageing rating.

*12* Performance and reliability.

*13* Private pilot, airplane, recreational.

**Par** Precision aircraft reference (Lear-Siegler twin-gyro platform).

**Para** *1* Parachute.

*2* Paragraph.

**parabola** Conic section made by cutting right circular cone parallel to any of its elements; locus of point which moves so that distance from line (directrix) equals distance from point (focus), so eccentricity = 1.

**parabolic aerial** One whose reflecting surface forms portion of parabola, thus converting plane waves into spherical waves or vice versa, and either emitting pencil beam from point feeder or focusing incoming radiation to single-point receiver. Also called parabolic antenna/mirror/reflector.

**parabolic trajectory** As eccentricity is unity it represents least eccentricity for escape from attracting body.

**paraboloid** Shape in 3-D formed by rotating parabola about major axis.

**parabrade** Braking parachute.

**Parac** PAR(4) attack characterization, system travelling-wave tube.

**parachute** *1* Any device comprising flexible drag or drag + lift surface from which load is suspended by shroud lines. Originally canopy was umbrella-shaped but today may be of Rogallo or other semi-winged types offering precision control of landing within large area. Distinction between \* and hang glider is blurred, but chief features distinguishing \* are rapid deployment from packed condition and suspension of load well below canopy.

*2* Verb, to use (1).

*3* Verb, to deploy an aerodynamic-drag system (UAV).

*4* See *braking* \*.

**parachute deployment height** Height AGL at which canopy is fully deployed.

**parachute flare** Illuminating flare equipped with parachute to prolong descent.

**parachute gore** See *gore*.

**parachute harness** That to which personal parachute is attached.

**parachute pack** Bag containing packed parachute.

**parachute signal light** Usually comprises two lights, one green, one red, to indicate when parachutists should start leaving aircraft.

**parachute tower** *1* Tower or mast from which parachute descents are made for sport or instruction.

*2* High-ceiling part of parachute section of airbase wherein parachutes are hung to dry after use.

**parachute tray** Rigid base to pack of parachute used in heavy dropping.

**parachute tropps** Assault force delivered by parachute [first, USSR, 1931].

**parachute vent** Aperture in top of canopy or left by blank gore(s) to ensure stable descent.

**parachutist** Person using parachute, esp. for sport.

**para-circular** Near-circular orbit (intended to be circular).

**paradrag drop** Ultra-low airdrop of cargo using drag of arrester parachute to extract and halt payload (NATO).

**paradrop** Delivery by parachute (from height significantly greater than paradrag drop) of personnel or cargo from aircraft (NATO).

**paraffin** Kerosene.

**parafoil** Parachute able to fly as aerodyne (L/D about 3) and stall, but with canopy instantly deployed from packed condition and attached by normal harness.

**parafocal vision** Used at night to see extremely dim sources; eye is oriented so that what light there is falls on area of retina populated mainly with rods, not in central (foveal) region but surrounding it.

**paraglider** *1* Inflatable hypersonic spacecraft having form of metallised-fabric kite of paper-dart shape.

*2* Also formerly applied to various flexible-wing gliders, towed kites and parafoils, but today no longer used; each device must be either a kite, hang glider, parachute or parafoil. See next.

**paragliding** Despite the above, this term is still current in the UK, see BHPA.

**Paralkatone** Protective sealant film sprayed on aluminium alloy aircraft, usually after completion or during erection.

**parallax aircraft parking aid** Built into airport gate, gives precise optical guidance for each type of aircraft.

**parallax error** Caused by viewing bi-planar display [eg dial instrument] obliquely.

**parallel** *1* Great circles parallel to Equator (\* of latitude).

*2* Circle on celestial sphere parallel to celestial equator (\* of declination).

*3* Connected so that current flow, signal, etc divides and passes through all components simultaneously, thereafter recombining.

*4* Software connection so that each signal has its own wire; hence a 16-bit wire has 16 conductor paths.

**parallel actuators** Two or more in parallel to drive single load; usually physically separated and tied by load in force or torque-summing fashion (thus providing rip-stop design).

**parallel aerofoil** Having constant section from tip to tip; two-dimensional.

**parallel burning** Solid grain which ignites at centre over whole length and burns purely radially outwards to case.

**parallel double-wedge** Aerofoil whose section is that of flat hexagon with sharp wedges at leading and trailing edges and parallel upper and lower surfaces; poor at subsonic speeds but acceptable supersonic shape, esp. for missiles.

**parallel-heading square** Training manoeuvre in which helicopter is flown at low level around a square, each of the four legs being flown with helicopter aligned with that side of square.

## parallel ILS

**parallel ILS** Serving parallel runways, with minimum lateral separation of 1,500 m, 5,000 ft.

**parallel-line design** Aircraft whose wing LE/TE, tips and sharp edges are all parallel. This concentrates radar signature into very narrow beams, easily missed by enemy. B-2 is example.

**parallel offset** Airway R-Nav route running alongside designated airway.

**parallel of origin** Parallel of latitude used as an origin (2).

**parallel redundancy** Addition of channels in parallel (3) mode purely to increase redundancy (1).

**parallel resonant circuit** Tuned circuit with inductive and capacitive elements in parallel (3).

**parallel runways** Runways at same airport on same alignment and with sufficient lateral separation to permit simultaneous use, including parallel ILS approaches. Designators have suffix L or R [left or right] thus 28L is south of 28R.

**parallel servo** One located in control system so that servo output drives in parallel with major input; usually arranged to drive both cockpit controls and flight-control system and thus performing as alternative to pilot.

**parallel warfare** Use of a sensor network and EBO to render an enemy helpless (USAF).

**parallel yaw damper** One connected direct into pilot/rudder control loop and, in some cases, resulting in movement of cockpit pedals. Normally superseded by series damper.

**paramagnetic** Possessing magnetic permeability above 1 and permanent magnetic moment; atoms tend to align in direction of external field giving resultant magnetic moment and tend to move to strongest part of field.

**Paramatta** Code for RAF WW2 blind target-marking by PFF using precision-aimed TIs of sophisticated types repeated at intervals; usual form with electronic aids called Musical \*.

**parameter** Basic definable characteristic or quality, esp. one that can be expressed numerically; specialized meanings in maths, EDP (1) and statistics.

**parametric amplifier** Reactance amplifier dependent on time-varying reactance (fed by signal and a pump source) forming part of tuned circuit; variable-capacitance usually Varactor or crystal diode. Also called Mavar (mixed amplification by variable reactance).

**parametric study** Study based on numerical values of system variables.

**parametric take-off number** Product of (landing wing loading  $\times$  1.11)  $\times$  (MTOW  $\div$  [total installed thrust  $\times$  C<sub>L2</sub>]).

**paramotor** Engine/propeller and seat unit [but no landing gear] for attachment to hang glider or parafoil. Hence, paramotoring.

**paramp** See *parametric amplifier*.

**pararescue team** Trained personnel who reach site of incident by parachute and render aid.

**parasheet** Parachute in form of regular polygon with rigging lines attached to apices; subdivided into gathered \* (periphery constrained by hem cord) and ungathered \*.

**parasite** Aircraft, invariably aeroplane, which for portion of flight relies on another for propulsion and possibly also for lift. Can ride on back of parent, or be attached elsewhere externally or internally, or be towed.

**parasite drag** Sum of all drag components from all non-lifting parts of body, usually defined as total drag minus induced drag. Not normally used (see *profile drag*).

## parking orbit

**parasitic element** Resonant element of directional aerial excited to produce directional pattern; eg reflector added to Yagi aerial.

**parasitic material** RAM added [usually by adhesive] to exterior skin to reduce RCS.

**parasitic oscillation** Generated by stray inductances and capacitances and eliminated by parasitic stopper.

**parasiting** Technique of using parasite.

**paraski** Sport combining downhill ski with lifting surface such as parachute, parafoil or hang glider; competitions test landing precision.

**parasol wing** One from which rest of aircraft is suspended by ties.; hence, parasol monoplane.

**paravane** 1 Hydrodynamic body towed (e.g., by helicopter) on end of minesweeping cable.

2 Aerodynamic body towed on end of cable from aircraft to keep line taut and steady, eg in mid-air recovery.

**para-visual director** Attention-getting non-quantitative flight instrument giving bold linear indication of excursions in pitch or azimuth, generated by rotation of striped 'barber pole' display; usually mounted on flight-deck coaming; indicator in GRDS is AMLCD (Smiths Industries).

**parawing** Variation of basic Rogallo flexible wing developed at NASA Langley for payload recovery and marketed by Northrop; not current term in hang gliding.

**PARC** 1 Particle-Astronomy Research Council (UK).

2 Pacific Alaska range complex (USAF).

**parcel** Any small volume of gas, esp. of atmosphere.

**Pares** Perimeter acquisition radar characterization system.

**PARD** Pilotless Aircraft Research Division (NACA, from 1946).

**Pardop** Passive ranging Doppler.

**parent** 1 Main aircraft in composite or carrier of parasite.

2 Aircraft carrying one or more RPVs over which it exercises control following release.

**parent body** Primary around which satellite orbits.

**PARES** Passive-radar ESM system.

**parity** 1 Symmetric property of wave function or other phenomenon; value is 1 if function is unchanged by inversion of its co-ordinate system.

2 Precise keying of two or more sets of data [eg EDP (1) software, tapes, reconnaissance pictures or wire recordings] so that they run to common time-base. System parities are assigned individual tracks in such devices as reconnaissance signal recorders.

**park** To establish synchronous satellite at its operating position, where it is parked.

**parked** Aircraft, esp. commercial transport, not in active use over extended period.

**Parkerizing** Anti-corrosion treatment in which metal part is boiled in solution of phosphoric acid and manganese dioxide and then dipped in oil.

**Parker-Kalon, PK** Patented family of self-tapping screws for sheet.

**parking brake** That applied continuously after aircraft is parked, to prevent subsequent rolling; also (US) called park brake.

**parking catch** Fitted to normal handbrake (rarely, toe brake) to convert to parking brake.

**parking orbit** Temporary spacecraft orbit for such

purposes as waiting for correct timing or for delivery of components, spacecraft or station assembly, or rectification of fault.

**PARL** Parallel.

**Parm, PARM** 1 Persistent anti-radiation missile.

2 Precision approach runway monitor, = PRM (2).

**Parmod** Progressive aircraft rework modification (USAF, USN).

**Paros** Prevention of an armed [or arms] race in outer space.

**parrot** Code for IFF transponder (DoD).

**PARS, Pars** 1 Programmed airline reservation system.

2 Primary attitude-reference system.

**parsec** Unit of length on cosmological scale equal to distance at which object has heliocentric parallax of 1" (one second of arc) = 206,265 times semi-major axis of Earth's orbit = 3.26 light-years =  $3.0857 \times 10^{16}$ m, abb. pc. Multiples are kpc, kilo-\* and Mpc, mega-\*.

**Parsecs** Program for astronomical research and scientific effects concerning space.

**Part** Chapter in rules governing civil aviation; e.g. \* 91 governs business aviation and \* 121 scheduled air carriers (FAA).

**part-charter** Particular flight, scheduled according to timetable.

**partial-admission turbine** One in which working fluid enters around only part of periphery.

**partially evaporative cooling** Piston-engine circuit in which coolant is briefly allowed to boil.

**partial pressure** That exerted by each gas in gaseous mixture; Dalton's law states value is same as if that gas occupied whole volume occupied by mixture at same temperature.

**partial-pressure suit** Skintight suit covering body except head, hands and feet and inflatable (usually by stitched-in tubing) to press on wearer and oppose internal pressures.

**partial priority** Unusual status accorded special traffic (SST was intended) by ATC services in special circumstances short of emergency.

**partial shielding** 1 Protection against micrometeorites incident from one direction only.

2 Radiation shielding of crew of nuclear-propelled aircraft whilst leaving radiation free to escape in other directions.

**particle separator** Device for cleaning solid (and possibly liquid) particles from air entering engine or other device, typically by centrifuging effect in vortex.

**particle static** Radio-communication static thought to be due to accumulation or shedding of particulate matter in flight (not defined and suggested arch.).

**parting out** Procedure for dismantling aircraft to yield certifiable parts.

**Partner** Partnership for air transportation noise and emission reduction (FAA).

**Part-Publication** Category of military aircraft whose characteristics could be openly published except for such items as performance, fuel capacity and other sensitive details (UK).

**parts crew** Scrapyard team which removes items capable of being reconditioned for further use.

**part-span shroud** Snubber [clapper] near mid-length of fan [rarely, compressor] blade; abuts on neighbours to damp out flutter or other vibration.

**part-span stall** 1 In an axial compressor, a stall affecting

only the outer portions of the fixed and rotating blades, usually at several places simultaneously and with rapid irregular rotation within the casing.

2 Self-explanatory, a stall affecting only part of an aircraft wing, usually at the root or tip.

**part surface** Surface being cut in GPP.

**part-throttle reheat** Augmentation of engine by afterburner brought in at less than maximum cold thrust, giving smoothly increased thrust and avoiding sudden augmentation by selecting afterburner at maximum rpm. Afterburner stays lit as throttle is closed, extinguished only at low fuel flow at low thrust level.

**Parylene** Conformal (vapour-deposited) barrier coating used to protect precision parts, especially electronics, from hostile environments (Union Carbide).

**PAS** 1 Performance advisory system (Simmonds subsystem offering minimum fuel and maximum propulsive efficiency).

2 Public-, or passenger-, address system.

3 Power available, shaft (UK, CAA = spindle).

4 Polyarylene sulphide.

5 Projector approach sight.

6 Paralkatone adhesive sealant [I adds inhibiting, TP temperature protection].

7 Police Air Support (UK).

8 Prime and suppliers.

9 Perch and stare (UAV).

10 Primary alerting system.

11 Pulse-analysis system.

12 Pseudo aircraft system.

13 Precision-attack system[s].

**PAS-2** A pioneer PAS (4) processed at relatively low temperatures for advanced airframes (Phillips Petroleum).

**Pasar** Podded advanced synthetic-aperture radar; S adds system.

**PASC** Pacific Area Standards Congress.

**Pascal** Software language, becoming disused.

**pascal** SI unit of pressure, Pa, =  $N/m^2 = 0.02088 \text{ lb}/ft^2, 0.000145038 \text{ lb}/in^2$ . As it is such a small unit kPa or MPa are more common.

**Pascal's law** In fluid at rest, all pressures acting on given point are equal in magnitude in each direction (neglects acceleration due to gravity).

**PASD** Pulsed arrested spark discharge.

**PASE** Planning assumption for service entry [a future date].

**PASI** Pre-application statement of intent.

**Paso, PASO** Pacific Aviation Safety Office, a Coscap group including Australia but [2005–] not NZ (ICAO).

**Paspo** Precision-attack systems program office.

**Pass, PASS** 1 Parked-aircraft security system.

2 Passive and active sensor subsystem.

3 Passive aircraft surveillance system.

4 Primary avionics subsystem.

5 Pylon-accommodated self-protection suite, or system.

6 Personnel-access security system.

7 Professional Airways Systems Specialists [trade union, office Washington DC] (US).

8 Production and service support.

**pass** 1 Single run by aircraft past point on ground or other object such as aircraft in flight on same heading at markedly lower speed.

**2** Short tactical run or dive by aircraft at target; single sweep through or within firing range of enemy air formation (DoD, IADB).

**3** Single orbit by satellite, starting at point Equator is crossed northbound.

**4** Single passage by satellite overhead.

**5** Single period of time during which satellite is within radio contact of control or data-acquisition station.

**passenger** In addition to basic meaning of humans carried in vehicle other than vehicle's crew, normal meaning in air-carrier terminology is FPP (fare-paying \*), normally, excluding company employees on cheap rate. Latter, however, are normally included in traffic statistics.

**passenger boarding bridge** Passenger loading bridge.

**passenger breathing equipment** **1** Drop-down oxygen mask.

**2** Smoke hood.

**passenger control unit** Hand-held audio-visual interface with cabin lightup, temperature, outside camera[s], communication and entertainment,

**passenger loading bridge** Covered walkway linking terminal and parked aircraft; see *bridge*.

**passenger profile** Distribution of pax at one airport through 24-h period.

**passenger service charge** Fee levied by airport authority on each departure passenger to help cover its costs.

**passenger service unit** Originally comprised overhead punkah outlet, now adds light(s), call button and possibly other interfaces.

**passivating** Coating, esp. metal surface, with inert film to prevent electrochemical corrosion.

**passive** **1** Receiving but not emitting.

**2** System, eg PFCS, which can only fail open.

**passive air defence** Includes such activities as cover and concealment, camouflage, deception, dispersion and shelters.

**passive attack weapon** Precision dart[s] designed to destroy CBW containers [usually without explosive charge, which would scatter contents].

**passive countermeasures** Detection and analysis of hostile emissions (see *ESM*).

**passive guidance** Use of received signals from whatever source in order to navigate.

**passive homing** Tending to fly towards source of emission from target, usually IR.

**passive jamming** Use of chaff and confusion reflectors.

**passive landing gear** One utilizing optimised self-adaptive damping devices.

**passive missile** One equipped with guidance able to home on emissions generated by the target.

**passive mode** Use of airborne radar in receive-only mode, eg AWACS.

**passive munition** **1** Delivered safe and then triggered either by timing system or radio signal.

**2** Inert until disturbed, eg mine.

**passive paralleling** Simplest and most common type of redundancy wherein two parallel functional devices are utilized such that, if one fails, second is still available. Limited to simple elements of control system which can only fail passive, such as springs and linkages. When failure of one element occurs, there is an acceptable change in performance or capability.

**passive pilot** One who, on long-haul, is relaxing or taking a nap.

**passive radar** Misnomer; normally interpreted as passive mode.

**passive ranging** Trajectory-measuring systems that do not require a transmitter or transponder in vehicle, eg Pardop. See next.

**passive ranging subsystem** Doppler plus phase rate of change to give direction and range.

**passive sonar** Listens for emissions from submarine.

**passive thermal control** Changing attitude of spacecraft to even-out incident solar flux, esp. by roll through 180°; so-called barbecue manoeuvre.

**pass off** To test and clear development or production item.

**pass-off testing** The test of each assembled production item.

**PAT** **1** Process action team (AFLC).

**2** Pilot access, or applications, terminal.

**3** Private pilot, airplane, recreational, transition.

**4** Pulse active thermography.

**5** Pop-up [satellite] archival tag.

**PATA** **1** Polish air-traffic agency.

**2** Pacific Asia Travel Association (Int.).

**PATC** Professional, administrative, technical and clerical.

**Patca** Plurilateral agreement on trade in civil aircraft.

**Patch** Precision approach to coupled hover.

**patch** **1** Strong fabric attachment cemented to aerostat envelope (see *eta* \*, *channel* \*, *split* \*, *rigging* \*).

**2** Embroidered or printed badge worn on working (especially flying) clothing.

**3** Area of ground illuminated by airborne radar.

**patching** Ceremonial admission to exclusive group, such as Thunderbirds (USAF).

**PATCO, Patco** Professional Air Traffic Controllers Organization (US, lost status 1981).

**Patec** Portable automatic test equipment calibrator.

**path** **1** Track of aircraft under control of TMA.

**2** Projection on Earth's surface of satellite orbital plane; same as track.

**3** Loosely, aircraft trajectory in 3-D.

**Pathfinder** **1** Software with immense capacity to extract intelligence from vast amounts of data.

**2** Passive thermal Flir for navigation, detection and enhanced resolution.

**pathfinder aircraft** One with special crew plus drop-zone/landing-zone marking teams, markers and/or electronic navaids to prepare DZ/LZ for main force (NATO).

**pathfinder drop-zone control** Communication and operation centre from which pathfinders exercise guidance (DoD, LADB).

**Pathfinder Force** Elite sub-force within RAF Bomber Command 1943–45 charged with marking targets for main-force attack, abb. PFF. Pathfinder Association supports needy survivors.

**pathfinders** Four meanings, all defined as plural:

**1** Experienced aircrew who lead formation to DZ, RP or target.

**2** Teams dropped or air-landed at objective to operate navaids.

**3** Radar or other navaid used to facilitate homing on objective, esp. in bad visibility.

**4** Teams air-delivered into enemy territory to determine

best approach/withdrawal lanes, LZs and sites for heliborne forces (all DoD, LADB).

**path-stretching** Deliberately routeing incoming traffic over longer path (1) to achieve correct spacing on approach.

**Patio** Platform for ATM (7) tools integration up to pre-operation (Euret).

**PATN** See *Pro-ATN*.

**PATP** Packed Aircraft Transit Pool (RAF).

**Patrick AFB** USAF base at Cape Canaveral supporting AMR.

**Patriot** 1 Provide appropriate tools required to intercept and obstruct terrorism (US).

2 Phased-array tracking to intercept of target.

**patrol** Flight by one or more military or quasi-military (e.g. customs) aircraft over prescribed area. Defensive \* no longer required in airspace with radar surveillance. Offensive \* actively seeks hostile aircraft. Standing \* is mounted at same time each day.

**patrol aircraft** 1 Generally accepted term for aircraft engaged in offshore duties such as search/rescue, customs/immigration and enforcement of marine laws.

2 US designation for large ocean combat aircraft engaged in ASW, maritime reconnaissance and mining.

**PATS, Pats** 1 Precision automated tracking station.

2 Prototype automatic target screener.

3 Primary aircraft training system.

4 Precision-attack targeting system.

**patter** Flying instructor's well-rehearsed flow of verbal instructions and comments.

**pattern** 1 Replica of part used in constructing casting mould.

2 Radiation of transmitting aerial as plotted on diagram of field strength for each bearing.

3 *Circuit* (1) (US).

4 Shape traced out on ground by track of aircraft, esp. in circuit, making procedure turns, in holding stack or other circumstance demanding accurate geometry.

5 Authorized flightpath (1) to point of touch-down.

**pattern aircraft** One supplied to participant in production programme, eg licensee or co-producer, to serve as master to instruct engineers and solve arguments, and possibly facilitate local change orders.

**pattern bombing** Systematic covering of target area with carpet of bombs uniformly distributed according to plan.

**pattern generator** Signal generator whose output provides TV-type pattern for testing TV, video, EO or visual-display systems.

**PATTS** Programmed auto trim/test system.

**PAT3** Parallel advanced tactical targeting technology.

**PATU** Pan-African Telecommunications Union.

**Patuxent River** US Naval Air Test Center.

**PATWAS, Patwas** Pilots' automatic telephone weather answering service (FSS, US).

**PAU** Passenger-address unit.

**PAUC** Program-acquisition unit cost.

**PAV** 1 Power assurance valve (CAA).

2 Prototype air vehicle.

**Pave** With this prefix the USAF designated numerous tactical electronic systems.

**pavement** Airfield paved area, including runways, taxiways, aprons and possibly dispersals.

**pavement condition index** A subjective scale based on heave, cracking and surface spalling.

**P<sub>avg</sub>** Average power of pulsed-radar signal.

**PAW** 1 Plasma-arc welding.

2 Passive attack weapon.

**PAWES** Performance assessment and workload evaluation system.

**Paws** 1 Phased-array warning system.

2 Passive airborne, or all-threat, warning system.

3 Portable analyst, or ASAS, workstation.

4 Passive approach warning sensor, or system.

5 Program for avionics and weapon systems.

**pax** Passenger[s].

**Pax River** See *Patuxent River*.

**Paxsim** Models passenger flow through all public areas of terminal, assisting design.

**payback** Aircraft added to procurement contract to replace one diverted, eg to another customer.

**payload** 1 That part of useful load from which revenue is derived (BSI). See *Maximum* \*.

2 Load expressed in short tons, US gal or number of passengers vehicle is designed to transport under specified conditions (DoD etc).

3 In missile, warhead section (DoD), plus container and activating devices (NATO); both definitions need modifying in light of MIRV and similar techniques.

4 For spaceflight, not yet defined; \* for Saturn V launch vehicle was complete Apollo spacecraft, whose LM ascent stage had its own \* in terms of two crew plus lunar rock.

5 For ECM, all discrete devices released or ejected, eg chaff, flares and jammers in prepackaged \* form.

6 Maximum load that can be positioned on upper base-plate (simulator).

**payload integration** Matching payload (4) to spacecraft, including power supply, environmental system and software.

**payload of opportunity** One put aboard space launcher because mass/volume is available.

**payload/range** Fundamental measure of capability of transport aircraft usually presented as graphical plot of payload (1) against range with specified operating conditions and reserves.

**payload specialist** Engineer skilled in designing and integrating payloads (4), esp. those of academic-research or commercial nature.

**PB** 1 Payload bay.

2 Passenger bridge.

3 Aircraft category, patrol bomber (USN, 1935–62); pursuit, biplane (USAAC 1935–41).

4 Pre-briefed].

5 Particle beam.

6 Pneumatic boot.

**P<sub>B</sub>** 1 Roll-rate induced angle of attack.

2 Fuel-burner pressure.

**Pb** Lead.

**P<sub>b</sub>** 1 Burning-time average chamber pressure (solid rocket motor).

2 Gas-turbine combustion-chamber pressure.

3 Polar modified air.

**PBA** 1 Pitch bias actuator.

2 Plastic blasting media.

3 Predictive battlespace awareness.

**PBAA** Polybutadiene acrylic acid (solid rocket propellant).

**PBAN** Polybutadiene acrylonitrile (solid rocket propellant).

**PBATS**

**PBATS** Portable battlefield attack system, all-weather all-aspect SAM.

**PBB** Passenger boarding bridge, see *bridge*.

**PBC** Practice bomb carrier, or container.

**PBCPI** Permanent bar-code parts identification.

**PBCT** Proposed boundary crossing time.

**PBD** Program budget decision, or document (US DoD).

**PB/D** Place, bearing and distance (waypoint).

**PBDI** 1 Position, bearing and distance indicator.

2 Pneumatic-boot de-icing.

**PBE** 1 Protective, or passenger, breathing equipment [smokehood].

2 Protein-based electronics.

**PBF** 1 Personnel (occasionally pilot) briefing facility.

2 Polymer-based film [appliquéd].

**PBG** Private pilot, free balloon, gas.

**PBH** Private pilot, free balloon, hot air.

**PBI** 1 Polybenzimidazole, fire-blocking chemical incorporated into felts and other fabrics (Celanese).

2 Push-button indicator.

3 Positive behavior identification [air-travel security] (US).

**PBID** Post-burn-in data.

**PBIL** Predicted, or projected, bomb-impact line.

**PBIT** Power-up built-in test.

**PBJ** Partial-band jammer.

**PBL** 1 Probable.

2 Performance-based logistics.

**PBM** Pulse-bias modulation.

**PBMS** Propeller balance monitoring system.

**PBO** Performance-based organization.

**PbO** Lead oxide.

**PBOR** Coalition for airline passengers' bill of rights [2006–] (US).

**PBP&E** Professional books, papers and equipment.

**PBPS** Post-boost propulsion system.

**PBS** 1 Prefabricated bituminous surface.

2 Plasma-based stealth.

3 Product breakdown structure.

**PbS** Lead sulphide.

**PBSI** Pushbutton selector/indicator.

**Pb Si** Lead silicide.

**Pb Sn Te** Lead tin telluride.

**PBT** 1 Polymer-based thermosetting.

2 Planning Board for Training (USN).

**PBTH** Power by the hour.

**PBV** Post-boost vehicle.

**PBW** 1 Particle-beam [or plasma-based] weapon.

2 Power by wire.

**PBX** 1 Atmospheric pressure (USSR, R).

2 Family of special explosives used to trigger NW devices; PBX-9505 is related to, and used with, Cyclotrol; PBX-9404 is still in general use; PBX-9502 is IHE.

3 Private branch exchange.

**PC** 1 Production, or positive, control.

2 Printed circuit.

3 Physical conditioning.

4 Permanent Commission (RAF).

5 Pulse compression.

6 Personal computer [now the most common meaning].

7 Pilot, or production, certificate.

8 Pilotage chart.

9 Programmable controller.

10 Power converter.

11 Potential conflict.

12 Plug-in card.

13 Pressure capsule.

14 Polynomial chaos.

**Pc** 1 Chamber pressure (any rocket).

2 Polar continental, or Canadian, air mass.

3 Cumulative probability of detection (radar).

**Pc** 1 Burn-time or action-time average chamber pressure.

2 Capsule pressure.

3 Load on a compression member.

**pc** Parsec[s].

**PC1, PC2 etc** Powered flight-control systems.

**PCA** 1 Polar-cap absorption.

2 Positive-controlled airspace, or area.

3 Physical configuration audit (software).

4 Photovoltaic concentrator array.

5 Pre-conditioned air.

6 Propulsion-controlled airplane (no aerodynamic controls).

7 Presidency of Civil Aviation (Saudi Arabia).

**PCAA** Polymorphic computer agent architecture.

**PCAS** Pitch-control augmentation system.

**PCASP** Passive-cavity aerosol spectrometer probe.

**PCAST** President's Council of Advisors on Science and Technology (US).

**PCATD** Personal-computer aviation-training device[s].

**PCB** 1 Printed-circuit board.

2 Plenum-chamber burning.

3 Polychlorinated biphenyl(s).

4 Pilot control bay (UAV-GCS).

5 Publications Clearance Branch (UK MoD).

**PCBW** Provisional combat bomb wing (USAAF).

**PCC** 1 Parts-consumption cost.

2 Pin-cushion correction.

3 Portland-cement concrete.

4 Pilot/control[ler] communication[s].

5 Prague Capabilities Commitment (NATO).

**PCCB** Program-configuration control board.

**PCC P** PC-based control panel.

**PCD** 1 Proceed.

2 Preliminary concept definition.

3 Panoramic cockpit display.

**PCDN** Process-change design notice.

**PCDU** Portable [electric] cable diagnostic unit.

**PCE** 1 Phase control electronics.

2 Professional continuing education (USAF).

3 Proximity communications equipment (ESA).

**PCF** 1 Pulse-compression filter.

2 Passenger-cum-freight (CAA).

3 Protein crystallization facility.

4 Pounds per cubic foot [not recommended].

5 Photonic crystal fibre.

**PCFTD** Personal-computer flight-training device.

**PCG** Projectile common guidance.

**PC(G)** Missile-armed patrol craft.

**PCI** 1 Pavement-condition index, scale based on heave, cracking, etc.

2 Protocol control information.

3 Pattern of cockpit indications [failure method].

4 Physical-configuration inspection.

5 Pounds per cubic inch [not recommended].

**pciBIRD** A 6-DOF magnetic tracker with processor card.

**PCID** Preliminary change in design.

**PCIDM** Personal-control, or plug-in card, improved data modem.

**PCIG** Personal-computer image generator.

**PCIP** Precipitation.

**PCIPB** President's Critical-Infrastructure Protection Board (US).

**PCL** 1 Power control lever [not flight controls].  
2 Pilot-controlled [cabin] lighting.  
3 Passive coherent location.

**PCLL** Persistent cell [storm stays in same place].

**PCM** 1 Pulse-code modulation, or modulated.  
2 Pyrotechnic countermeasures.  
3 Phase-control module.  
4 Post-crash management.  
5 Parametric cost modelling.  
6 Prearranged contact mode.  
7 Power-converter module.

**Pc max** Maximum chamber pressure (solid rocket motor).

**PCMCIA** Personal-computer memory-card interface association.

**PCN** 1 Pavement Classification Number; part of ICAO standard ACN-PCN system for relating aircraft footprints to pavement strengths [Annex 14, Amdt. 35].  
2 Personal communications network.

**PCO** 1 Photochemical oxidant, = smog.  
2 Procuring (or procurement) contracting officer (DoD).

**PCOA** Phase-control-only array.

**PCP** 1 Platoon command post (SAM).  
2 Program change proposal.

**PCPN** Precipitation amount.

**PCR** Programme commitment review.

**P<sub>cr</sub>** Critical [e.g. buckling] load.

**PCRT** Projection CRT.

**PCS** 1 Performance command system.  
2 Portable, or piloting, control station (RPV).  
3 Permanent change of station (military).  
4 Pitch (or powerplant) control system.  
5 Power conditioning system.

**PCSA** Police Community Support Officer (UK airports).

**PCSB** Pulse-coded scanning beam.

**PCSC** Precision-cast single-crystal.

**PCSV** Pilot-to-controller service.

**PCT** 1 Power control test.  
2 Portable common tool [software; E adds environment, I interface].

**PCU** 1 Powered-, or power-, control unit (flight controls).  
2 Pilot's, or passenger, or parachute, or portable, or propeller, or power (engine), control unit.  
3 Pod conditioning unit.  
4 Pitch-change unit (helio).

**PCV** Pneumatic control valve.

**PCZ** Positive-control zone.

**PD** 1 Pulse Doppler.  
2 Powered, or profile, descent.  
3 Power-doubler (radio).  
4 Preliminary design.  
5 Project definition (abb. results in confusion with [4]).

6 Period (full stop) in message.  
7 Pre-digital.  
8 Presidential decision (US).  
9 Procurement document.  
10 Probability of detection.  
11 Pictorial display [/CLC adds course-line computer].  
12 Point detonating.  
13 Programme Director.  
14 Personal display (PCU2).  
15 Pilot deviation.

**Pd** Packet mode, data, GPS com. link used for signalling and ground/air messages.

**Pd** 1 Probability of detection in single look or sweep (radar).  
2 Dynamic pressure.

**p.d.** Potential difference.

**PDA, p.d.a.** 1 Post-deflection modulation.  
2 Photon detector assembly (space telescope).  
3 Problem-detection audit.  
4 Personal digital assistant.  
5 Premature-descent alert.  
6 Power-distribution assembly.

**PDADS** Passenger digital-activated display system.

**PDAF** Probabilistic data association filtering.

**PDAM** Precision direct-attack munition.

**PD&E** Procedures development and evaluation.

**PDAR** Preferential departure and arrival route.

**PDAT** Portable data access terminal.

**PDB** 1 Precision digital barometer.  
2 Performance data-base.

**PDBS** Pilot data, or direct, broadcast system.

**PDC** 1 Performance data computer.  
2 Public dividend capital.  
3 Personnel despatch centre.  
4 Programme development card; /PMM adds performance-monitor module.  
5 Power distribution centre.  
6 Pre-departure clearance.  
7 Pressure-drop control.

**PDCG** Pressure-drop control governor.

**PDCO** Pressure-drop control orifice.

**PDCS** Performance-data computer system (Lear-Siegle/Boeing).

**PDCU** Panel data concentration unit.

**PDCV** Pressure-drop control valve.

**PDD** 1 Post-delivery development.  
2 Package design document.

**PDDI** Product definition data interface.

**PDE** 1 Pulse detonator, or detonation, engine.  
2 Partial differential equation[s].  
3 Power drive electronics.  
4 See PD&E.

**PDES** 1 Pulse-Doppler elevation scan; PDNES plus electronic scanning in vertical plane to give target height.  
2 Product-data exchange specification.

**PDEW** [Passengers] per day each way, measure of total flow.

**PDF** 1 Precision direction finding.  
2 Primary display function.  
3 Portable document file [F adds format].  
4 Paint-definition freeze [last point at which customer can change specification].  
5 Probability desnity, or distribution, function.

**PDFN** Phase-distortion at first null.

- PDG** 1 Precision-drop glider.  
 2 Président directeur-général (F).  
 3 Programmable display generator.  
 4 Pilot's display group.
- PDI** 1 Powered descent insertion.  
 2 Primary direction indicator.
- PDID** Pulse-doppler identification.
- PDL** Program design [or description] language.
- PDM** 1 Pulse-duration modulation.  
 2 Primary development model.  
 3 Programmed depot maintenance.  
 4 Presidential decision memorandum.  
 5 Product-data management.  
 6 Pilot decision-making.  
 7 Propulsion deorbit module.
- P-DME** Precision DME.
- PDMF** Programmable digital matched filter(s).
- PDMM** Pulse-Doppler map matching.
- PDMS** Point-defense missile system.
- PDN** 1 Public data network.  
 2 Pulse-Doppler navigation.
- PDNES** Pulse-Doppler non-elevation scan; surveillance down to surface, without indication of target height.
- PDO** Pendulum dynamic observer.
- PDOP** 1 Phase degradation of performance.  
 2 Position dilution of precision (GPS).
- PDOS** Powered-door operating [or opening] system.
- PDP** 1 Program(me) decision package.  
 2 Plasma, or performance, display panel.  
 3 Portable data processor [S adds system].  
 4 Project definition phase.  
 5 Polar-diagram plotter.
- PDQ** 1 Photo-data quantiser (or quantifier).  
 2 Pre-defined qualities.
- PDR** 1 Preliminary design review.  
 2 Pulse-Doppler radar.  
 3 Pilot's display recorder (Ferranti).  
 4 Predetermined routeing.  
 5 Primary defect rate.  
 6 Preferential departure route.  
 7 Programmable digital radio.  
 8 Pressure-drop regulator.  
 9 Program-development review.
- PDRC** Pressure-drop ratio control.
- PDRJ** Pulse-Doppler radar jammer.
- PDRR** Product/program/project definition and risk reduction.
- PDS** 1 Passive detection system.  
 2 Prestocked dispersal site.  
 3 Pulse-Doppler search mode.  
 4 Passenger distribution system.  
 5 Post-design service(s), or support.  
 6 Primary display system.  
 7 Project definition study.  
 8 Portable data store.
- PDSTT** Pulse-Doppler single-target track mode.
- PDT** 1 Pyrotechnic door [or deployment] thruster.  
 2 Pacific Daylight Time (US).  
 3 Pliable display technology.
- PDU** 1 Pilot[s] display unit.  
 2 Power drive, or distribution, unit.  
 3 Pneumatic drive unit.  
 4 Protocol data unit.
- PDV** 1 Pressurizing and dump valve.
- 2 Parafoil-delivered, or -deployed, vehicle, for MOP(5).  
 3 Pressure-drop valve.
- PDVOR** Precision DVOR.
- PDW** 1 Pulse-detonation wave [rocket] or ramjet.  
 2 Priority delayed weather.
- PDWC** Post-departure weather change.
- PDWE** Pulse-detonation wave engine.
- PDZ** Parachute dropping zone.
- PDZC** Pathfinder drop-zone control.
- PE** 1 Procurement Executive [MoD, Abbey Wood, Bristol BS12 7DU] (UK).  
 2 Position error, also p.e.  
 3 Pilot error.  
 4 Piston engine.  
 5 Program, or processing, element (DoD).  
 6 Professional engineer (US).  
 7 Permanent echo.  
 8 Ice pellets.  
 9 Pre-emptive.  
 10 Precision engagement.  
 11 Polyethylene.  
 12 Passive element [warning system].
- Pe** Pressure in core-engine jetpipe.
- Pe** See *Péclet number*.
- Pe** Total installed power of shaft-drive engine[s].
- PEAD** PE(10) assessment definition.
- peak** 1 In production programme, time or rate of maximum output.  
 2 In aerospace vehicle, highest points in sine-wave flight, typically 200,000 ft.
- peaking circuit** Extends frequency response of video amplifier at highest frequencies.
- peak suction** Lowest pressure on upper surface of wing or on 2-D aerofoil profile; rarely, lowest pressure on other convex surface of aerodynamic body.
- peak/trough ratio** Peak (usually summer) traffic rate divided by lowest (usually winter) traffic rate.
- peaky** Aerofoil section (profile) of traditional type causing large acceleration of flow over leading edge and hence very low pressure (large peak suction) over narrow strip at 8–15% chord; opposite to supercritical or root-top.
- PEAT** Procedural event analysis tool.
- PEC** 1 Personal equipment connector.  
 2 Pressure, or position, error correction.  
 3 Pulsed eddy current.  
 4 Precision-engagement capability.
- PECHS** Percussion/electric conversion hardware system [ammunition].
- pecked line** Broken or dashed line in graphics or artwork.
- pecking** Touching ground with propeller tips, esp. on takeoff.
- Péclet number**  $Pe = \frac{Vl}{\lambda}$  where V is fluid flow velocity, l a length and  $\lambda$  thermal conductivity; applies in heat transfer at low airspeeds.
- PECM** 1 Passive electronic countermeasures.  
 2 Pulsed electro-chemical machining.
- PECP** Primary entry control point, to hostile airspace.
- PECT** Peer entity contact table.
- Pectenometers** Class of aerodynes weighing c6.5g, 0.23 oz, which fly like, e.g., butterflies, by clapping aerofoils together, ejecting air rearwards. On separation, air is sucked in from the front (NRL).

**PED** 1 Program(mme) element description.

2 Post-exit deflector.

3 Passenger [or portable, or personal] electronic device[s].

**pedal turn** Changing heading (azimuth) of hovering helicopter or Stovl using pedals only.

**pedestal** 1 Raised box between pilots on flight deck carrying numerous control and system interfaces.

2 Pillar supporting aircraft on ski (and, it is suggested, float).

**Pedoba** Portable electronic device[s] on board aircraft.

**PEDS** Portal explosive detection system.

**PEE** Photoelectron emission.

**PEEK** Polyetheretherketone.

**peel off** To roll away from straight-and-level flight, esp. from a formation, and dive away; normally manoeuvre performed in sequence by all aircraft of formation.

**peen** 1 To cold-work metal surface by repeated light blows of ball-pane hammer [peen forming] or bombardment with hard balls [shot peening].

2 To deform metal part by series of hammer blows, eg to set rivet or burr end of bolt to prevent loss of nut.

**PEFT** Performance evaluation flight test.

**PEG** Polyethylene glycol.

**Pegasys** Precision and extended-glide airdrop system (USA).

**PEI** 1 Polyetherimide, important family of resins.

2 Professional engineering institutions.

**PEL** 1 Personnel licensing.

2 Precision elastic-limit.

**PELS** Personal equipment life-support system, a smokehood, with decompression protection.

**PELSS** Precision emitter location strike system.

**Peltier effect** Generation of current by making circuit containing two different metals and keeping two junctions at different temperatures; some definitions refer to generation or absorption of heat at junctions upon passage of current.

**PELTP** Personnel Licensing and Training Panel (ICAO).

**PEM** 1 Parametric estimation model.

2 Program element monitor (DoD).

3 Plastic-encapsulated microcircuit, hence plural Pems.

4 Proton exchange membrane.

**PEMB** Procurement Executive Management Board (UK).

**PEN** Photonic exchange network.

**penaids** See *penetration aids*.

**penalty** Deficiency in one aspect of aircraft design or performance in return for improvement in another; eg adding thermocouple in jetpipe to indicate temperature assists pilot but creates drag in jet reflected in reduced cruising speed, range or both.

**pencil beam** Narrow, strongly directional beam with minimal sidelobes.

**pendant** 1 Arrester wire (deck cable).

2 Flag indicating centre of arrester wire.

**pendulum damper** Crankshaft counterweight vibration damper in form of pivoted mass.

**pendulum stability** That inherent in large vertical distance between high centre of wing lift and low c.g.

**pendulum valves** Gravity-operated flaps covering ports in housing of air-operated gyro which sense tilt and

control airflow to cause restoring (erecting) precessive force.

**penetrant dye** Method of detecting cracks and pores by washing part with coloured liquid and then with white developer.

**Penetrate** Passive enhanced navigation with terrain-referenced avionics: radar altimeter and INS plus 3D terrain model in database (Ferranti).

**penetration** 1 Flight into hostile, esp. defended, airspace.

2 Ability of sailplane to keep going by trading kinetic energy for distance with minimal loss of height or speed while heading for next thermal.

3 Flight deep into cloud, esp. one with large vertical extent and severe turbulence.

4 Flight into eye of tropical revolving storm.

5 Success in previously unattacked market.

6 Progress into flight manoeuvre, esp. one posing potential problem or danger, hence stall-\*.

7 Portion of high-altitude instrument approach which prescribes descent to start of approach (DoD).

**penetration aids** Devices and systems assisting vehicle to accomplish penetration (1), eg jammers, chaff, flares, decoys and warning systems, low (lo) flight level, reduced RCS and improved vehicle hardness.

**penetration area** That within which enemy defences are to be neutralized to degree assisting succeeding aircraft to reach targets.

**penetration factor** Reciprocal of amplification factor of valve.

**penetration fighter** One intended to fly deep into hostile territory (term now rarely used).

**penetrator** 1 Tool, usually powered, for quickly cutting apertures in side of aircraft for speedy rescue of occupants.

2 Aircraft designed for penetration (1).

3 High-density projectile designed to pierce armour by kinetic energy.

4 Spacecraft designed to penetrate an atmosphere, or plunge through a surface crust. Hence \*/lander.

**penetrometer** Measures ability of airfield surface to support static or moving aircraft.

**penguin** Officer devoid of brevet (RAF).

**pennant** Mooring and haul-down wire for captive balloon.

**penny-farthing** Helicopter of normal configuration (colloq.).

**Pensky Martin** Standard apparatus for determination of flashpoint; used in two forms, closed or open.

**penthouse roof** Top of cylinder combustion space having sloping sides.

**pentode** Thermionic valve having three grids.

**PEO** Program Executive Officer, or Office (US).

**PEP, p.e.p.** 1 Peak envelope power.

2 Pre-engine production.

3 Productivity enhancement programme.

4 Pulse envelope programming.

5 Predesignated ejection point.

6 Pulsed-energy projector.

7 Performance-enhancing proxy [satcom].

8 Confusingly, also means proxy-enhancement protocol or protocol-enhancing proxy.

**PEPDC** Primary electrical power-distribution centre.

**PEPE** Parallel-element processing ensemble (or element).

**PEPP** Planetary-entry parachute program (Martin Marietta/NASA).

**PEPS, Peps** 1 Positive-expulsion propellant system.

2 Pintle escape propulsion system.

**PER** Performance.

**PERA** Production Engineering Research Association (Melton Mowbray, UK).

**perceived noise level** See *noise*.

**perch position** In pattern (3) with touchdown point 45° behind.

**percussion cap** Detonator/igniter for ammunition activated by sudden deformation.

**percussion drilling** 1 Originally, mechanical drilling hard material by repeated physical impact, plus abrasive.

2 More recently, using a laser fired directly at the work-piece, not [as most commonly] via a 45° mirror.

**percussion gun** Device for cheaply making loud bangs to scare birds.

**perfect fluid** Usually implies inviscid and incompressible, as well as homogeneous.

**perfect gas** One exactly obeying Joule and Boyle laws so that  $PV = nRT$ ; also obeys Charles, Gay-Lussac and several other laws.

**perforated** Pierced by holes, in case of aerodynamic surface typically removing 25–30% of projected area; perforation of flap or airbrake can reduce actuation power requirement and increase drag of surface, esp. when at large angle to airflow, but destroys value of flap as lifting surface and thus confined to divebrakes and airbrakes.

**performance** 1 From operational viewpoint, ability of system to perform, esp. expressed in numerical values.

2 From flight-safety viewpoint, ability of aircraft to perform required functions and manoeuvres, esp. in degraded condition and under adverse circumstances, again expressed numerically. Subdivided into three categories: 1, measured \*, that actually recorded for particular aircraft at particular time; 2, gross \*, factored from measured to allow for poorest aircraft in fleet, guaranteed-minimum instead of average thrust propulsion and possibly other degrading factors; and 3, net \*, factored from gross to allow for further possible temporary variations (airframe damage or icing or certain non-critical fault conditions) and minimum standard of pilot skill and experience.

3 Narrow interpretation of numerical values of aircraft flight limits such as speeds, altitudes and payload/ranges.

**performance-command system** Microprocessor-based crew advisory system in commercial transports which optimises performance and saves fuel.

**performance factors** Those deriving from aircraft performance which affect airline traffic achieved, as distinct from commercial and operational factors.

**performance groups** UK aeroplane categories: those whose first C of A was issued before 1951 are NPG (no performance group); those built since 1951 are Group A, large multi-engined; B, spare; C, light multi-engined; D, single-engined; X, foreign multi-engined imported before particular dates.

**performance index** Non-dimensional comparator for radars, derived from xmt peak power, prf, beam width, pulse width, antenna gain and receiver noise.

**performance limiting conditions** Those demanding flight to near boundaries of flight performance or point at which auto-ignition, stick-shaker or other subsystem is triggered.

**performance management system** See *flight management system*.

**performance number** Knock rating; below 100 called octane number.

**performance reduction** Historically, calculations to reduce measured aircraft performance to standard values at a chosen weight and in particular atmospheric pressure and temperature.

**performance-type glider** Sailplane, esp. competition sailplane.

**periapsis** Pericentre of orbit.

**pericentre** Point on orbit closest to primary.

**pericynthian** Point in spacecraft trajectory closest to Moon.

**perifocus** See *pericentre*.

**perigee** Pericentre of Earth orbit.

**perihelion** Pericentre of solar orbit.

**perilune** Pericentre of lunar orbit.

**perimeter** 1 Periphery of airfield flying area.

2 Boundary of defended area.

**perimeter track** Taxi track linking ends of runways, revetments or dispersals and main hangar/apron area.

**period** 1 Time interval between successive passages through particular point in same direction of SHM or other wave motion =  $\frac{1}{f}$  or  $\frac{1}{f_1}$ .

2 Time interval between successive passages through particular bounding plane in same direction of satellite, usually time between successive northbound transits of Equator (orbital \*); see *sidereal* \*, *synodic* \*.

**periodic inspection** Inspection, with or without tear-down, according to published schedule of time intervals irrespective of performance (1) of device.

**periodic reservation** Several aircraft book slots on same Satcom T-channel.

**period of performance** Timeframe in which work is done.

**peripheral hem** Leading edge of parachute canopy.

**peripheral VLS** Distributes SAM launchers along ship to enhance survivability.

**peri track** Perimeter.

**PERM** Permanent.

**Permalloy** Family of American Fe/Ni alloys which are magnetically soft, with high permeability at low magnetizing forces.

**permanent echo** Terrestrial features as seen on radar at fixed site.

**permanent magnet** One which retains its magnetism in absence of strong demagnetizing field.

**Permaswage** Patented fluid-tight method of connecting pipes.

**permatron** Gas tube similar to thyratron with magnetic-field control.

**PERME, Perme** Propellants, Explosives and Rocket Motor Establishment (Westcott, Waltham Abbey, UK).

**permeability** 1 In magnet, ratio  $B/H$  where  $B$  is magnetic flux induction and  $H$  is magnetizing force, symbol  $\mu$ , this is divided into absolute and relative or specific \*,  $\mu_r$ , except in emu system, where \* of free space is defined as unity; measured in henry/metre.

## permeability tuning

**2** In aerostat, measure of rate at which gas at STP can pass through fabric, usually expressed in litres per 24 h.

**3** In amphibian, ratio of volume of landing-gear compartments that can be occupied by water to whole buoyant volume.

**permeability tuning** Radio tuning by varying permeability of inductor core, usually with translating bar of ferrite.

**Perminvar** Family of low-hysteresis alloys of Fe/Ni/Co. **permissive action link** Highly secure, jam-proof data links (various categories) which enable bomber crew to trigger nuclear weapon live from cockpit when bomber is at safe distance (hi-alt laydown only).

**permittivity** Dielectric constant: relative \* is ratio of electric flux density in medium to that which same force would produce in vacuum, symbol  $\epsilon_r$ , unit farads per metre; absolute \*  $\epsilon_0$  is in vacuum, often called free space (see *Coulomb law*).

**Permit to fly** Issued to categories, such as homebuilts, warbirds, classic GA aircraft and micros, that do not qualify for a C of A but may be flown with restrictions. (UK CAA).

**Permy** Permanently (FAA).

**PERP** Peak effective radiated power.

**perpendicular-heading square** Training manoeuvre in which helicopter is flown around square, crabbing at 90° sideways along each of the four sides.

**persistence** A measure of flight endurance, especially over target area or other hazardous environment.

**persistent area-denial** Use of loitering robotic systems [ie, UAVs] to provide non-stop surveillance/attack over battlefield for period of days to months.

**Pervis** Persistremt elevated recon[naissance] surveillance intelligence unmanned system (USN).

**personal equipment connector** Quick-make/break multi-channel coupling for aircrew oxygen, R/T, intercom, g-suit and EC. Not necessarily synonymous with AEA.

**Personal Proficiency Index** Assessment of pilot experience and capability, principally prior to qualification on VLJ (2005–).

**personal transprt unit** Airlift bed providing intensive care.

**personnel locator beacon** Miniature transmitter sending coded signal and worn on flying clothing.

**personnel reaction time** Time from nuclear warning to all defensive measures taken.

**Perspex** Family of methyl methacrylate plastics important as aircraft transparent material (ICI).

**Pert, PERT** Programme Evaluation and Review Technique; critical path method.

**perturbation velocity** Difference between local and free-stream velocities, symbol usually  $V_p$ .

**PES** **1** Passenger entertainment system, audio plus film.

**2** Polyethersulphone.

**3** Pre-entry [to inlet] streamline.

**Pesa, PESA** Passive electronically-scanned antenna.

**PESO** Product engineering services office.

**PET** **1** Piston-engine time.

**2** Positron emission tomography.

**3** Polyethylene terephthalate.

**4** Point of equal time.

**5** Pacific engineering trials.

**PETA, Peta** Pulsed-ejector thrust augmentor.

**peta** Prefix,  $\times 10^{15}$ , symbol P.

**Petal** Preliminary Eurocontrol test of air/ground data link; II adds Phase II, IIE adds Phase II Extension.

**petal cowling** One divided into large hinged segments opening like petals of flower.

**PETF** Practice emergency training frequency.

**PETN** Pentaerythritol tetranitrate (explosive).

**petrol** Fuel or solvent tailored from hydrocarbons [eg heptane, hexane, octane] plus additives. Density 0.708–0.72, giving typical mass 3.93 kg (8.65 lb) gal<sup>-1</sup>, 3.27 kg (7.2 lb) US gal<sup>-1</sup>, different fractions boil at from 41°C. US = gasoline, universal name in aviation Avgas. Today almost all petrol available at airfields is of 100LL grade (\*100-octane, low-lead), also called F-18 (NATO) or Avgas 100/130 (UK Joint Service), density about 0.715, colour blue. Preserved warbirds and a few other aircraft require Avgas 115/145, NATO F-22, density about 0.708, colour purple. See *low-lead, octane number*.

**Petroseal** A film-forming foam fire-extinguishant.

**Pett, PETT** Project engineers & technologists for tomorrow.

**petticoat** In airship gas duct, pleated sleeve able to seal duct yet leaving clear passage when released.

**Petty valve** Operated manually after fighter mission to release pressure in gun-firing pneumatic circuit (pre-1950).

**PEU** Pod, power or processing electronics unit.

**PF** **1** Pilot flying (others being PNF).

**2** Plastics factor.

**3** Preformed fragment.

**4** See *p.f.*

**PF, P/F** **1** Powder forging (or forged).

**2** Primary/final talkdown.

**Pf** Pressure in fan duct of turbofan.

**pF** Picofarad,  $10^{-12}$  farad.

**p.f.** Power factor.

**PFA** **1** The popular Flying Association [formed 1946 as ULAA; office, Turweston airfield, NN13 5YD] (UK).

**2** Pulverised fuel ash.

**3** Porous friction asphalt.

**4** Probability of false alarms.

**PFAA** Professional Flight Attendants Association (US).

**PFB** Preliminary flying badge.

**PFC** **1** Primary flight control, or computer.

**2** Powered flight (or flying) control(s).

**3** Pre-flight console.

**4** Passenger facility charge[s].

**5** Porous friction course (see *PFA (3)*).

**5** Protocol functional collection.

**PFCES** Primary flight-control electronic system.

**PFCP** Passenger facility charge program (FAA).

**PFCS** Primary flight-control, or computer, system.

**PFCU** Powered flying-control unit, surface power unit.

**PFD** **1** Primary flight display, or director; /ND adds navigation display, S subsystem.

**2** Planned flight data.

**3** Personal flotation device.

**PFE** **1** Purchaser-furnished equipment.

**2** Path-following error.

**Pfenninger wing** Strut-braced, yet high-subsonic wing with exceptional aspect ratio and reduced thickness, yielding L/D of up to 40.

**PFF** **1** Pathfinder Force (RAF, WW2).

## PFFT

## phase angle

2 Perspective [prospective is meant] frontal fighter (US).	2 Guided missile (ICBM) launched from soft pad (DoD, obs.).
3 Panel fill factor.	3 Precision ground map[ping].
4 Preformed fragment.	<b>PGMPS</b> PGM (1) planning software.
<b>PFFT</b> Parallel fast-Fourier transform.	<b>PGN</b> Passenger-generated noise.
<b>PFH</b> Per flight (or flying) hour.	<b>PGO</b> Foreplane, canard (R).
<b>PFHE</b> Prefragmented high explosive.	<b>PGRV</b> 1 Post-boost guided re-entry vehicle (has IMU and TPU).
<b>PFHUD</b> Pupil-forming head-up display.	2 Precision-guided re-entry vehicle (DoD).
<b>PFI</b> 1 Post-flight inspection (US = after-flight).	<b>PGS</b> 1 Pilot-guard system.
2 Private [or project] finance initiative.	2 Prompt global strike.
<b>PFIA</b> Professional Flight Instructors Association [Oxford Airport] (UK).	<b>PGSC</b> Personnel guide surface canopy.
<b>PFIAB</b> President's Foreign Intelligence Advisory Board (US).	<b>PGSE</b> Peculiar (ie, to type) ground-support equipment.
<b>PFIS</b> 1 Portable flight-inspection system.	<b>PGSM</b> Precision-guided submunition.
2 Passenger flight-information system.	<b>PGT</b> Private pilot, gyroplane [autogyro], transition.
<b>P<sub>5</sub>H<sub>9</sub></b> Pentaborane rocket fuel.	<b>PH</b> 1 Hit probability (also <b>P<sub>H</sub></b> ).
<b>PFL</b> Practice forced landing (A adds 'area').	2 Porte hélicoptères (F).
<b>PFLD</b> Pilot's fault-list display.	3 Public holiday.
<b>PFM</b> 1 Pulse-frequency modulation.	4 Pacific, Hawaii (ICAO).
2 Pre-flight message.	<b>PHA</b> 1 Preliminary hazard analysis.
<b>PFMA</b> Post-flight mission analysis.	2 Polymerized healing agent (composites).
<b>PFMGO</b> Pre-flight message-generating officer (RAF).	<b>PHAE</b> Penetrating high-altitude endurance.
<b>PFN</b> Pulse-forming network.	<b>PHAK</b> <i>Pilot's Handbook of Aeronautical Knowledge</i> (US Government).
<b>PFNA</b> Pulsed fast-neutron analysis.	<b>phantom beacon</b> R-Nav waypoint where no beacon actually exists.
<b>PFO</b> Port-facing oblique.	<b>phantom contract</b> See <i>phantom order</i> .
<b>PPF</b> 1 Partnership for peace (NATO).	<b>phantom drawing</b> One using phantom lines.
2 Proximity-fuze programmer.	<b>phantom lines</b> Geometrically accurate but incomplete lines merely giving location of item or alternative positions thereof, eg to show avionic equipment in structural airframe drawing.
3 Primary flight permit.	<b>phantom member</b> Non-existent member added in pre-computer era to assist solution of structural analysis.
<b>PPFS</b> Portable flight-planning system.	<b>phantom order</b> Draft contract with manufacturer with provision for preplanning immediate production in time of crisis or conflict (DoD).
<b>PFQT</b> Preliminary flight qualification test.	<b>PHAR</b> Program for harmonized air-traffic-management research [E adds in Europe, or Eurocontrol].
<b>PFRR</b> 1 Permitted flying route (CAA).	<b>Pharos</b> Plan-handling and radar operating system.
2 Passenger flow rate.	<b>Pharus</b> Phased-array universal synthetic-array radar.
3 Post-flight report.	<b>phase</b> 1 In any periodic cycle, fraction of period (1) measured from any defined reference.
4 Primary flight reference.	2 In reactive circuit, relationship between current and voltage.
<b>PFRT</b> Preliminary flight rating test.	3 In physical chemistry, distinct homogeneous physical states separated by sharp boundaries, eg liquid/solid, solid/solid, or immiscible liquids.
<b>PFS</b> 1 Primary flying squadron.	4 Periodic variation in solar illumination of Moon as seen from Earth.
2 Product file sets.	5 Normal meaning often applied to programme planning, amphibious assault, establishment of military government etc. In DoD, Phase 1 is concept, 2 is proof of concept, 3 is downselect and demonstration.
3 Planetary Fourier spectrometer.	<b>phase-advance</b> Subsystem which senses aeroplane rate of change of pitch and triggers stick-pusher progressively earlier as rate increases, so that pitching momentum never takes AOA beyond prescribed limiting value.
<b>PFSV</b> Pilot-to-forecaster service.	<b>phase angle</b> 1 Phase (1) difference between two sets of periodic phenomena expressed in angular measure.
<b>PFTA</b> Payload flight-test article.	2 Angle between current and voltage in rotating-vector plot of alternating current.
<b>PFTI</b> Photoelastic fast tactical imagery.	3 Angle between sightlines to Sun and Earth measured at remote locations, eg other celestial body.
<b>PFTS</b> 1 Production flight-test schedule.	
2 Permanent field training site.	
<b>PFU</b> Private Finance Unit (MoD, UK).	
<b>PG, p.g.</b> 1 Processing gain.	
2 Plastic/gas.	
3 Peelable graphics, esp. airline livery or logo on aircraft.	
4 Program management assistance group (USAF).	
5 Photographic group (USAAF).	
6 Aircraft category pursuit, ground attack (USA 1919–24); powered glider (USAAF 1943–47).	
<b>PGA</b> 1 Pressure-garment assembly.	
2 Pin grid array.	
3 Proactive Green Aircraft.	
<b>PGAA</b> Prompt gamma-ray activation analysis.	
<b>PGB</b> 1 Precision-guided bomb.	
2 Power gearbox.	
<b>PG bearing</b> Plastic/gas, avoiding solid/solid contact.	
<b>PGCS</b> Portable ground-control station (UAV).	
<b>PGEN</b> Program generator (software).	
<b>PGL</b> Private pilot, glider.	
<b>PGM</b> 1 Precision-guided munition.	

## phased array

**phased array** Physically fixed antenna (aerial) scanned electronically, usually in both x and y (horizontal and vertical) axes.

**phase difference** Measure of phase angle (1) from any VOR radial related to that on bearing 000°.

**phase discriminator** Detector of phase modulation.

**phase inverter** Radio or other signal-processing stage with unity gain whose output is reciprocal of input (not synonymous with half-wave rectifier).

**phase modulation** Carrier phase angle (1) varies from carrier angle by amount proportional to instantaneous amplitude of modulating signal and at a rate proportional to modulation frequency, PhM.

**phase out, phaseout** Progressive withdrawal from production or active service.

**phase shift** Phase difference (not necessarily VOR); change of phase angle (1).

**phase shifter** Circuits which steer the beam emitted by a planar-array radar antenna.

**phase velocity** That of equiphase surface of travelling plane wave along wave normal; also called wave speed/velocity.

**Phasst** Programmable high-altitude single-soldier transport.

**PHB** Pilot's handbook (USGPO).

**PHD** Pilot's horizontal display.

**PHDD** Projection head-down display.

**PHE** Penetrating high-altitude endurance.

**PHEI** Penetrator HE incendiary.

**p-HEMT** Pseudomorphic high-electron-mobility transistor.

**phenolic/epoxy** Family of resins and adhesives much used in composites derived from phenol (carbolic acid) and characterized by oxygen bridges linking hydrocarbon radicals.

**phenolics** Large family of synthetic polymers (plastics/resins/adhesives) dating from 1907 and mainly unmodified phenol-formaldehydes or (esp. in case of adhesives) resorcinol-formaldehydes.

**PH-15-7Mo** Refractory stainless steel, primary structure of B-70.

**PHI** 1 Position and homing indicator.

2 Pitot-head inoperative.

**Phibuf** Performance buffet-limit.

**Phigs** Prgrammer's hierarchical international graphic standard, or system.

**Phillips entry** Shape of leading edge of typical modern wing [Horatio Phillips, patent, 1884].

**Phills** Portable hyperspectral imaging low-light spectrometer.

**Phinom** Nominal bank angle.

**PHLD** Powered high-lift device.

**PHM** 1 Proportional hazards modelling.

2 Prognostic[s] and health monitoring, or management.

**phon** See *noise*; not used in modern work.

**phonetic alphabet** See Appendix 4.

**phoney war** Northern France, 3 September 1939 to 10 May 1940.

**phonic wheel** Sensor for tachometer, disc with precise peripheral teeth which transmits signal at frequency proportional to shaft speed.

**phosphate esters** Fire-resistant hydraulic fluids based on esters of P(18) acids.

**phosphor** Substance which is luminescent; those in

## photonic material

radars/CRT/TV etc are commonly zinc sulphide/zinc and selenide/copper compounds, but cadmium and rare earths are common. Those for printing on opaque substrates are unrelated.

**phosphorescence** Luminescence which continues more than  $10^{-8}$  s after cutoff of excitation, usually being visible to eye for days thereafter.

**phosphorus** P, three main forms, esp. white \* soft non-metal, spontaneously flammable, MPt 44°C, density 1.8.

**phot** Non-Si unit of illuminance = lm/cm<sup>2</sup> =  $10^4$  lx.

**photint** Photographic intelligence.

**photoactivated** Activated by light.

**photocathode** Electrode for photoelectric emission.

**photochemical** Involving chemical change and emission/absorption of radiation.

**photochromic** Having colour, transmittance or other optical property changed by variation in incident light. Also called photochromatic.

**photochromy** Colour photography.

**photoconductive** Having electrical resistance varied by illumination.

**photodiode** Diode converting light into electricity; hence \* array yields signals which when processed analyse incident light pattern.

**photodrafting** See *photographic lofting*.

**photoelectric** Involving light and electricity, usually by absorbing photons and emitting electrons.

**photoelectric cell** Transducer converting EM radiation in visible, IR or UV wavelengths into electricity; abb. photocell.

**photoelectron** Electron ejected, eg from metal surface, by impact of energetic (short wavelength) photon.

**photoelectronics** Involving electrons and photons (many devices).

**photoemissive** Emitting electrons (ie electric current) when illuminated.

**photoflash** Pyrotechnic cartridge producing brief but intense illumination, esp. for lo-level night reconnaissance.

**photogrammetry** Making accurate measurements and drawings, esp. surveying and mapmaking, by photographic means.

**photographic layout drawing** Photographic lofting.

**photographic lofting** Lofting entirely with photographs.

**photographic reconnaissance** Photo reconnaissance.

**photographic transmission density** Log of opacity (base 10), thus perfectly transparent film has \*\*\* of zero, while one transmitting only 10% has \*\*\* = 1.

**photometer** Instrument for measuring luminous intensity, luminance or illuminance.

**photometrical calibration** Regular measurement of output of all airfield lighting, especially on Cat II, III runways.

**photometry** Science or technology of measuring luminous flux, luminous intensity, luminance and illuminance.

**photomultiplier** Tube containing photocathode, several intermediate electrodes (dynodes) and output electrode; also called multiplier phototube.

**photon** Elementary parcel of EM energy emitted by transition of single electron, with energy  $h\nu$  ( $h$  = Planck constant,  $\nu$  frequency) and momentum  $h\nu/c$  where  $c$  is velocity of light.

**photonic material** Material designed to manipulate light,

as distinct from electrons, with properties based on an arrangement of atoms on an artificial structure.

**photronics** Using light to process RF signals.

**photon rocket** Theoretically achievable rocket whose working fluid is light, ie stream of photons; small thrust but in deep space very high  $I_{sp}$ , and vehicle velocity could be significant fraction of that of light.

**photopic vision** Using retinal cones, hence colours distinguishable.

**photo reconnaissance** Military mission to bring back images of scenes in enemy territory, such as buildings and structures, troop movements, ships and results of previous attacks. Can be high vertical, low oblique, stereo, overlapping strip, etc.

**photosensitivity** Degree to which substance changes chemical or electrical state when light falls on it.

**photosensor** Device operating by photoconductivity, eg light valve.

**photosmoke method** One of two techniques for measuring smokiness of jet by direct determination of optical density (other is Hartridge); gives output in PSU.

**photosphere** Intensely hot, bright outer layer of Sun's atmosphere.

**phototheodolite** Instrument comprising camera whose azimuth and elevation are precisely recorded (usually on its own film).

**phototransistor** Solid-state device, originally Ge wafer, generating holes by light absorption and multiplying this photocurrent by transistor action at collector.

**phototube** Electron tube (vacuum tube) containing photoemissive cathode and collecting anode (usually plus other sub-devices).

**photovoltaic cell** Transducer which, like photoelectric cell, converts EM radiation in visible or near-visible wavelengths into electricity; unlike photocell its purpose is to generate usable current instead of merely giving signal or serving other purpose calling for very low power; example is solar cell.

**phraseology** Accepted forms of speech, codes phonetic alphabet, etc, used to facilitate telecommunications, usually by voice.

**PHS** Precision hover sensor.

**PHT** 1 Private pilot, helicopter, recreational, transition.

2 High-temperature platform.

**phugoid** One of the five classical modes of aeroplane motion, a long-period oscillation of pitch axis, perpetually hunting about level attitude and trimmed speed, a switchback trajectory at almost unvarying AOA; noun and also adj, eg \* oscillation.

**phut-phut** *Put-put.*

**PHY** Physical interface (device).

**P<sub>hd</sub>** Fluid system pressure, esp. hydraulic test pressure of rocket motor case.

**physics package** Warhead of an air-delivered NW [free-fall or cruise missile] (RAF usage).

**PI** 1 Point of interception (navigation plot).

2 Photographic interpreter (or interpretation).

3 Process (or program) instruction.

4 Practice interception.

5 Program introduction (D adds 'document').

6 Production investment.

7 Production installation, of new equipment in Service aircraft.

8 Product improvement.

9 Precipitation identification.

10 Parameter identifier.

11 Pipeline inspection.

12 Principal investigator.

13 Performance Index [usual meaning in flight-control systems].

14 Parallel interface [bus].

**Pi** Input power, esp. of jammer.

**PIA** 1 Pilots' International Association [office, Minneapolis, MN] (US).

2 Pilot-interpreted approach.

3 Proprietary Industries Association (US).

4 Performance integrity and availability.

5 Pittsburgh Institute of Aeronautics [PA15236] (US).

**PIAC, Piac** Peak instantaneous airborne count[s].

**PIAG, Piag** Propulsion Installation Advisory Group (Int.).

**Pianeg, Pianet** Planning the implementation of an improved AFS/AFTN network (ICAO).

**piano hinge** One continuous along edge of hinged item.

**piano keys** Black/white runway end markings (colloq.).

**piano wire** Finest steel wire normally produced; 0.8–0.95% C, very high uts, accurate dimensionally.

**PIB** Preflight information bulletin.

**Pibal** Pilot-balloon aloft (observation).

**PIC** 1 Pilot in command.

2 Prime integration contract.

3 Price-improvement curve.

4 Potential icing [category].

**PCA, PICA** Phenolic-impregnated carbon ablator.

**Picao, PICAO** Provisional ICAO (1945–47).

**Picasso** Predicted ionograms correlated against segmented swept output (ionospheric analysis).

**PICC** Processor interface controller and communication.

**piccolo actuator** PFCU or other actuator whose output is generated by row of parallel jacks fitting within thin aerofoil.

**piccolo tube** Tube perforated by (usually linear) row of holes from which hot deicing air is blown, usually to impinge on inside surface of a leading edge.

**pick-a-back** 1 See *composite aircraft*.

2 Superimposed printed-circuit boards.

**picket** 1 AEW or AWACS aircraft.

2 Instrumented oceangoing ship on missile range.

**picketing** Securing aircraft against movement when parked in open, normally by attachment to heavy masses or spiral rods screwed into ground.

**picketing anchor** Spiral rod with eye at upper end.

**pickle** Tactical air code: moment of manual triggering of system, esp. release of ordnance on surface target.

**pickle button** That commanding release of airdropped stores.

**pickled facility** Warm long-term storage, esp. for NW.

**pickling** Soaking in dilute acid solutions to remove oxides or other surface films or inter-crystalline carbides and surface scale. Principal acids are HCl, H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub> and HfI.

**pick-off** Sensor of angular motion or position; many types, eg electric potentiometer, angular digitizer, photo-cell, magnetic coil moving-iron reluctance bridge, or fluidic valve or gate.

**pickoff excitation** Normally a frequency.

## pickoff sensitivity

**pickoff sensitivity** Usually signal voltage per unit angular travel.

**pickup** A fault or omission noticed and corrected later.

**PICL, Pilc** Pool-item candidate list.

**pico** Prefix,  $\times 10^{-12}$ ; hence one picosecond (1 ps) is one millionth of one millionth of a second.

**picocell** Small radio tower on passenger aircraft to instruct handsets to communicate with it exclusively and at lowest power.

**picosatellite** Mass  $\leq 0.5$  lb, 0.2268 kg.

**picric acid** *Trinitrophenol*.

**Pics, PICs** 1 Photogrammetric integrated control system.

2 Protocol implementation conformance statement[s].

**picture manoeuvre** Manoeuvre made by large aerobatic team involving wide separation of aircraft to fill large part of display area, eg bomb-burst.

**Picus** Pilot in command under supervision.

**PID** 1 Program introduction document (DoD).

2 Passive identification device.

3 Photo-ionization detector, or detection.

4 Post-impact delay.

5 Portable intruder detector.

6 Parameter, process or primitive identifier.

7 Passenger-information display.

8 Proton-induced damage.

**PIDP** Programmable indicator data-processor (USAF).

**PIDS, Pids** 1 Prime-item development specification.

2 Pylon integrated dispenser system.

3 Positive identification system.

4 Perimeter, or portable, intrusion detection system.

**piece of cake** A task posing no problems (RAF colloq., WW2).

**pier** Long corridor, usually two-level, connecting airport terminal with gates.

**pierce** To cut part from sheet; hence large family of presswork dies such as \* and cut off, \* and form, \* and trim.

**pierced-steel planking** Standard (mainly WW2 to 1950) unit of prefabricated airfield surface; mild steel plates measuring 119.75 in  $\times$  16 in and weighing 65 lb (29.5 kg) with interlocking edges.

**pie-shaped** NLG steering, or other, inceptor having shape of segment of disc.

**pièze** Non-Si unit of pressure used in French legal system = 1 sn/m<sup>2</sup> = 1 kN/m<sup>2</sup> = 1kPa = 0.14503 lb/in<sup>2</sup>.

**piezoelectric** Relationship exhibited by certain crystalline substances, esp. single crystals, between electric potential difference and mechanical stress; eg applying voltage (DC or AC) across opposite faces results in expansion/ contraction or vibration, while applying stress or vibration results in potential difference. Purists divide sensors into: piezoelectric, in which the output is generated by the stress; and piezoresistance, in which the stress changes the resistance sensed by an applied current.

**PIF** 1 Photo-interpretation facility.

2 *Pilot's Information File* (US, WW2).

3 Pilotage in force [control by thrusters or thrust-vectoring].

**pif/paf** Missile control system combining lateral thrusters at c.g. [pif] with aerodynamic surfaces [paf].

**Pifet** Piezoelectric field-effect transistor.

**PIG, Pig** 1 Pendulous integrating gyro.

## pilot-interpreted system

2 Pilot's Information Guide.

**Piga** PIG accelerometer.

**Pigeon, pigeons** Air-intercept code: "Your base bears X° and is Y miles away".

**piggyback** Composite aircraft, or aircraft carrying large vehicle superimposed.

**Pigma** Pressurized-inert-gas metal arc.

**pigtail** 1 Projecting rigid pipe, usually with 90° bend and threaded connection for attachment to fluid system.

2 Short length of any other kind of cable or transmission line projecting from device for attachment to system.

**PIHM** Protective integrated hood mask.

**pillow tank** Dracone or similar flexible fluid storage.

**Pilot** 1 Piloted low-speed test (ambiguous).

2 Pod integrated localization, observation, transmission.

**pilot** Person designated as \*. Previous definitions involved operation of particular controls (in one case 'mechanisms') or guidance of aircraft in 3-D flight, none of which need be done in advanced aircraft, though \* required to monitor. In case of RPV \* may be in other aircraft or on ground. For command-guided missiles preferred term is operator.

**pilotage** Contact flying, navigating by visible surface landmarks.

**pilot assister** Qualified pilot in right-hand seat of aircraft training navigators or other crew members [generally = copilot].

**pilot balloon** Meteorological balloon; alternatively, small free balloon devoid of instrumentation, observation of which from ground enables wind at different heights to be calculated.

**pilot canopy** Small auxiliary canopy, ejection of which pulls out main canopy (personal, cargo and braking parachutes).

**pilot case** Original term for capacious briefcase for pilot's documents, headset, etc.

**pilot certificate** In many countries, title of document licensing pilot according to five to 11 categories. In UK and many other countries called licence.

**pilot chute** *Pilot canopy*.

**pilot control bay** Location of flight trajectory and navigation interface in UAV GCS.

**pilot deviation** Pilot action that violates FARs.

**piloted** Supervised by human beings, usually on board, playing active and direct role in control of vehicle.

**pilot flying** In multi-crew operation, pilot actually flying the aircraft, also called handling pilot.

**pilot hole** Small but precisely located hole serving as guide to subsequent larger drilling.

**pilot in command** Person responsible for aircraft in flight.

**pilot induced oscillations** Potentially dangerous or even catastrophic pitch oscillations caused by pilot trying to stop them. Cause may be oversensitive system with very light input forces, or restricted hydraulic flow rates in PFCUs so that pilot is always making late corrections with ever-greater magnitude.

**pilot-interpreted system** One, eg early AI radar, requiring skill and judgement on part of operator, in contrast to modern digital readout and unambiguous indications. Note: early systems were often interpreted by other members of crew but no term exists.

## pilotless aircraft

**pilotless aircraft** Ambiguous: aircraft whose pilot has departed or aircraft designed to fly unmanned (arch.).

**pilot opinion rating** Subjective assessment of aircraft stability and handling, measured according to Cooper scale.

**pilot parachute** 1 See *pilot canopy*.

2 Parachute worn by pilot, eg with seat-type pack or forming part of ejection seat.

**pilot plane** Auxiliary surface mounted ahead of main surface (some definitions add 'and free to take up position in line with wind').

**pilot pushing** Unlawfully urging aircrew to work excessive hours.

**pilot rating** See *pilot opinion rating*.

**Pilot's Associate** Artificial intelligence aid for fighter pilots combining software, hardware and advanced pilot/vehicle interfaces (McDonnell Douglas, Texas Instruments).

**pilot's automatic telephone weather answering service** Weather advisory continuously available by telephone (US).

**pilot's discretion** ATC has given pilot freedom to choose timing/place/rate of climb or descent.

**pilot shop** Retail outlet for readily portable items needed by pilot or enthusiast.

**pilot's notes** Handbook providing operating instructions, helpful advice and all significant images and numerical data for pilot of particular type or sub-type of aircraft.

**pilot's preference kit** Small bag of allowed personal effects (NASA).

**pilot's reference eye position** Assumed position of eyes of normal pilot looking ahead (as for landing) in particular type of aircraft, esp. in designing cockpit.

**pilot's trace** Rough overlay to map made by pilot of reconnaissance aircraft immediately after sortie showing locations, directions, number and order of sensing runs together with sensors used on each.

**pilot's view** Working section of tunnel as seen by notional pilot of vehicle under test.

**PIM, Pim** 1 Previous intended movement, of aircraft carrier.

2 Processor in memory.

3 Platform interface module (NCCT).

**Pimaws** Passive IR missile-approach warning system.

**PIMPf** Programmable intelligent multi-purpose fuze.

**PIN, p-i-n** Semiconductor p-n junction diode with interleaved layer of intrinsic semiconductor (from 'positive-intrinsic-negative').

**pinch hitter** Safety pilot, esp. one who is unlicensed, and frequently the spouse or partner of the PIC (US colloq.).

**PIND** Particle impact noise detection, test carried out by acoustically sensing foreign particles in electronic devices.

**PINE, Pine** Passive infra-red night equipment.

**pinger** 1 Acoustic transducer array or other source of ASW underwater signals.

2 Operating sonobuoy.

3 Crew member in charge of ASW sonics.

**pingly** ASW helicopter, or a crew-member thereof (UK, colloq.).

**ping-pong snow** Loose aggregations similar in size to table-tennis ball.

**ping-pong test** Pressure test in which air is used and

volume is filled with ping-pong balls to reduce stored energy.

**pin joint** Joint between structural members where link is pivot, thus no bending moment can be transmitted and members of structure entirely pin-jointed must all be in pure tension or compression.

**pink and green** Uniform of former USAAF (colloq.).

**pinked** Cut with zig-zag edge (with pinking shears); almost universal with fabric coverings.

**pinking** See *knocking, detonation*.

**pinking shears** Shears or scissors which make a zig-zag cut.

**Pinlite** Miniature light source of discrete-device type.

**pink slip** Piece of paper telling employee he/she has been laid off (US).

**pinned** Of the end of a beam, fixed in space but able to pivot in the plane of the beam [not in torsion].

**pinpoint** 1 Precise fix.

2 Small positively identified ground feature providing fix.

**PINS** Pipeline Inspection Notification System, warns low-flying military of low-flying GA, esp. PI(11) helicopters and ag-aircraft.

**pins** 1 Palletized INS.

2 Pipeline inspection notification system (UK).

**pin stowage** Authorized and clearly visible attachments for safety pins removed from ejection seat.

**pint** Non-SI measure of capacity, pt = (UK) 0.568261 l ≡ 568,261.0 mm<sup>3</sup>; US liquid \* = 0.473176 l; dry \* = 0.550610 l.

**pintle** Word used in normal sense, as cantilever pivot-pin, in types of gun mount, esp. on underside or in doorway of helicopters.

**PIO** 1 Pilot-induced oscillation(s).

2 Processor input/output.

3 Public Information Officer (UK).

**PIP** 1 Product-improvement programme.

2 Predicted impact point (NASA).

3 Pulse-interval processor.

4 Program initialization parameter.

5 Production investment phase.

**pip** Small blip on CRT, especially one used (usually as one of series) as timing mark.

**PIPA, Pipa** Pulse integrating pendulous accelerometer.

**Pipals** Pilot-interpreted precision-approach [and] landing system.

**Piperack** Advanced jammer for AI radars (RAF 192, 214 Sqns 1944).

**pipper** Aiming mark, typically 2-mil-diameter dot on HUD or other sight system.

**Pip pin** Patented family of connecting pins having one end headed (often with knurled drum) and other chamfered and provided with two spring-loaded round-head plungers 180° apart which keep pin in position; usually steel and not normally used as permanent fixture.

**PIPR** Pose-invariant pattern recognition.

**PIPS, Pips** Pilot internet practice [not practise] service.

**PIR** 1 Precision instrument runway.

2 Pilot incident report.

3 Property irregularity report, dealing with loss/damage to baggage and other pax possessions.

4 Priority intelligence requirement(s).

5 Passive IR, see next.

6 Passive IR radiometry.

## PIRA, Pira

7 Parachute Infantry Regiment (USA).

**PIRA, Pira** Precision-impact range area.

**piracy** Used in traditional sense for unauthorized appropriation of aircraft, ie hijacking.

**Pirani gauge** Measures vacuum by Wheatstone bridge and resistance wire.

**Pirate** Passive IR airborne tracking equipment.

**Piraz** Positive-identification and radar advisory zone.

**PIRC** Pre-emptive IR countermeasure.

**Pircm** Proactive IR countermeasure (USAF).

**PIRE** Pipe internal roll extrusion.

**Pirep** Automatic pilot report programme; pilot reports actual weather on discrete frequency to chosen VOR nearby where message is taped and rebroadcast by VOR until an amending Pirep is received (FAA, from 1960).

**Pirsa** Portable ILS receiver-signal analyser.

**Pisa, PISA** 1 Pilot's IR sighting ability.

2 Portable ILS/VOR signal analyser.

**piston** Aircraft, esp. newly built, with piston engine[s] (US colloq.).

**piston engine** One in which working fluid yields energy by expanding and driving piston along cylinder, specif. IC engine of Otto (by far most common in aviation), diesel or Stirling type.

**piston ring** Precision-ground abrasion-resistant ring fitted in groove around piston to make spring-tight fit against cylinder (see *gas ring, junk ring, obturator ring, oil-scraping ring*).

**piston-ring seal** One of hard metal pressed against cylinder wall by its own elastic stress.

**PIT** 1 Pilot instructor training.

2 Prioritized image-transmission.

3 Telecommunications research institute (Poland).

**pit** Location, usually referenced to ground, of air-refuelling contact; a \* stop (colloq.).

**pitch** 1 Angular displacement (rotation) about lateral (OX) axis.

2 Arguably, angular displacement about that axis which, at any moment, is perpendicular to both vehicle longitudinal (OX) axis and local vertical; thus in vertical bank, according to this widespread definition, \* = yaw.

3 See *propeller* \*.

4 In case of ballistic vehicle, rotation about axis perpendicular to vertical plane containing vehicle's longitudinal axis.

5 Angular setting, measured at defined station, of helicopter main- or tail-rotor blade relative to axis of rotation.

6 Uniform distance between evenly spaced objects in row, eg rivets, bolt threads or passenger seats (in each case measured from same reference point in each object).

7 Rotation of camera about axis parallel to vehicle lateral axis; also known as tip.

8 See *porpoise* (1).

9 Rotation of main landing-gear bogie beam about transverse axis.

**pitch attitude** Angle between vehicle longitudinal (OX) axis and defined reference plane, eg local horizontal.

**pitch axis** See *lateral axis*.

**pitch bucking** Repeated sequence in which canard fore-plane stalls, nose drops, canard unstalls, aircraft pitches up and repeats cycle.

**pitch circle** See *pitch curves*.

## pitch trim compensator

**pitch cones** Contacting cones of bevel gears on which normal pressure angles are equal.

**pitch control** 1 That giving manual control of propeller pitch (3), eg by moving datum of CSU.

2 That, normally effected by stick, giving control in pitch (1) of VTOL aircraft at zero or low airspeed.

3 That giving control of pitch attitude of spacecraft.

4 Combined cyclic/collective systems of helicopter (in this case, rotor pitch).

**pitch curves** Intersection of tooth surfaces in pitch cones.

**pitch cylinder** Notional cylinder containing all points of contact between teeth of spur or helical gears.

**pitch-damping derivative** Common symbol  $C_{mq}$ , this [usually negative] term determines the moment that opposes any pitch rate.

**pitch diameter** That of pitch line in circular wheel.

**pitch indicator** Cockpit instrument based on tube containing coloured liquid, also called fore/aft level, replaced by artificial horizon.

**pitching** See *pitch* (1).

**pitching moment** One causing pitch (1), measured as positive when nose-up or tail-heavy. Basic equation  $M = C_M^{1/2} \rho V^2 S c$ , where  $C_M$  is total moment coefficient,  $\rho$  density,  $V$  velocity,  $S$  wing area and  $c$  wing chord.

**pitching tank** Towing tank in which tendency of marine aircraft to *porpoise* (1) can be studied.

**pitch jet** RCJ providing low-airspeed control in pitch (1).

**pitch line** Locus of points at which centres, contact points or pitch (6) of gearwheel teeth or bolt threads are measured.

**pitch lock** Propeller subsystem which reacts to either overspeed or loss of oil pressure. Normal pressure or rpm keeps two mating rings of ratchet teeth apart.

**pitchover** Pronounced departure from upwards-pointing attitude, eg at point where ballistic vehicle is programmed to pitch (4) away from vertical, aircraft in stall-turn pitches at highest point and aircraft attempting absolute-altitude record runs out of kinetic energy.

**pitch plane** That common to both pitch cylinders of helical or spur gears, pitch cones of mating bevel gears, or both pitch cylinders of wormwheel (on which axial and transverse pitches are equal) and pitch line of mating gear.

**pitch point** Point of contact of two pitch circles.

**pitch pointing** Advanced FCS mode giving ability to vary pitch (1) and thus AOA at constant flightpath angle.

**pitch range** Angular range of travel of blade, esp. of propeller.

**pitch rate** With stick held back, rate of change of the longitudinal axis about the c.g., i.e. rate of rotation about the lateral axis,  $q$ .

**pitch ratio** Ratio of pitch (3) to diameter.

**pitch setting** 1 Act of setting up propeller or helicopter rotor so that all blades have correct pitch according to that commanded.

2 Actual pitch of blade(s) at particular time, in case of propeller usually at 0.75 radius.

**pitch speed** Product of mean geometric pitch and number of revolutions made in unit time (latter is s or h depending on unit used to express answer).

**pitch-stiffness derivative** Common symbol  $C_{ma}$ , the slope of the curve of the static coefficient of pitching moment against AOA [ $\alpha$ ] with cockpit controls neutral.

**pitch trim compensator** See *Mach trimmer*.

**pitch trimmer** Scissors link connecting bottom of main-leg outer casing and one end of landing gear bogie beam.

**pitch-up** Uncommanded positive pitch (1) experienced by some aeroplanes at high subsonic Mach numbers or (tip stall on swept wing or tailplane in wing downwash) at large AOA.

**Pitho** Hard tool steel formerly used for piston-engine valves.

**PITL** Pilot in the loop [of the flight-control system].

**pitot bomb** Pitot head carried on free-weathercocking mass towed on cable.

**pitot comb** Row of pitot tubes, eg in vertical row behind wing.

**pitot head** Sensing head for pitot/static system. In case where static pressure is taken from skin vent, pitot pressure only, thus essentially = pitot tube.

**pitot pressure** That sensed by pitot head, intended to be close to stagnation pressure.

**pitot rake** See *pitot comb*.

**PitotShield** Weatherproof covering for pitot head with scarlet banner [tears off on takeoff if inadvertently left in place].

**pitot/static system** Instrumentation system fed by combination of pitot pressure and local static pressure, difference giving dynamic head and thus ASIR.

**pitot traverse** Taking successive measures of pitot pressure under same conditions but at different places, esp. along vertical (less commonly horizontal) line in wake of wing or other body; result indicates fluid momentum transfer and thus drag.

**pitot tube** Open-ended tube facing forwards into fluid flow, thus generating internal pressure equal to stagnation pressure (in case of supersonic flow, that downstream of normal shock).

**PITS, Pits** Passive identification and targeting system.

**PIU** 1 Pilot-induced undulation (PIO is better).

2 Processor, or pylon, or programmable, interface unit.

3 Intermediate contingency power (F).

4 Plasma ignition unit.

**PIV, p.i.v.** 1 Pressure isolating valve.

2 Peak inverse voltage.

**Piver** Programmation et interprétation des vols d'engins de reconnaissance (F).

**pivot-door reverser** Jet-engine [usually turbofan] reverser in which either the fan jet [only] is deflected by from two to four doors, or the entire engine efflux is deflected, usually by two doors pivoted on swinging links.

**PIXE** Pronounced pixie, proton-induced X-ray emission, ion-beam technique.

**pixel** Picture element, from which electronically transmitted picture is assembled.

**PJ** Parajumper, in helo rescue crew.

**Pj** 1 Radar received-power from jammer.

2 Jetpipe pressure.

**PJBD** Permanent Joint Board on, or of, Defence (Canada/US).

**PJC** Permanent Joint Council (Russia-NATO).

**PJE** Parachute-jumping exercise.

**PJF** Partially jet-borne flight.

**PJH** PLRS/JTIDS hybrid.

**PJI** Parachute-jumping instructor.

**PJND** Perceived just-noticeable difference[s].

**PK, P<sub>k</sub>** 1 Kill probability.

2 Peak.

**PkAF** Pakistani air force (UK usage).

**PKB** Programmable keyboard.

**PKD** 1 Path of known delay.

2 Parts knock-down, aircraft or other product supplied unassembled.

**PKE** Pluto Kuiper Express (NASA).

**PKI** Public key infrastructure.

**PKM** Perigee kick motor.

**PKO** Cosmic (space) defence forces (USSR).

**PKP** 1 Passenger-kilometres performed.

2 Predicted kill point.

**PK screw** Parker-Kalon.

**PL** 1 Position line.

2 Plain language (often P/L).

3 Pulse, or parameter, length.

4 Pilote de ligne (F).

5 Parts list.

T/P. 6 Powered lift; often used for helicopter power loading

T/P.

7 Primary lighting.

8 Public Law (US).

9 Power line (d.c. electrics).

**P/L** 1 Payload.

2 Plain language.

3 Penetrator/lander [lunar].

**PLA** 1 Programmable logic array.

2 Power-lever angle.

3 Power-lift aircraft.

4 Pre-launch activites, for new aircraft.

5 Post-launch autonomy.

6 Practice low approach.

7 Plain-language address.

8 Private pilot, lighter-than-air, airship.

**PLAB** Napalm (USSR, R).

**placard value** Published numerical values of aircraft performance, esp. those concerned with safety or limiting speeds and often displayed on placard (small plate) fixed in cockpit.

**place** Seat; hence '4-\* ship' = four-seat aircraft (US usage).

**PLACO, Placo** Planning committee (ISO).

**Plaid** Precision location and identification.

**plain bearing** One in which rotating shaft is simply run in surrounding fixed support, usually lined with bearing metal, without needles, rollers, balls or dynamic pressure from air or gas, but with interposed oil film.

**plain flap** Simple flap in which trailing edge of wing is hinged.

**plain language** Message not coded for security.

**plan** One of three basic orthogonal views, that showing object from above; hence \*-form.

**planar** Essentially lying in one plane, 2-D; hence \* technology or \* electronics include solid-state devices constructed as various deposited layers, with etching, metallization and other layer-modification.

**planar-array radar** One whose aerial comprises numerous (normally identical) elements in flat array; probably electronically scanned and probably synonymous with phased-array.

**Planck constant** Symbol  $h$ ,  $= 6.626196$  [a later value is  $6.6260755 \times 10^{-34}$  Js].

**Planck Law** Fundamental law of quantum theory:  $E = hv$  where  $E$  is value of quantum in units of energy,  $h$  is Planck constant and  $v$  is frequency.

**plane** 1 Aeroplane or airplane (colloq., rarely used in professional aerospace).

2 A wing, either left or right or complete tip-to-tip.

3 To move over water at speed sufficiently high for hydrodynamic and aerodynamic lift to predominate over buoyancy.

**plane angle** Angular measure in 2D, planar, unit rad [radian] = 57.2958°; hence 1° = 0.0174533 rad, 1' =  $2.90888 \times 10^{-4}$  rad, 1" =  $4.81814 \times 10^{-6}$  rad.

**plane-change engine** Small rocket, usually MHR, whose thrust alters orbital plane of satellite.

**plane flying** Navigation without electronic aids over short distances such that curvature of Earth is neglectable (in Editor's view, nonsense).

**plane-guard** Routine duty of aircraft (today helicopter) stationed off port (left) quarter (towards stern) of carrier while flying operations are in progress; rescues ditched aircrew and performs other tasks.

**planemaker** Aircraft manufacturer (colloq.).

**plane of reference** That, perpendicular to plane of symmetry and in front of [or possibly touching] the nose, from which all nose-to-tail stations are measured.

**plane of rotation** That in which tips of blades of rotating object travel; in case of helicopter main rotor synonymous with tip-path plane, and thus seldom perpendicular to shaft axis.

**plane of symmetry** That containing OX and OZ axes, dividing aircraft into (usually mirror-image) left/right halves.

**plane-polarized** EM radiation, eg light, in which electric force and direction of propagation remain in one plane.

**planer** Machine tool, often large, whose workpiece is cut by linear motion past fixed tool. Skin mill has revolving cutter(s).

**planetary boundary layer** From planet surface to geostrophic wind level, including Ekman layer.

**planetary gear** Reduction gear in which driven sun-wheel turns planet-wheels engaging with fixed outer annulus; any gearwheel whose centre describes circular path around another.

**planetary lander** Spacecraft designed to (usually soft-) land on planet.

**planetocentric** Related to planet's centre, eg \* orbit.

**plane wave** One whose front is normal to propagation direction.

**planform** Geometric shape in plan, esp. of wings and other aerofoils.

**planimeter** Instrument for mechanically measuring area on plane surface.

**planing bottom** Fairied smooth surface on underside of float or hull (BSI); this omits to note need for deadrise, chine, step etc, needed to plane (3).

**plank** Loosely used to mean a principal spanwise wing-skin member, especially if integrally stiffened.

**plank antenna** Antenna formed from planar assembly of waveguides in vertical plane, fixed parallel to aircraft longitudinal axis [usually on struts above fuselage].

**plank wing** Traditional wing, as distinct from swept or other modern planform (colloq.).

**plan-label display** Radar display on which SSR alphanumeric information can be written in association with positional echo or symbol; usually fast synthetic, or mixed-phosphor (hard for high-refresh alphanumerics and soft for raw position symbol).

**planned flight** One for which flightplan is filed and which has specific purpose, ie not air experience or joyride.

**planned load** One made up in advance and tailored to cargo-aircraft type and mission.

**planning-programming-budgeting** Integrated system for management of DOD budget and Five-Year Defense Program (USAF).

**planometer** Surface plate.

**plan-position indicator** P-type display in which scene appears in plan with observer, radar or other sensor at centre; objects at radial distance giving range (usually linear scale, often selectable to several values) and with correct bearing (000° usually at top or 12 o'clock position); offset PPI moves sensor to position away from centre, typically to 6 o'clock margin. Expanded-centre PPI has zero range at ring surrounding centre.

**plan range** In air reconnaissance, horizontal distance from sub-aircraft point (that where local vertical through aircraft intersects surface) and ground object.

**PLAP, Plap** Power-lever angle prime, throttle in UFC (1) to which engine responds irrespective of pilot demand.

**PLASI, Plasi** Pulse-light approach slope indicator.

**plasma** Assembly of neutral atoms, ions, electrons and possibly molecules in which particle motion is determined by EM interactions; electrically conductive, hence responds to magnetic field. Study called MHD or hydro-magnetics.

**plasma antenna** Glass or ceramic container of ionized gas.

**plasma-based stealth** Making aircraft more or less invisible to hostile radars by enveloping them in an intense EM field.

**plasma engine** See *plasma rocket*.

**plasma flame stabilization** Use of nanosecond pulses of high-voltage current to stabilize very lean combustion.

**plasma ignition** Source of 1,000 J/s at 5,000K for solids, liquids or gases.

**plasma jet** Jet of plasma produced by MHD.

**plasma panel** Electronic display of gas-discharge type, usually AC, usually orange (Ne), but many other colours with different gases.

**plasma plating** Deposition of refractory, abrasion-resistant or anti-corrosive coating by means of intensely hot ( $c16,600^{\circ}\text{C}$ ) plasma jet moving at supersonic speed into which coat material is introduced as powder.

**plasma rocket** One whose working fluid is a plasma, accelerated by intense EM field (ie, plasma jet).

**plasma sheath** That surrounding re-entry vehicle or spacecraft, serving as barrier to radio communications.

**plasma torch** See next.

**plasma welding** Process similar to TIG welding except that the current is carried by the plasma itself, not by a pulsed arc.

**plasma wind tunnel** One capable of simulating spacecraft re-entry to Earth atmosphere.

**plastic** Not elastic, tending to remain in deformed shape or position (see *plastics*).

**plastic effect** Electronic display shows relief but little tonal value.

**Plasticole** Transparent plastic which, unlike Pyralin, is non-inflammable and does not discolour with age.

**plastic flow** That caused by stress beyond elastic limit and remaining when stress is removed.

**plastic gyro**

**plastic gyro** Wheel assembled from moulded plastics components.

**plastic instability** Column failure due to plastic flow in compression rather than to bending.

**plasticity** Ability to be deformed to new permanent shape.

**plasticizer** Substance added to polymer to change properties to improve mouldability or other useful properties; usually liquid of high boiling point. In solid propellants used chiefly to increase flexibility, strengthen bonding and eliminate cracking.

**plastics** General terms for vast range of synthetic materials made by mixing constituents of which prime members are polymers, for distribution as liquid, fibre, granules or sheet subsequently moulded (see *thermoplastic*, *thermosetting*) or used as reinforcement with adhesive bonding. Properties range from rubbers to highly crystalline fibres. Singular 'plastic' is adjective; in describing part or finished product preferred usage is 'plastics' or, if possible, name material, eg PTFE, PVC, GRP or CFRP.

**plastic factor** Additional factor, typically 1.2–1.5, applied in designing primary structure in fibre-reinforced composite; this 'factor of ignorance' is being relaxed as experience is gained.

**PLAT** Pilot's landing-aid TV.

**Plate** 1 Sheet thicker than 0.25 in (6.35 mm); in airframes invariably machined or chem-milled. Not to be confused with sheet.

2 Principal anode of vacuum tube.

3 Pocket-size sheet of paper, plastics or aluminium on which are printed details of facilities, aids and approach data for one airport.

**plate brake** Mechanical brake for rotating shaft, eg landing wheel or helicopter rotor, where retarded moving member is ring fabricated from heavy plate (steel, titanium or beryllium, or CFRP-based) often stacked in parallel; essential difference from disc brake is that ring is gripped from both sides.

**plate-wired memory** Advanced and highly compact memory woven on loom from coated wire giving non-volatile storage and low-nanosec speeds.

**platelet** Small plate, esp. one which is perforated by, or whose surface contains precision channels usually produced by, photo-etching, for fluidic or rocket-injector system.

**platelet injector** Rocket injector assembled from large stack of platelets to give optimum multiple paths for (usually two) liquid propellants.

**platform** 1 Vehicle carrying sensors and/or weapons, eg aircraft or spacecraft.

2 Extended root of turbine (rarely, other) blade linking root attachment to outer aerofoil.

3 Raised operating area for helicopter or V/STOL, esp. on surface vessel, also called pad.

4 See *airdrop platform*.

**platform drop** Drop of loaded platform (4) from rear-loading aircraft with roller conveyor.

**platform dynamics** Those resulting from motion of platform (1), esp. as they affect ECM/ESM, eg range, range-rate (velocity), acceleration and acceleration-rate (jerk); can cause receiver to lose lock or synchronization.

**platform face** That forming inner end of aerofoil portion of turbine rotor blade and part of inner wall of gas duct.

**platform operator** This usually means pilot.

**platform strength** Number of aircraft available.

**Platinizing** Coating steel with Zn.

**platinum** Costly non-corroding metal, density 21.5, MPt 1,773°C, symbol Pt.

**Plato** 1 Program logic for automatic teaching operations.

2 Pilot low-altitude terrain overlay.

**platypus** Flat 2-D jet-engine propulsive nozzle.

**playing area** Area of operations possible with digital ATC (1) simulator, typically, 256, 512 or 1,024 miles square.

**PLB** 1 Personnel (or personal) locator beacon.

2 Passenger loading bridge.

3 Propeller log book.

**PLC** Programmable logic controller.

**plc** Public limited company.

**PLCU** Primary-lighting control unit.

**PLD** 1 Pulse-length discrimination (in MTI circuits eliminates fast-moving clouds and other moving objects whose size precludes their being targets).

2 Precision laser designator.

3 Proportional lift-dump [mode].

4 Programmable, or programmed, logic device.

**pleasure flight** One made by private pilot landing back at the point of departure.

**plenum chamber** Airtight chamber, esp. one containing fluid-flow sink such as operative air-breathing engine; essential for gas turbine having double-entry or reverse-flow compressor with ingestion all round periphery.

**plenum-chamber burning** Boosting thrust of vectored-thrust turbofan by burning additional fuel in the 'cold' nozzles downstream of the fan.

**plenum-chamber door** Blow-in door to increase airflow into chamber when internal depression falls below selected level, eg on take-off.

**Plesetsk** Soviet, now Russian, ICBM base and launch establishment for Cosmos and many other large ballistic systems; in Leningrad military district at 62.9°N 40.1°E.

**Plexiglas** Registered name (Rohm & Haas) of family of acrylic-acid resin plastics, esp. transparent, widely used for blown mouldings; essentially US counterpart of Perspex, though different material.

**Plexus** Proprietary aerosol non-abrasive cleaner for transparencies.

**Plezit** PLZT.

**PLF** 1 Precise local fix.

2 Parachute landfall.

3 Powered-lift facility.

4 Passenger load factor.

**PLGR** Precise, or precision, lightweight, or location, GPS receiver.

**PLGS** Precision laser guidance set.

**PLH** Propeller load horsepower.

**PLI** Pre-load indicator (projects from head of structural bolt).

**P-lines** Power lines [cables].

**pliss** See *PLSS (2)* (colloq.).

**PLL** Phase-lock[ed] loop.

**PLM** 1 Pulse-length modulation.

2 Pulse-length monitor.

3 Product life-cycle, or lifetime, management.

**PLN** Flight plan.

## P-LOCAAS

**P-LOCAAS** Powered derivative of the low-cost autonomous attack submunition.

**Plod** Passenger landed on deck (carrier onboard delivery).

**PLOG** Pilot's [flight-planning] log.

**Plog** Pilot-log record[s], no formal definition.

**Plonk** AC2 or ACH/GD, lowest form of life (RAF, WW2).

**plot** 1 Graphical representation of two or more variables on 2-D surface.

2 Graphical construction for solving navigation problems, eg triangle of velocities.

3 Map, chart or graph representing data of any sort (DoD).

4 Visual display, eg on radar, of aerial object at particular time; hence \* extraction.

5 Portion of map or overlay showing outlines of areas covered by reconnaissance or survey photographs.

**plot extraction** Translating radar plot (4) into quantified target position information, formerly done manually.

**plot extractor** Electronic system which detects replies from primary or secondary radar and, after making validity check, digitizes information ready for transmission over narrow-band link equipment or high-grade telephone line; where input is SSR basic range/bearing information can be supplemented by identity and height.

'Extraction' derives from fact system eliminates information not needed.

**plotting board** Large horizontal (rarely vertical) surface upon which positions of moving objects are shown with respect to co-ordinates or fixed reference points.

**plotting chart** Chart designed for graphical methods of navigation.

**ploughing, plowing** Taxiing marine aircraft at below planing speed.

**PLP** 1 Pipeline patrol.

2 Parallel-line planform.

**PLRO** Plain-language readout.

**PLRS** Precision (or position) location (and) reporting system.

**PLS** 1 Precision landing system; R adds receiver.

2 Palletized loading system.

3 Personnel locator, or location, system.

4 Plasma subsystem, to measure solar wind.

**PLSS** 1 Precision location strike system.

2 Portable life-support system.

**PLU** 1 Position (or preservation of) location uncertainty.

2 Program load unit.

**plug** 1 Extra section, usually of constant cross-section, added in front of or behind wing when stretching fuselage.

2 Air-refuelling contact, hence wet \*, dry \*.

3 As verb, one meaning is to blank over passenger window with metal skin.

**plug aileron** Has form of curved sheet forming segment of cylinder, extended on pivoted brackets from curved slot in wing.

**plug door** One so designed, eg with inward/upward travel or with retractable upper and lower portions, that it is larger than doorway, two mating with thick tapered edges to increase security of pressurized fuselage. Pressurization load merely forces door more tightly against frame.

**plug gauge** Male-type gauge, not always of circular

cross-section and often tapered or threaded, for checking dimensions of holes and internal threads.

**plug inlet** One form of inlet for air-breathing propulsion at Mach 3.5–6 in which axisymmetric duct tapers from sharp lip to rear, and contains large plug (spike) which when translated fully aft can seal flow; in most forms rearward spike travel renders shock-on-lip operation impossible.

**plug nozzle** Proposed for rocket engines: combustion chamber is annular toroidal form discharging around central cone with curved profile which converts initial inwards radial component into pure axial flow. Also called spike nozzle.

**plug ring** Translating ring surrounding rear of piston engine cowl to control cooling airflow; not necessarily provided with hinged flaps or shutters (ie gills).

**plug section** See *plug* 1.

**plug tap** Final non-bevelled or bottoming tap for completing threaded hole.

**plug weld** One made by drilling through part of structure, eg boom splice or skin/stringer, and welding through hole to increase strength of joint.

**plug window** Overlarge window with tapered periphery (as plug door) used as emergency exit in pressurized fuselage.

**plumber[s]** Ground crew (RAF colloq.).

**Plumbicon** Photoconductive camera tube similar to vidicon but using semiconductor PbO target doped to behave as reverse-biased PIN.

**plumbing** Pipework for liquid systems, eg hydraulics, lube oil, Lox etc (colloq.).

**plume** Originally having specific applications, today a general word meaning entire wake from jet (airbreathing or rocket) bounded at periphery and at more vague downstream extremity by envelope enclosing all parts having significant effects on environment, eg thermal, aerodynamic, acoustic, contrail formation or as IR source.

**plume target** Aerial target emitting plume simulating that from hostile jet aircraft.

**Plus** Patient-loading utility system.

**plus count** Forward count begun at lift-off of space-flight, continued throughout mission to provide GET reference.

**plutonium** Silvery metal, many isotopes, all radioactive and toxic, density 19.8, MPt (typical) 641°C, most important constituent of NW devices, alone or with an alloy, symbol Pu.

**pluviometer** Rain gauge.

**PLV** Payload launch vehicle (ABV).

**PLVL** Present level.

**PLW** Ploughed (US).

**PLWS** Precision lighting warning system.

**Plymetal** Plywood/aluminium sandwiches, invariably non-structural.

**PLZT** 1 Lead lanthanum zirconate titanate.

2 Polarized lead/zinc titanate.

**PM** 1 Pulse modulation.

2 Phase modulation, or modulated.

3 Permanent magnet.

4 Program(me) manager, or management.

5 Powder metallurgy.

6 Pressurized module.

7 Poly medialite.

8 Power management.

- 9 Phase margin [coupling between FCS and structure].  
 10 Pilot monitoring.
- P<sup>m</sup>** Polar maritime.
- P/M** Presentation/manoeuvring (simulator).
- PMA** 1 Projected map assembly.  
 2 Parts manufacturing [or manufacturer] approval, or authority.  
 3 Permanent-magnet alternator.  
 4 Pressurized mating adapter (docking).  
 5 Portable maintenance aid.  
 6 Positive mental attitude (US).  
 7 Propagation management and assessment [algorithms].  
 8 Post-mission analysis.
- P-MA** Political-Military Affairs (US).
- PMA/A** Probable missed approach per arrival.
- PMADS** Pedestal-mounted air-defense [missile] system.
- PMAI** Prime mission aircraft inventory.
- PMAS** Performance measurement analysis system, for assessing contractors and management (DoD).
- PMAT** Portable maintenance access terminal.
- PMAWS** Passive missile approach warning system.
- P<sub>max</sub>** 1 Maximum power (electronic).  
 2 Maximum pressure (usually MEOP).
- PMB** Phare Management Board.
- PMBCC** Plastic-media blast corrosion control.
- PMBM** Permanent-magnet brushless motor.
- PMC** 1 Plastic/metal composite sandwich, usually two metal skins bonded to low-density core.  
 2 President of Mess Committee (RAF).  
 3 Maximum continuous power (F).  
 4 Polymer/matrix composite.  
 5 Power management control.  
 6 Performance management computer (S adds "system").  
 7 Personal multimedia communications.  
 8 Provisional memory cover.  
 9 Private military [including air] companies.  
 10 PCI mezzanine card.
- PMCS** Portable mission control station (UAV).
- PMD** 1 Projected map display.  
 2 Maximum take-off power (F).  
 3 Panel-mounted display.  
 4 Programme management directive.
- PMDB** Production management[s] data base.
- PMDS** Projected-map display set.
- PME** 1 Professional military education (US).  
 2 Precision-measurement equipment [L adds laboratory] (USAF).
- PMF** Processeur militaire Français.
- PMFD** Pilot, or primary, or principal, multi-function display.
- PMFT** Post-maintenance flight test.
- PMG** Permanent-magnet generator.
- PMH** Patrol missile hydrofoil (US Navy).
- PMI** 1 Payload margin indicator.  
 2 Performance management indicator.  
 3 Principal maintenance inspector (FAA).  
 4 Planned maintenance interval.  
 5 Polar moment of inertia.
- PMIRR** Pressure-modulated IR radiometer.
- PMM** Performance monitor module.
- PMMA** Poly-methylmethacrylate.
- PMN** Lead/magnesium niobate [-PT adds lead titanate].
- PMO** 1 Program(me) management office.  
 2 Principal medical officer.  
 3 Prime maintenance organization[s].
- PMOP** Phase modulation on pulse.
- PMOS** Positive (p-type) metal-oxide silicon, or semiconductor.
- PMP** 1 Program management proposal.  
 2 Propulsion modernization program.  
 3 Premodulation processor.  
 4 Provost Marshal prohibited (RAF).
- PMPS** Portable mission-planning system (USAF).
- PMQC** Purchase-material quality control (UK, quality assurance).
- PMR** 1 Pacific Missile Range, from Vandenberg (WTR) and Pt Mugu (US); F adds Facility, at Kauai, Hawaii, and Kwajalein Atoll.  
 2 Proton magnetic resonance.  
 3 Portable MLS receiver.  
 4 Private mobile radio.  
 5 Permit Maintenance Release [Permit to Fly] (CAA).  
 6 Product material release.  
 7 Provost Marshal restricted (RAF).
- PMRAFNS** Princess Mary's RAF Nursing Service (UK).
- PMRT** Program management responsibility transfer (DoD).
- PMS** 1 Performance/power/programme management system.  
 2 Projected map system (or subsystem).  
 3 Personnel Management Squadrons (RAF).  
 4 Performance measurement system (of programme).  
 5 Process and materials specifications (manual).  
 6 Poor-man solution.
- PMSP** Parallel-module signal processor.
- PMST** Project-management support team.
- PMSV** Pilot-to-metro service.
- PMTC** Pacific Missile Test Center.
- PMU** Maximum contingency power (F).
- PN** 1 See *pseudonoise*.  
 2 Performance number.  
 3 Prior notice.  
 4 Pursuit, night (USA 1919–24).  
 5 Pilot's Notes [publication for each type].
- P/N** Part number.
- PNA** Point of no alternate.
- PNB** Pilot/navigator/bomb aimér (former RAF aircrew grade, higher than SEG).
- PNC** Pneumatic nozzle control.
- PNCP** Peripheral node control point (SNA).
- PNCS** Performance and navigation computer system.
- PND** 1 Pilot numerical display, including distance to go, G/S.  
 2 Primary navigation display.
- PNdB** Perceived noise decibels (see *noise*).
- PNDC** Pakistan National Development Complex.
- pneud, pneudraulic** Combined hydraulic and pneumatic operation.
- pneumatic** 1 Air-operated; term usually reserved for services taking very small flow at high pressure energized by shaft-driven compressor or one-shot bottle. Ambiguously also often used for services taking very large

## pneumatic altimeter

flow at low pressure to drive turbines, air motors and cabin environmental controllers.

2 Also describes panel instruments driven by air pressure or air-driven gyro.

**pneumatic altimeter** Traditional barometric altimeter.

**pneumatic bearing** Externally pressurized gas bearing.

**pneumatic deicing** Removal of ice accretion by alternate inflation and deflation of flexible tubes along [wing or tail] LE.

**pneumatic logic** That used in fluidics.

**pneumatic power module** Stores energy for extremely rapid high-power release.

**pneumodynamic** System supplies air, or other gas, in rapidly time-variant controlled manner.

**PNF** Pilot not flying, the non-handling pilot.

**PNG** 1 Pseudonoise generator.

2 Passive night (-vision) goggles.

**PNI** Pictorial navigation indicator.

**PNJ** Pulse(d) noise jamming.

**PNL** Perceived noise level (see *noise*).

**PNLT** Tone-corrected PNL.

**PNM, pnm** Per nautical mile. See next.

**pnm** Passenger nautical mile.

**PNP** Programmed numerical path.

**PNR** 1 Point of no return.

2 Prior notice required.

3 Part number.

4 Passenger name record, full details on database (US).

**PNS** Pictorial navigation system.

**PNTR** Permanent normal trade relations.

**PNU** Precision navigation upgrade.

**PNVG** Panoramic night-vision goggles.

**PNVS** Pilot's night vision system, or sensor (attack helicopters).

**PNWA** Prevention of nuclear war agreement (1973).

**PNY** Portuguese navy [UK usage].

**PO** 1 Purchase order, or option.

2 Preposition operation(s).

3 Dust devil (from French).

**P<sub>0</sub>** static pressure [ $P_s$ ] is preferred.

**POA** 1 Position of advantage (air combat).

2 Plain old Acars.

3 Pre-owned aircraft.

4 Power-optimized aircraft.

5 Production Organisation Approval[s].

**POAP** Photoconductor on active pixel.

**POB** 1 Persons, [the number] or pilot, on board.

2 Polymer optical backplane.

**POBA** Project for on-board autonomy (orbiter).

**POC** 1 Point of contact.

2 Parts obsolescence cost.

3 Professional Officer Course (ROTC).

4 Payload Operations Center (MSFC).

5 See next.

**POC, PoC** Proof of concept.

**POCA** Parting-out candidate aircraft.

**POCC** 1 Payload operations control center, now POC (4).

2 Passenger operations control center [principally for rebooking passengers who have missed connections].

**pocket** Short spanwise length of light trailing edge attached to rear of helicopter rotor-blade spar, many \* being required for each blade.

**POCU** Pre-OCU.

## point-designation grid

**POD** 1 Preliminary orbit determination.

2 Probability of detection.

3 Proof of design.

4 Proper orthogonal decomposition.

**pod** Streamlined container carried on pylon, strut or other attachment entirely outside airframe and housing propulsion system, reconnaissance sensors, flight-refuelling hose/reel or similar devices.

**PODA** Pre-operational data-link applications.

**Podas** Portable data-acquisition system.

**podded** Accommodated in pod.

**padding** Philosophy and technique of using pods, esp. for accommodation of main engines.

**pod formation** Formation of friendly aircraft disposed so that ECM assets give maximum mutual protection.

**podium** Desk for boarding agent at airport gate.

**PODS, Pods** 1 Portable data store.

2 Portable digitizer subsystem.

**pod strike** Impact of under-wing engine on runway.

**POE** 1 Probability of error.

2 Port [includes airfields] of embarkation.

**Poems** Pre-operational European Mode-S (ATC).

**POES** Polar-orbiting environmental satellite.

**Poet** 1 Portable opto-electronic tracker.

2 Primed oscillator expendable transponder.

**POF** Plastic optical fibre.

**POFM** Petrol/oil fuel mixture.

**Pogo** 1 See *pogo effect*.

2 Tail-standing VTOL (colloq.).

3 Local below-airways ATC linking Paris airports.

4 Air-intercept code: "Switch to preceding channel or, if unable to establish communications, to next channel after \*\*" (DoD).

5 Mechanical link in PFCS which in case of any jammed components automatically overrides drive cam.

6 Precision on-board GPS optimization (missile guidance).

7 Project on Government Oversight (US).

**pogo effect** Longitudinal oscillation or vibration, esp. of vehicle having high ratio of thrust to mass and whose propulsive thrust may suffer short-term variations; characterized by significant and uncomfortable axial accelerations and, in large ballistic rocket, severe propellant sloshing.

**pogo-stick** Precisely calibrated penetrometer for measuring strength of paved or unpaved surfaces.

**POH** 1 Pilot operator's [or pilot's operating] handbook.

2 Put on hold.

**Pohwaro** Pulsated overheated water rocket (FFA, Switzerland).

**POI** 1 Programme of instruction.

2 Probability of intercept.

3 Point of interest.

4 Principal operations inspector (FAA).

5 Proximity orbit insertion.

**Point Arguello** At south Vandenberg, Western Test Range (US).

**point defence** 1 Defence of specified geographical areas, cities and vital installations; distinguishing feature is that missile guidance radars are near launch sites (USAF).

2 Defence of single surface ship, esp. against incoming missile.

**point-designation grid** Grid drawn on map or photo-

## point discharge

graph whose sole purpose is to assist location of small features.

**point discharge** Gaseous electrical discharge from surface of small radius (point, or tips of static wick) at markedly different potential from surrounding; unlike corona discharge, \*\* is silent and non-luminous.

**point light** Luminous signal without perceptible length (ICAO).

**point mass** Simplifying equations of motion by assuming aircraft has no dimensions, thus eliminating torques and moments.

**Point Mugu** Location of Naval Missile Center and Naval Missile Range (US).

**point navaid** Electronic navigation aid located at a single site, e.g. NDB, VOR.

**point of attachment** Where balloon rigging cable joins flying cable.

**point of entry** Where aircraft enters control zone.

**point of equal time** Same time to reach destination or return to start.

**point of interest** Airfield, or point navaid.

**point of inversion** Height at which lapse rate at last passes through zero; where temperature begins to fall.

**point of no alternate** Geographical position on track or time at which fuel remaining becomes insufficient to reach declared alternate.

**point of no return** Geographical position on track or time at which fuel remaining becomes insufficient for aircraft to return to starting point (DoD, NATO wording ‘to its own or some other associated base’).

**point parallel** Standard form of rendezvous for boom-type tanker and large receiver, in which aircraft fly reciprocal tracks to ARCP, tanker then turning 180° to come up 3.5 miles ahead of receiver at roughly same height, heading and speed.

**point target** 1 One requiring accurate placement of conventional ordnance in order to neutralize or destroy it (DoD).

2 With NW, one in which target radius is not greater than one-fifth radius of damage.

**point to point** Linear motion of tool between NC-instructed commands.

**point vortex** Section of straight-line vortex in 2-D motion.

**Poise** Pointing and stabilization platform element (USA, RPVs).

**poise** Non-SI unit of dynamic viscosity, defined as 1 dyn.s.m<sup>-2</sup> = 0.1 Ns.m<sup>-2</sup> = 0.067197 lb.s/ft<sup>2</sup>.

**Poiseuille equation** Relates flow through tube (defined as ‘long and thin’; elsewhere as ‘capillary’) to variables:  $Q = \pi Pr^4/8l\mu$  where Q is volume per unit time (seconds), P is pressure difference across ends of tube, r is radius, l is length and  $\mu$  is viscosity.

**Poiseuille flow** 1 Viscous laminar flow in circular-section pipe.

2 Viscous laminar flow between close bounding planes.

**Poisson's equation** In stressed material  $\sigma = (E/2n)-1$  where  $\sigma$  is Poisson's ratio, E is Young's modulus and n is modulus of rigidity.

**Poisson's ratio** Ratio of lateral contraction (in absence of local waisting) per unit breadth to longitudinal extension per unit length for material stretched within elastic limit, symbol  $\nu$  or, less often,  $\sigma$ .

## polar navigation

**Poits** Payload orientation and instrumented tracking system.

**poka yoke** Japanese words meaning foolproof, ie eliminating disruption caused by faulty work.

**poke** Propulsive thrust or power (colloq.), hence ‘pokier’, etc.

**poke welding** Similar to spot welding but using single ‘poked’ electrode, the other being clamped to any convenient point on workpiece.

**POL** Petrol, or petroleum, oil and lubricant.

**Pol, pol** Polarity (but P in FFP).

**Polar** Precision over-the-horizon land attack rocket.

**polar** 1 Air mass supposedly originating near pole, hence cold and usually dry: thus \* Atlantic, \* continental, \* front, \* maritime.

2 Parameter plotted on polar co-ordinates.

3 Basic performance curve of sailplane in which sink speed is plotted against EAS (units of two scales differ, traditionally ft/s against kt but today m/s; km/h).

**polar-cap absorption** Radio blackout by HF absorption in ionospheric storms.

**polar continental** Typically extremely cold, dry and stable air mass; abb. Pc.

**polar control** Twist-and-steer flight control.

**polar co-ordinates** Those defining locations by means of angle of a radius vector, measured relative to agreed direction, and vector length; similar to rho-theta navigation.

**polar diagram** One giving values round 360° from a point, eg noise, IR or radio emission, stress or temperature.

**polar distance** Angular distance from celestial pole.

**polar front** That separating polar air mass from contrasting mass.

**polarimeter** Instrument for determining degree of polarization of EM radiation, esp. light.

**polarimetry** Particular meaning in aerospace is examination of changes in polarization of radar returns from different types of target surface.

**polariscope** Instrument for detecting polarized radiation.

**polarity** 1 Of line segment, having both ends distinguishable.

2 Hence, of physical system, having two contrasting points, specif. oppositely marked terminals of electric cell or plus/minus characteristics of ions.

**polarization** Many meanings but chiefly associated with EM radiation in which \* can be plane, elliptical or circular. Plane \* rotates all wave motion so that all E (electric) vibrations take place in one plane (plane of vibration) and all H (magnetic) vibration takes place at 90° to this (plane of \*).

**polarization diversity** Having ability to switch from plane-polarized to circular-polarized (radar).

**polar maritime** Air mass that is cold and, though absolute humidity and dewpoint temperature low, relative humidity is high; abb. P<sub>m</sub>.

**polar moment of inertia** Moment of inertia of area about axis perpendicular to its plane. Traditional symbol not I but J.

**polar navigation** Navigation at high latitudes, distinguished in bygone days on account of unreliability of magnetic compass, possible electrical/radio interference and other problems such as rapid change of meridians and map-projection difficulties.

**polar orbit** Orbit passing over, or close to, poles of primary body.

**polar Pacific** Air mass originating over N Pacific or N America, seasonal characteristics; abb. P<sub>P</sub>.

**polar plot** Locating a point, eg target, by polar co-ordinates.

**Polar stereographic** Map projection, that of high-latitude region projected on flat sheet touching Earth at Pole by light source at opposite pole. Parallels expand at sec<sup>2</sup> co-lat/2.

**polar triangle** One formed by three intersecting great circles.

**pole** 1 Origin of polar co-ordinate system.

2 Point of concentration of magnetic charge (magnetic \*).

3 Point of concentration of electric charge (dipole and sought-after monopole).

4 Intersection of Earth's surface and axis of rotation (geographic \*).

5 For any circle on spherical surface, intersection of surface and normal line through centre of circle.

6 Parts of surface of magnet through which magnetic flux emanates or enters (theoretical but necessary concept).

7 Terminal of battery.

**pole model** Miniature or full-scale model, eg complete aircraft, mounted on tall pole to measure RCS (2) from all aspects.

**pole piece** That part of core of electromagnet which terminates at air gap.

**poll** 1 To ask specific questions of number of sensors; questions are normally asked sequentially, and answers constitute an update of information in system.

2 Technique used in data transmission whereby several terminals share communication channels, particular channel chosen for given terminal being determined by testing each to find one free, or to locate channel on which incoming data are present. Also used to call for transmissions from remote terminals by signal from central terminal; method used for avoiding contention.

**polled** ACARS mode in which airborne system transmits only in response to received uplink message.

**poll the room** To obtain consensus in solving problem in manned space mission.

**polonium** Po, grey semi-metal, energy source for spacecraft, density 9.3, MPt 254°C.

**polyanilines** Range of electrically conducting plastics made by oxidising aniline and then polymerizing with various acids; basis of smart skins.

**polybutadiene acrylic acid, PBAA** Important solid rocket propellant and monofuel.

**polybutadiene acrylonitrile, PBAN** Important solid rocket propellant and monofuel.

**polyconic** Mapmaking by projecting latitude bands on the succession of cones, each centred on Earth's axis and each touching surface along parallel passing through centre of map, subsequent strips on single-curvature conical surface being unrolled.

**Polydol** Alcohol-resistant foam liquid for firefighting made from protein hydrolysate and an organometallic complex; mixes with fresh or sea-water.

**polygon warhead** One having several (typically 8–16) radial faces from which are projected tailored fragments, steels balls, shaped-charge jets or other damage mech-

anisms. Common type of warhead for SAMs and AAMs, radial blasts being so timed that their plane passes through target.

**polymerization** Basic processes for making large (high-polymer) molecules from small ones, normally without chemical change; can be by addition, condensation, rearrangement or other methods.

**polymer optical backplane** Airframe structure on which are printed fibre-optic conductors.

**polymorph** Aircraft capable of gross change of shape.

**polyphase coding** Pulse-compression technique for radar, esp. for fighters, in which successive phases are rotated by fixed angles such as 90°.

**polyvalence, polyvalent** Multirole (F).

**POM** 1 Printer output microfilm.

2 Program objective(s) memorandum, or memoranda (DoD).

**Pomcus** Prepositioned overseas materiel configured in unit sets (ie, grouped by user units).

**POMO, Pomo** Production oriented maintenance organization (USAF).

**Pomros** Power-off minimum rate of sink.

**POMS** Production-oriented maintenance system.

**pond** Reservoir for cooling water below testbed for large rockets.

**ponding** Settlement of runway subsoil leading to formation of standing-water pond in rain.

**P1E** Phase 1 enhancement.

**pongo** Member of friendly army (RAF colloq.).

**PONO** Project office nominated official.

**pontoon** 1 Inflatable buoyancy bag used as permanent alighting gear for helicopter.

2 Rigid float, of circular or rectangular section, used on early water-based aircraft.

**POO** 1 Payload of opportunity.

2 Pronounced poo, to clear manned-spacecraft computer display prior to solving fresh problem, from P-zero-zero (colloq.).

**Pooley's** Flight guide to UK and Ireland, commercially published annually.

**pool fire** Burning pool of fuel surrounding crashed aircraft.

**poopy suit** Flight-crew overwater survival suit (colloq.).

**POP** 1 Probability of precipitation.

2 Product optimization programme.

3 Plug-in optronic payload.

4 Period of performance.

5 Point of presence.

**pop** Sudden rise by target, from ground cover or out of clutter on radar.

**Popeye** Air-intercept code: "I am in cloud or reduced visibility".

**popouts** Fast-inflating buoyancy bags for flotation in emergency.

**poppet valve** Common mushroom-type valve of piston engine.

**Pop rivet** Pioneer form of tubular rivet closed by withdrawing central mandrel which forms integral part of each rivet and is gripped by jaws of tension tool.

**POPS, Pops** 1 Position and orientation propulsion system.

2 Pyrotechnic optical-plume simulator.

**pop-up** Manoeuvre made by attack aircraft in transition from lo penetration to altitude from which target can be

## pop-up alert

identified and attacked; eliminated by BFPA (blind first-pass attack).

**pop-up alert** Unmissable warning caption [e.g., terrain proximity] on a cockpit display.

**pop-up delivery** In delivery of NW, was usually from 500 to 1,000 ft altitude at maximum rate (RAF) See \* point.

**pop-up missile** 1 One ejected, often by gas generator/piston or other device not forming part of missile propulsion, from launch system in vertical direction, subsequently making fast pitch-over on target heading. Launcher need not move in azimuth or elevation, thus minimizing reaction time.

2 Missile making pop-up manoeuvre as it nears previously located target on which it then dives.

**pop-up point** Ground position at which PU delivery is initiated, 25,000 ft [103 s] before overflying target.

**pop-up test** Test of pop-up missile (1) launch system.

**POR** 1 Pilot opinion rating.

2 Pacific Oceanic Region.

**PORM, Porm** Plus or minus.

**Poroly** Porous metal produced by incomplete sintering, mainly used as filter.

**porous friction asphalt** Asphalt whose constituents and lay-down process are tailored to give high- $\mu$  surface which will not permit standing water to remain. Preferred top layer to runway.

**porpoise** 1 Undulatory (near-phugoid) motion of marine aircraft and some landplanes with bicycle landing gear characterized by pitch oscillation and limited-amplitude vertical travel; normally problem only at particular speed(s).

2 In absence of radio contact, deliberate roller-coaster flight to indicate to pilot of friendly interceptor (more rarely, tower) that aircraft is in distress.

**port** 1 Left side or direction, aircraft viewed from rear.

2 Aperture in solid rocket motor case opened for thrust termination.

3 Aperture[s] in volume under pressure regularly opened and closed by valves, such as in piston engine or reciprocating-compressor cylinder.

**portable data store** Computerized flight-planning data carried by member of flight crew and plugged in before take-off.

**portal** 1 Air/land interface; airfield or heliport.

2 Airline website.

**port drift** From pilot's viewpoint, wind from the right.

**Porteous loop** Loop with 360° aileron roll added at zenith.

**portfolio** Owner's catalogue of aircraft [usually used] for lease or sale.

**POS** 1 Peacetime operating stocks.

2 Position.

3 Positive.

**posigrade** In direction of travel, hence \* rocket increases speed of satellite in order to reach higher orbit. Opposite of retrograde.

**POS-Init** Position initialization.

**position** 1 For celestial body, bearing and altitude.

2 Location of crew member, esp. in military aircraft.

3 Location of manually aimed defensive gun(s) in military aircraft (today archaic); gun \*.

4 Location of AAA defending land target; gun \*.

5 To fly aircraft to where it is needed; hence \* or positioning flight.

## positive stability

**position error** That induced in ASI system by fact that stagnation pressure sensed is seldom that of true free stream (see *airspeed*).

**positioning** Flying aircraft to airport from which productive [commercial carrier or business] flight will start. Rarely, to launch point of military mission.

**position light** See *navigation light*.

**position line** Line along which vehicle is known to be at particular moment, eg by taking VOR bearing. Two PLs are needed for fix.

**position stabilized** Held to linear trajectory, eg LOS, in absence of commanding signal (eg antitank missiles).

**positive acceleration** Acceleration upwards along OZ axis, to right along OY and forwards (ie to increase speed) along OX. Axes are always vehicle related.

**positive area** That enclosed on tephigram between path of rising particle and surrounding air when particle is throughout warmer than surroundings.

**positive coarse pitch** Locked minimum-drag setting of non-feathering propeller after engine failure.

**positive control** 1 Operation of air traffic in radar/non-radar ground control environment in which positive identification, tracking and direction of all aircraft in airspace is conducted by authorized agency (DoD).

2 Command/control and release procedures, and operational procedures that provide acceptable level of assurance against misuse of nuclear warheads, when these warheads are part of a weapon system (USAF).

**Positive Control Line** Notional frontier at which, in time of crisis, NW-armed aircraft would wait for PRM4; in 1960–90 the PCL for RAF Strike Command was 8° E.

**positive coupling** Mutually inductive coupling such that increase in one coil induces rising voltage in other similar in sense to that caused by increasing current in other.

**positive-displacement pump** One delivering fluid in discrete parcels in irreversible way, eg pumps using pistons, vanes or gearwheels in contrast to centrifugal blower.

**positive-driven supercharger** Mechanical drive as distinct from turbo.

**positive-expulsion propellant system** One in which liquid propellants are forced from container by gas pressure, esp. acting on flexible bag containing propellant(s).

**positive feedback** Feedback that results in increasing amplification; also called regenerative.

**positive g** See *positive acceleration*.

**positive-identification and radar advisory zone** Specified area established for identification and flight-following of aircraft in vicinity of fleet defended area.

**positive ion** One deficient in one or more electrons.

**positive pitch** 1 Nose-up.

2 Propeller set for forward flight as distinct from braking.

**positive pressure cabin** Arch., see *pressure cabin*.

**Positive Recall** An order to turn back before reaching the Go-NoGo Line [see Automatic\*] (USAF, RAF).

**Positive Release Message** Brief command sent with authority of head of state, authorizing bomber to cross Positive Control Line and drop NW on designated target, in effect start of W3 (USAF, RAF).

**positive rolling moment** Tending to roll right-wing-down.

**positive stability** Aeroplane tends of own accord to resume original condition, esp. level flight, after

## positive stagger

disturbance (upset or gust) in pitch, without pilot action. Term applies only to motion in vertical plane, along OZ axis.

**positive stagger** Leading edge of upper wing is ahead of that of lower.

**positive stall** Stall under 1 g flight or positive acceleration, ie not from inverted attitude or negative g.

**positive yaw** Tending to rotate anticlockwise about OZ axis seen from above, ie nose to left.

**positron** Short-lived particle equal in mass to electron but positive in sign.

**positron emission tomography** Technique for measuring fluid flow in which positrons are used as labels, generating 511 keV gamma rays which can be read from outside the structure of an engine or other container.

**Posix** 1 Portable operating system interface for computer environments.

2 Also translated as Portable operating system IX.

**POSN, Posm** Position.

**POS-Ref** Position reference.

**POSS, Poss** 1 Power-off stalling speed.

2 Precipitation-occurrence sensor system.

3 Possible (ICAO).

**POST** 1 Portable optical sensor testbed (hardened sites).

2 Passive optical seeker technique (or technology).

3 Production-oriented scheduling technique.

4 Point-of-sale terminal.

**post** 1 Vertical primary structure, eg fin \*, king-\*.

2 Main landing leg, thus MLG of YC-14 described as of four-\* type.

**post-attack period** Between termination of nuclear exchange and cessation of hostilities.

**post-boost** After cut-off of mainstage propulsion.

**post-boost vehicle** Vehicle and payload after cut-off of mainstage propulsion, and hence posing new problems to SDI acquisition and tracking systems.

**post-exit deflector** Powered flap(s) downstream of engine nozzle, able to vector entire thrust for STOVL or air combat.

**post-flight report** Basically comprises ECAM warnings and maintenance status, printed on demand.

**post-integration** Occurring after assembly of complete space launch system but before lift-off.

**post-pass** After (usually soon after) satellite has passed overhead.

**post-stall gyration** Uncontrolled motions about one or more axes, usually involving large excursions in AOA, following departure (3).

**post-stall manoeuvres** Manoeuvres carried out [more or less] under full control with AOA near or even beyond 90°.

**post-strike** Immediately after attack on surface target, hence \* reconnaissance provides information for damage assessment.

**posture** Military strength, disposition and readiness as it affects capabilities (DoD).

**POT, pot** Potentiometer.

**pot** Piston engine cylinder (colloq.).

**potassium** K (from *kalium*), reactive silvery metal, MPt 64°C, density 0.86.

**potential** 1 In electric field, work done in bringing unit positive charge to that point from infinite distance.

2 Value atmospheric thermodynamic variable would

## power amplifier

have if expanded or compressed adiabatically to 1,000 mb (100 kPa).

3 Specialized meanings in thermodynamics, geodesy and celestial mechanics.

**potential density** That which parcel of air would have if adjusted adiabatically to 1,000 mb (100 kPa), given by  $\rho' = p/R\theta$  where  $\rho'$  is \*\*, p is pressure at 100 kPa, R is gas constant and  $\theta$  is potential temperature.

**potential difference** Measured between any two points in conductive circuit, in volts; if between terminals of battery, when no current is flowing.

**potential energy** That possessed by mass by virtue of position in gravitational field; can yield \*\* by ‘falling’, ie moving towards region of lower \*\*.

**potential flow** Fluid motion in which vorticity is everywhere zero.

**potential gradient** Local space (linear) rate of change of potential.

**potential refractive index** That so formulated that variation with height in adiabatic atmosphere is zero.

**potential temperature** That which parcel of dry air would have if adiabatically brought to pressure of 100 kPa.

**potentiometer** 1 Variable resistance (rheostat), esp. one of precise type giving, eg, accurate radar pointing information.

2 Instrument for measuring EMF (potential differnece, esp. DC), usually without drawing current from circuit measured.

**POTS** 1 Production off the shelf.

2 Plain old telephone service, or system.

**potted device** Electronic component encapsulated in resin, mainly to give mechanical protection.

**pouce** Inch [measurement unit] (F).

**Pounce** Air-intercept code: “I am in position to engage target”.

**pound** Non-SI unit of mass, abb. lb, = 0.45359237 kg. Note, plural also lb. Strictly, not the same as force or weight of 1 lbf.

**poundal** Non-SI unit of force, abb pdl, = 0.138255 N = 0.31081 lbf.

**pound force** Abb. lbf, see *pound weight*.

**pounds per square inch** Non-SI unit of pressure, abb. lbf/sq in (psi or lb psi not recommended), = 6,894.76 Pa = 6.89476 kPa; = 14.696 ata = 2.03596 in Hg.

**pound weight** Attraction of standard Earth gravity for mass of 1 lb, abb. lbf (lb force), = 4.44822 N. See *pound*.

**pour point** Temperature established by standard pour test as lowest at which liquid, esp. fuel or lube oil, will flow.

**POV** Pigmented oil varnish.

**POW** Prisoner of war.

**Powdered** Tactical code: enemy aircraft broke up in the air.

**powder metallurgy** Production of finished or near-finished parts by fusion under heat and pressure of metal in form of finely divided powder. Usually synonymous with sintering.

**power** Rate of doing work; SI unit is watt (W) = J/s; kW = 1.34012 hp = 1.359621 cv, PS; hp = 0.745700 kW; cv, PS = 0.7355 kW.

**power amplification** Ratio of AC power at output to AC power at input circuit.

**power amplifier** Amplifier designed to deliver large

## power-assisted flight control

output current into low impedance to obtain power gain as distinct from voltage gain.

**power-assisted flight control** FCS in which power inputs assist pilot by overcoming major part of hinge moments while leaving pilot to move surfaces directly and experience direct feedback, and with difficulty control aircraft in event of system failure.

**power brake** US term for sheet-metal press, esp. one using mating male/female dies or rubber.

**power bumping** Sheet-metal forming on bumping hammer.

**power by the hour** Contract for total support of customer's engines at agreed rate per hour flown. Contractor may be O&M or OEM.

**power centroid** Point which will be selected by seeker (radar or IR) as centre of target; in case where both real target and decoy (eg flare) are visible, \*\* likely to be in space between them.

**power coefficient** In calculating propeller performance by the Drzewiecki method, a grading curve to torque component plotted against blade radius may be drawn for each pitch angle to arrive at function  $K_Q$ , constant for each value of advance ratio  $J$ ; \*\* equals  $K_Q J^2$ , and has symbol  $C_p$ . Total power absorbed is  $C_{pp} n^3 D^5$ , where  $\rho$  is air density,  $n$  rotational speed and  $D$  tip diameter.

**power control unit** Electronic box on [usually gas turbine] engine.

**power convertor** Apron vehicle or trailer converting 50 or 60-Hz current to 400 Hz.

**power density** 1 Power per unit volume (electronic device, nuclear reactor).

2 Power per unit area of beam cross-section (radar).

**power dive** Steep dive with engine at full throttle, suggest no longer relevant in jet era.

**power drive unit** 1 In floor of hold, usually electric, for positioning cargo.

2 Source of mechanical power for secondary power system, eg to actuate landing gear or flight-control surface, a recent usage.

3 More specifically, device for converting electric, hydraulic or pneumatic power into rotary or linear mechanical power.

**powered approach** One in which aircraft propulsion is giving significant thrust.

**powered ascent** That from lunar or other non-Earth surface.

**powered controls** Powered flight-control system.

**powered descent** That of Lunar Module or other soft-landing device on to surface other than Earth.

**powered flight** Flight of vehicle while self-propelled.

**powered flight-control system** Vehicle flight-control system which uses irreversible actuation such that no manual reversion is possible, though pilot may have manual override over AFCS at input.

**powered high-lift system** High-lift system in which energy drawn from main propulsion plays direct role, either by flow augmentation, flap-blowing, USB or other technique other than jet lift or use of rotors.

**powered lift** Lift resulting wholly (or in case of CC/BLC aerofoil, partly) from engine power. Almost all PL aircraft can fly at very low airspeed or hover.

**powered-lift aircraft** In 2002 FAA was defining rules for what were once called convertiplanes, with VTOL capability but [most] cruising in aeroplane mode.

## power performance index

**powered-lift regime** Flight regime in which sustained flight at below POSS is possible because lift and control moments are derived from installed powerplants.

**powered slat** One positively driven to extended position instead of being moved by its own aerodynamic lift.

**power egg** Complete ECU, usually without propeller (normally piston engine).

**power factor** 1 That by which product of alternating current and voltage must be multiplied to obtain true load,  $= \cos \phi$  where  $\phi$  is phase angle between current and voltage. [θ is also common]: p.f. =  $P$  [watts]/VI.

2 Measure of dielectric loss of capacitor.

3 In wind tunnel, ratio of driving power to kinetic energy multiplied by mass flow in working section.

**power feedback** Feedback in which significant amount of power (electrical, electronic or acoustic) is transferred.

**power folding** Folding wings by power actuation, usually controlled from cockpit and sometimes by external protected control.

**power gain** 1 Ratio of power, usually expressed in dB, delivered by amplifier or other transducer to power absorbed by input.

2 In any direction,  $4\pi \times$  ratio of radiation intensity sent out by aerial to RF power input; with strongly directional (eg pencil beam) aerial close to zero except on axis of main lobe.

**power gearbox** In a turboprop engine, that which drives the propeller.

**power head** On large machine tool, cutter and associated drive.

**power in, power out** Aircraft parks at airport and departs without use of towing vehicle.

**power in, push out** Tug is used to push aircraft from nose-in stand to taxilane.

**power jet** In traditional carburettor, fuel jet which comes into operation only when throttle advances beyond maximum-cruise position.

**power lever** Throttle, esp. for gas turbine of any kind.

**power loading** 1 For propeller-driven aeroplane,  $W/P_e$ , total mass (usually taken as MTOW) divided by total installed horsepower,  $ehp$  in case of turboprop; units  $lb/hp = 0.60864 \text{ kg kW}^{-1}$ , reciprocal 1.643. Jet equivalent = thrust loading.

2 Input shaft power divided by projected area of propeller [not propeller disc].

**power-on spin** One entered from power-on stall.

**power-on stall** Normal stall in which propulsive power is maintained at significant (eg normal cruising) level throughout; nose is raised higher to lose speed at acceptable rate and slipstream usually adds to lift, generally resulting in more extreme attitude and more violent pitchover when stall finally occurs.

**power-optimized aircraft** Research programme which aims to identify, optimize and validate aircraft equipment which reduces consumption of non-propulsive power (EC7).

**power overlap** Overlap of firing strokes in multi-cylinder piston engine; for four-stroke engine more than four cylinders are needed to make this concept of continuous power effective.

**power performance index** Computerized index of helicopter engine power corrected for atmospheric pressure/temperature, altitude, power-turbine temperature and drive torque.

## power plant, powerplant

**power plant, powerplant** 1 Those permanently installed prime movers responsible for propulsion, including their number; thus \* of L-1011 TriStar is three RB.211 turbofans (some authorities would add 'plus ST6 APU').

2 One prime mover, of any type, in complete form plus accessories, silenced nozzle, propeller and associated subsystem and, in some cases, surrounding cowling. This is a different meaning from (1).

**power port** Socket beside passenger seat for laptop or to charge switched-off mobile.

**power press** Any press whose actuation force does not derive from human muscle; need not have vertical motion.

**power processing unit** Converts electricity from solar panels into power for a Hall-effect thruster.

**power rating** Rating (1).

**power-recovery turbine** Driven by exhaust gas from piston engine to put extra power into crankshaft or other output.

**power section** Gas-generator part of engine, especially where two share a common output gearbox and drive.

**power shear** Shear for cutting heavy sheet or plate, with hydraulic ram(s) moving blade.

**power spectral density** The assumption that a random [Gaussian] process can be made up of an infinite number of sinusoidal components of infinitesimal amplitude and frequency difference.

**power spectrum** Plot of  $S_a(f)$ , signal amplitude against frequency, normally symmetrical about peak at  $f_c$  and with form varying with modulation.

**power/speed coefficient** 1 Function in propeller performance calculation, introduced by F.E. Weick;

$$C_s = \frac{J}{2C_p^{0.2}} = \frac{\rho^{0.2}V}{P^{0.2}n^{0.4}}$$

where J is advance ratio,  $C_p$  power coefficient,  $\rho$  density, V slipstream velocity, P power consumption and n rotational speed.

2 Variation of installed power or thrust with airspeed, esp. for jet engine; normally plotted at constant air density.

**power take-off** Shaft from which power is available to drive accessory or other item.

**power train** Assembly of gearwheels, shafts, clutches and possibly other items for transmitting shaft power. Generally synonymous with transmission.

**power transfer unit** Interconnection between otherwise totally separated hydraulic systems, eg Green and Yellow, which enables power to be transferred from one to the other.

**power turbine** Mechanically independent turbine (ie connected to engine only by shaft bearings and gas path) driving propeller gearbox of turboprop or output shaft of turboshaft.

**power unit** 1 Power plant (2) (not recommended).

2 Device which either generates electrical or EM radiative power or produces required currents or signals from raw AC or DC input.

3 Source of energy, other than propulsion, for missile, RPV or spacecraft where there is no shaft-driven alternator or other supply.

4 Prime mover of APU or EPU/MEPU.

**power venturi** Venturi used to operate air-driven instruments or other devices relying on suction.

**POWS** Proximity operations work-station (NASA Ames).

**PP** 1 Descent through cloud (ICAO code).

2 Present position.

3 Pilot production.

4 Peak-to-peak, also p.p.

5 See *P/P*.

6 Pre-production aircraft.

7 Probability percentage.

8 Polypropylene.

**P/P** 1 Private, or pupil, pilot.

2 Push/pull.

**Pp** Polar Pacific.

**p.p.** Peak-to-peak.

**PPA** 1 Pre-planned attack.

2 Passengers per annum.

3 Pre-production aircraft.

**PPAC** Product performance agreement center (US).

**PPARC** Particle Physics & Astronomy Research Council [Swindon SN2 1SZ] (UK).

**P/PATM** Passengers per air transport movement.

**PPB** 1 Program/planning/budgeting; ES adds evaluation system, S adds system (US).

2 Parts per billion; (M) adds by mass, (V) by volume.

3 Passenger protective breathing; E adds equipment.

**PPB&E** Planning, program review, budgeting and execution[s].

**PPC** 1 Production possibilities curve.

2 Pulse position code [uplink/downlink].

**PPCR** Product and process confirmation review.

**PPD** Proximity/point detonating.

**PPDU** Physical-layer protocol data unit.

**PPE** 1 Passengers (per year) per employee.

2 Personal protective equipment.

**PPF** 1 Production-phase financing.

2 Payload processing facility.

**PPFRT** Prototype preliminary flight rating test.

**P/PFRT** Pupil-pilot flight rating test.

**PPG** 1 Planning policy guidance.

2 Powered para-glider.

3 Pacific Proving Ground[s] (USA).

4 Pulse pressure gain [combustion].

**PPH, pph** Pounds or, less commonly, pints, per hour.

**PPhA** Passive phased-array radar.

**PPHE** Prefragmented preprogrammable high explosive.

**PPI** 1 Plan-position indicator.

2 Power performance index.

3 Photo production and interpretation.

4 Personal Proficiency Index.

5 Public/private initiative[s].

**PPIF** Precision photographic interpretation facility (pre-1980, photo processing [or production] and interpretation facility).

**PPINA** PPI (1) not available.

**PPINE** PPI (1) normal, no echoes observed.

**PPIONM** PPI (1) out for maintenance, or inoperative.

**PPL** 1 Private Pilot's Licence; (A) adds aeroplane, (AS) airship, (B) balloon, (G) gyroplane/autogyro, (GR) ground examiner, (H) helicopter, (IR) instrument rating, (microlight), (R) examiner, (SLMG) self-launching motor-glider, (X, followed by appropriate suffix) examiner authorized to conduct flight and ground tests (CAA).

2 Polypropylene.

3 State airports enterprise (Poland).

## PPLI

- 4** Pulsed plasma thruster.  
**5** Processor-to-processor link.
- PPLI** Precise participant location information.
- PPM** *1* Pulse-position modulation.
- 2** Pounds, or pages, per minute.
- 3** Production performance measurement (IATA).
- 4** Performance programs manual.
- 5** Pre-processor module.
- 6** Programmable processing module.
- 7** Periodic permanent magnet.
- 8** Pneumatic power module.
- ppm** Parts per million.
- PPMF** Permanent periodic magnetic focusing.
- PPMFD, P<sup>2</sup>MFD** Projection primary multi-function display.
- PPMS** Precision power-measurement system (EW).
- ppn** Precipitation.
- PPO** *1* Prior permission only.
- 2** President's Pilot Office.
- 3** Position pick-off; U adds unit.
- PPOS** Present position.
- PPP** *1* Synoptic chart: pressure referred to normal mean sea level.
- 2** Public/private partnership.
- 3** Point-to-point protocol (computers).
- 4** Pulse-pair processing.
- PPR** *1* Prior permission required.
- 2** Periodic performance report.
- 3** Prospective price redetermination.
- 4** Plans, programmes, [and] requirements.
- PPRM** Power plant recording and monitoring.
- PPRN** Professional pilots' rumour network (website www.pprune.org.uk, with wealth of advice for pilots and controllers).
- pprune** See Prune.
- PPS** *1* Passenger processing system.
- 2** Photovoltaic power system.
- 3** Pilot's performance system.
- 4** Polyphenylene sulphide.
- 5** Parliamentary Private Secretary (UK).
- 6** Post-production support.
- 7** Precise position[ing] service [GPS, or system].
- 8** Provisional project structure.
- 9** Precision pointing system.
- 10** Policy planning staff.
- 11** Propulsion pod system (J-Stars).
- 12** Packets per second (see next).
- 13** Propulsion prognosis system.
- pps** *1* Pulses per second.
- 2** Pixels per second.
- PPSI** *1* Probe-powered speed indicator.
- 2** Pounds per square inch [not recommended].
- PPSN** *1* Public packet-switching network.
- 2** Present position.
- PPT** *1* Perspective-pole track (HUD).
- 2** Pulsed plasma thruster.
- PPU** Power processing unit.
- PPV** Pre-production verification.
- PQ** Category, man-carrying target (USAAF 1942–47).
- PQAR** Product quality action request.
- PQC** Poor-quality cost.
- PQE** Product-quality engineer.
- PQO** Principal Quality Officer (UK).
- PQS** Personal qualification standards (USN).

## prang

- PQT** Production qualification and test.
- PR** *1* Photo-reconnaissance.
- 2** Pitch rate.
- 3** Pressure ratio.
- 4** Polysulphide rubber.
- 5** Ply rating (tyre).
- 6** Purchase request.
- 7** Periodic reservation.
- 8** Precipitation, or primary, radar.
- 9** Partial.
- 10** Procurement Regulation (US).
- 11** Public relations.
- 12** Personnel Recovery (USAF).
- 13** Programs and Resources (USAF).
- Pr** *1* Prandtl number.
- 2** Radiation pressure.
- 3** Power required [usually for level flight].
- 4** Perimeter of torsion box.
- PRA** *1* Popular Rotorcraft Association (US, office Mentone, IN).
- 2** Particular risks analysis.
- PRADS, Prads** Parachute/retrorocket air drop system.
- PRAIM, Praim** Predictive receiver autonomous integrity monitoring.
- PRAM, Pram** *1* Productivity, reliability, availability and maintainability.
- 2** Pre-recorded announcement machine [for passengers].
- Prandtl-Glauert equation** States that lift, drag or pressure coefficients at high subsonic speeds, where compressibility must be taken into account, are equal to those at lower speeds factored by Glauert factor  $(1-M^2)^{-\frac{1}{2}}$  where M is Mach number, ie
- $$C_L = \frac{C_{L \text{ [incompressible]}}}{\sqrt{1-M^2}} .$$
- Prandtl-Glauert law** That describing effect of compressibility on lift of 2-D wing.
- Prandtl interference factor** Dimensionless factor  $\sigma$  used in determining interference between wings or biplane; dependent upon ratios
- gap** and **upper span**; where both wings have mean span **lower span**; same span,  $*** \approx 0.5$  for gap/span ratio of 0.2 and about 0.375 for gap/span ratio of 0.3.
- Prandtl lifting-line** First [1918] fundamental theory for wing lift, based on  $C_L$  for the difference between geometric and zero-lift angle of attack.
- Prandtl-Meyer expansion** Original treatment of supersonic expansion round corner, in which entropy remains constant but pressure, density, temperature and refractive index all fall. Prandtl solved 2-D case in 1907.
- Prandtl number** Ratio of momentum diffusivity to thermal diffusivity,  $Pr = \mu C_p/\lambda = \nu\alpha$ , where  $\mu$  is viscosity,  $C_p$  is specific heat at constant pressure,  $\lambda$  is thermal conductivity,  $\nu$  is kinematic viscosity and  $\alpha$  is angle of attack.
- Prandtl-Schlichting** Original treatment of transition flow between laminar and turbulent boundary layers forming link curve on plot of skin-friction coefficient against Reynolds number.
- prang** To have accident, esp. to crash aircraft; also derived noun (RAF, WW2, colloq.). If written on aircraft (PRANG), Puerto Rico Air National Guard.

## PRAT, Prat

**PRAT, Prat** Production reliability acceptance test.

**Pratt truss** Basic braced monoplane.

**PRAWS** Pitch/roll attitude warning system.

**prayer mat** Portable anti-erosion mat for jet V/STOL operation.

**PRC** 1 Program(me) review committee.

2 Performance Review Commission (Eurocontrol).

3 Pilot Reliability Certification.

**PRCA** Pitch/roll control assembly.

**PRCR** Preliminary request for customer response.

**PRCS** Pitch reaction-control system.

**PRCTN** Precaution.

**PRD** 1 Program review data.

2 Primary radar data.

**PRDA** Program research/development announcement (US).

**PRDS** Processed radar display system.

**pre-balanced assembly** Gas-turbine module held in store until needed.

**precautionary flight zone** That beyond left boundary of helicopter h/V (height/velocity) curve, where safe autorotative descent is unlikely or impossible.

**precautionary landing** Practice forced landing; various techniques but invariably objective is to arrive at correct point with correct speed for minimum ground run, then overshoot without touching.

**precautionary launch** Launch of aircraft loaded with NW from airbase or carrier under immediate threat of nuclear attack, not necessarily on mission to enemy target but to preclude friendly-aircraft (ie, its own) destruction.

**precession** Rotation of axis of spinning body, eg gyro, when acted upon by external torque, such that spinning body tries to rotate in same plane and in same direction as impressed torque; ie axis tends to rotate about a line (axis of \*) normal to both original axis and that of impressed torque. Horizontal component called drift; vertical called topple.

**precession cone** That described by longitudinal axis of slender body, eg ballistic rocket, devoid of attitude or roll stabilization; two cones each having apex at vehicle c.g.

**precipitation** Moisture released from atmosphere, esp. that in large enough particles to fall sensibly, ie excluding fog and mist; examples are rain, snow, hail, sleet and drizzle.

**precipitation attenuation** Loss of RF signal due to presence of precipitation.

**precipitation drag** That caused by slush or standing water on aircraft wheels; snow not normally included in this term.

**precipitation hardening** Usually synonymous with ageing (aluminium alloys).

**precipitation heat treatment** Artificial ageing, usually preceded by solution heat treatment.

**precipitation interference** Static discharge, normally considered to be caused by precipitation and atmospheric dust, which increases ambient noise level, making some reception (eg NDB) difficult.

**precipitation static** See previous.

**precise encrypted** Accurate GPS using not only L1 (1,575 MHz) but also L2 (1,227 MHz), available only to US and Allied armed forces; abb. P(Y).

**precise local fix** An offset (3) near inconspicuous ground target.

## precombustion chamber

**precise positioning service** Self-explanatory, based on dual-frequency P-code of GPS.

**precision approach** 1 One in which pilot is provided by ground PAR controller with accurate guidance to extended centreline, informed of glidepath interception and thereafter provided with precise az/el guidance together with distance from touchdown at intervals not greater than 1 mile (rarely, 1 km). Hence, \* radar.

2 One in which ILS is used.

**precision-approach interferometer radar** Low-power ground interrogator near runway triggers replies from airborne SSR transponder received at three azimuth dishes (readout within 0.02°) and four elevation dishes (within 0.03°).

**precision-approach monitoring** Use of monopulse *ESPA* radar with fast (1s) refresh rate to give track information accurate enough for landing on parallel runways 700 ft apart.

**precision approach path-indicator** Optical aid to holding glidepath. Banks of coloured lights are precisely aligned towards incoming aircraft, red showing too low and white too high [some put green between the two].

**precision approach radar, PAR** Primary radar designed specifically to provide accurate azimuth, elevation and range information on aircraft from range of at least 10 miles (16 km) on extended centreline to threshold.

**precision bombing** Level bombing directed at specific point target.

**precision casting** One in which main surface areas are to finish dimensions, needing only drilling or trimming and surface treatment.

**precision-drop glider** Glider, usually of Rogallo type, for delivery of cargo to point target after release from nearby aircraft.

**precision instrument runway** One served by operative non-visual precision approach aid, esp. ILS; specially marked with non-precision instrument runway indications plus TDZ markers, fixed-distance markers and side stripes. See *Categories (3)*.

**precision landing system** Precise blind landing system based on GPS with civil/military interoperability. (Raytheon).

**precision runway monitor** Installation permits simultaneous landings on close parallel runways.

**precision spin** Accurately performed spin completed as training manoeuvre: entry must be positive, spin must be fully developed within quarter-turn and spin recovery must take place after prescribed number (or number and fraction) of turns.

**precision tool** One not held in hand whose positions and attitudes in relation to workpiece are established to limits closer than engineering tolerances.

**precision turn** Training manoeuvre often conducted above straight road or similar reference in which smoothness of entry, quick roll to correct bank attitude, absence of skid, correct rate of turn and proper exit on desired heading are mandatory.

**precision velocity update** Use of Doppler tracking of radar ground clutter to determine exact ground speed and drift.

**precombustion chamber** Rare ancillary chamber used in start cycle of rocket or ramjet where burning fuel is produced to act as ignition source for main chamber. Also feature of certain diesel or oil engines.

## Precomm

**Precomm** Preliminary communications search, start of SAR process.

**precursor** 1 Material such as PAN yarn from which by carbonization process carbon or graphite fibre is made.

2 Air pressure wave ahead of main blast wave in nuclear explosion of appropriate yield over heat-absorbing or dusty surface.

**predatory pricing** Price structure established by airline on particular route[s], or by manufacturer of hardware, alleged by rivals to be aimed at elimination of competition; such prices are often held to be below direct costs.

**predesignated ejection point** Location where pilot can depart in knowledge that aircraft will crash harmlessly.

**prediction** Predicted numerical value.

**prediction angle** That between LOS to target and gun line when properly pointed for hit on future position.

**predictive battlespace awareness** “A commander-driven process to predict and pre-empt adversary actions when and where we choose” (USAF).

**predictive gate** Radar range-gate sensitive to hostile frequency-hopping and ECCM.

**predictive maintenance** Not mere remote diagnostics but the synthesis of massive amounts of fleet data, overlain with AI plus the remote diagnostics from each item [eg, engine] to forecast and thus prevent any future malfunction or unscheduled maintenance.

**predictor** Mechanical computer used (1926–45) to predict future positions of target for AAA.

**predominant height** Height of 51% or more of structures within area of similar surface material subject to air reconnaissance.

**pre-emptive attack** Attack initiated on basis of incontrovertible evidence that enemy attack is imminent (DoD). Word ‘nuclear’ absent.

**preferential routes** Within an ARTCC preferential arrival (PAR) and departure (PDR) routes link an airport to an en-route point and simplify flight planning.

**preferential runway** One suggested or offered for departure to minimize local noise nuisance and afford route away from urban areas even though not optimum from viewpoint of departing traffic.

**preferred IFR route** In effect aerial motorways listed to guide long-distance pilots in US and facilitate ATC; divided into high- and low-altitude routes, some involving SIDs or STARs and one list being unidirectional (FAA).

**preflight** 1 Pre-flight inspection, and verb to accomplish same.

2 After completion of new aircraft when systems are checked and other work done prior to first flight.

**pre-flight inspection** That carried out on aircraft before each flight by flight crew, especially PIC, to broadly standard procedure which varies from type to type. Obvious tasks are to remove removables, check for fluid leaks or superficial damage, inspect tyres and landing gear and have cleared objects that could be blown by slipstream. On entering aircraft it is then necessary to \* cockpit (task sometimes performed by ground crew).

**pre-flight line** Parking line for newly completed aircraft where work is carried out prior to first flight; hence pre-flight hangar.

**prefomed cable** For flight control, one whose individual wires are preformed to final spiral, or spiral-spiral, shape; thus they do not splay out should cable be cut.

## pre-production aircraft

**prefragmented warhead** One containing large number of high-density steel balls or similar penetrative objects. Term not to be used for continuous-rod or heavy casing scored by grooves.

**pre-ignition** Fault of IC piston (esp. Otto) engine in which, due to incandescent carbon or other cause, mixture ignites before spark, and may run after ignition has been switched off.

**PreKote** Mixture of alkali soap and saline compound which promotes paint adhesion (Pantheon).

**pre-launch period** Time between receipt of alarm and take-off of manned aircraft, esp. NW carrier.

**Prelim** Preliminary data.

**Preliminary Design Review** Immediately following PD of hardware and software, the PDR is the crucial first opportunity to study the whole design against the desired requirement[s].

**preliminary flight rating test** First assessment of pupil’s aptitude.

**Preliminary System Safety Analysis** The PSSA studies system failures [especially those identified and assessed by Functional Hazard Analysis] and uses available analytical tools and procedures to improve the system and demonstrate that it will now comply with requirements. This leads to the System Safety Analysis, the final stage prior to certification.

**premate preparation** Tasks accomplished before vehicle integration, eg before Shuttle has SRBs and tank added.

**Premir** Precise multi-intelligence registration, to fuse multiple images into one display (AFRL).

**pre-owned** Not new, secondhand.

**pre-oxygenation** Breathing pure O<sub>2</sub> prior to high-altitude or space flight, period depending on duration and altitude of flight.

**PREP, Prep** 1 Pilot’s reference eye position.

2 Part-reliability enhancement programme.

3 Prepare, preparation.

4 Primary-radar engineering program.

**prepaid ticket advice** Paid for (usually in local currency) in country of destination and sent as valid ticket to passenger in country of origin. Price structure usually same as in country of origin.

**Prepha** Programme for research and study into hypersonic propulsion (F).

**preplanned air support** Air support in accordance with a program(me) planned in advance of operations.

**preplanned mission request** Request for an air strike or reconnaissance mission on target which can be anticipated sufficiently in advance to permit detailed mission co-ordination and planning.

**prepositioned** In place prior to hostilities to ensure timely support of initial operations.

**prepreg** CFRP raw material in form of oriented fibres, tows or other reinforcement impregnated with resin and supplied as sheet, strip or other form ready for final cutting and moulding, usually as number of plies with different orientation, to make product. Not relevant to product made by filament winding. Note: terminology bound to spread into boron/epoxy and many other forms of FRC construction.

**pre-production aircraft** Incorporates modifications shown to be necessary by testing prototype[s] but still short of final build-standard. Usually not sold to customer.

## preware

**preware** Software, usually paper and DVD, for self-instruction in PPL, IR or other qualification.

**pre-rotation gear** Landing gear whose wheels are spun-up before touchdown.

**pre-rotation vanes** Upstream of fan in wind tunnel to impart swirl which is eliminated by fan.

**PRES, Press** Pressure.

**Preselect** Autopilot mode to capture desired condition, usually altitude.

**presentation** 1 Geometric form, character and style of display, esp. one of electronic nature; eg PPI plus alphanumerics, line plot plus cursive writing or TV picture plus alphanumerics.

2 Presentation flight.

3 Putting up a target to be shot at with guns, SAMs or by fighters; each \* can be racetrack, snaketrack, straight line or other form.

**présentation** The merge (F).

**presentation flight** First showing of new type of aircraft to Press/customers/public, usually [unlike demo flight] in sedate flypasts.

**preset guidance** Pre-programmed autopilot determining mission in advance.

**PRESFR** Pressure falling rapidly.

**pre-simulator training** Training on Technamation and similar animated displays, with mainly dummy controls, to ensure familiarity with systems and procedures.

**PRESRR** Pressure rising rapidly.

**Press** 1 Pacific Range electromagnetic signature study (USAF, DARPA).

2 Project review, evaluation and scheduling system.

3 Pressure.

**Presselswitch** Pressure selector with manual input.

**press fit** Loose term which usually means interference fit.

**press tooling** Tooling for use in presses, such as rubber or mating male/female dies for making finished or near-finished parts in sheet; not usually applied to tools for applying curvature to plate.

**press to transmit** Pushbutton on control wheel or other inceptor enabling pilot to use R/T whilst flying manually.

**press-ups** Jet STOVL training: vertical takeoffs and landings repeated on same spot.

**pressure** Force per unit area. The SI unit is the pascal,  $1 \text{ Pa} = \text{Nm}^{-2} = 0.02089 \text{ lbf/ft}^2$ ;  $1 \text{ lbf/ft}^2 = 47.8303 \text{ Pa}$ ;  $1 \text{ kPa} = 0.29530 \text{ in Hg}$ ;  $1 \text{ in Hg} = 3.38639 \text{ kPa}$ ;  $1 \text{ MPa} = 0.0675 \text{ UK tonf/in}^2 = 151.2 \text{ lbf/in}^2$ ;  $1 \text{ lbf/in}^2 = 6.89476 \text{ kN/m}^2 = 6,894.76 \text{ Pa}$ ;  $0.0689476 \text{ bar} = 2.03602 \text{ in Hg}$ ;  $1 \text{ in Hg} = 0.49115 \text{ lbf/in}^2 = 3.38639 \text{ kNm}^{-2}$ ;  $1 \text{ in H}_2\text{O} = 249.089 \text{ Nm}^{-2} = 5.2023 \text{ lb/ft}^2$ ;  $1 \text{ bar} = 10^5 \text{ Nm}^{-2} = 750.08 \text{ mm} = 29.5307 \text{ in Hg}$ ;  $1 \text{ ata} = 101.325 \text{ kNm}^{-2} = 1.01325 \text{ bar} = 14.6959 \text{ lb/in}^{-2} = 760.01856 \text{ mm} = 29.922 \text{ in Hg}$ .

**pressure accumulator** Device for storing energy in form of compressed fluid, typically by gas (nitrogen or air) trapped above liquid (eg hydraulic system).

**pressure altimeter** Conventional altimeter driven by aneroid capsule(s) and measuring not height but local atmospheric pressure.

**pressure altitude** 1 Height in atmosphere measured as vertical distance above standard sealevel reference plane defined in pressure terms, invariably 1013.2 mb; thus height indicated by pressure altimeter set to QNE and corrected for IE (2) and PE (2).

## pressure garment assembly

2 Altitude in standard atmosphere corresponding to atmospheric pressure in real atmosphere.

3 That simulated in pressure (vacuum) environmental chamber.

4 That at which gas cell(s) of aerostat become full.

**pressure-balance seal** Disc carried by gas-turbine shaft acted upon by internal air pressure to maintain positive forward load on shaft location bearing.

**pressure breathing** Respiration of gas (eg O<sub>2</sub> or mixture) at pressure greater than ambient surrounding wearer of mask; hence \* mask. Converse of demand breathing.

**pressure bulkhead** One sealed to serve as boundary of pressure cabin or pressurized section of fuselage.

**pressure cabin** Volume in aircraft occupied by human beings in which pressure is always maintained at or above selected level (eg equivalent to atmospheric height of 2,500 m or 8,000 ft) for comfort of occupants no matter how high aircraft may ascend. Term derives from early (c1930-40) usage when \*\* was entity installed in fuselage. Today inappropriate for civil transports where entire fuselage is pressurized except for nose tip, extreme tail and cut-out for wing; preferable simply to use adjective pressurized.

**pressure chamber** Strictly, one in which environmental pressure is raised above atmospheric; decompression chamber is preferred.

**pressure coefficient** Local pressure (eg measured on surface of body such as wing) divided by dynamic pressure, thus  $C_p = P/\frac{1}{2}\rho V^2$ .

**pressure cooling** Cooling of heat-generating device (eg piston engine) by liquid maintained under pressure to raise boiling point.

**pressure-demand system** Demand oxygen system supplying at above wearer's local pressure.

**pressure differential** Difference in pressure between two volumes, eg pressurized fuselage and surrounding atmosphere, dP.

**pressure door** Sealed to form part of boundary of pressure cabin or pressurized cargo compartment.

**pressure drag** Drag due to integral (summation) of all forces normal to surface resolved along free-stream direction; most wings in cruising flight have small \*\* because adverse pressures on and immediately below leading edge are largely countered by helpful pressures over rear portion.

**pressure-drop control** Called a \* valve, \* orifice or \* system, this turbofan fuel-control unit comprises sliding variable-aperture orifices moved by a centrifugal governor controlling transmission of primary to main fuel pressure.

**pressure error** Instruments using a pitot/static system suffer from \*, made up of compressibility error and position error.

**pressure face** Side of propeller or helicopter-rotor blade formed by lower surfaces of aerofoil elements, over which pressure is usually greater than atmospheric.

**pressure fatigue** Structural fatigue induced in pressurized fuselage by repeated reversals of pressurization stress.

**pressure flap** Large fabric inwards- (rarely, outwards-) relief valve(s) in skin of airship to allow air to flow in during descent so that internal pressure shall never be significantly below that of surrounding atmosphere.

**pressure garment assembly** NASA terminology for types of space suit, without PLSS.

**pressure gradient** Rate of change of pressure along any line normal to local isobar direction, eg in atmosphere or on surface of lifting wing.

**pressure head** Combined pitot/static tubes.

**pressure height** 1 See *pressure altitude* (4).

2 That, related to standard atmosphere, at which gas cells reach predetermined super-pressure (BSI). Thus, that at which gas release valves open.

**pressure helmet** See *pressure suit*.

**pressure instruments** Flight instruments operated by air pressure difference, eg ASI, VSI and simple altimeter.

**pressure jet** Helicopter tip-drive unit comprising propulsive jet on or near tip of main-rotor blade fed with compressed air supplied along interior of blade. May or may not have provision for combustion of fuel, which if used results in combustion-\* or tip-burning. See next.

**pressure-jet atomisation** Gas-turbine injector in which fuel is first spun violently in a swirl chamber. It is then discharged through a central nozzle as a fine conical spray.

**pressure lubrication** Lube oil supplied under pressure, usually from gear pump, and ducted through drillings and pipes to main bearings and other parts (see *pressure-relief valve system*).

**pressure manometer** Liquid-filled U-tube at foot of aerostat gas cell.

**pressure-pattern flying** Technique of long-range navigation (1944–60) in which isobar patterns provided basis for flight-planning to make maximum use of following winds.

**pressure pump** That supplying fluid under pressure to closed system, eg lube oil (less often, hydraulics).

**pressure-raising shut-off valve** Successor to the traditional HP cock (HP shut-off valve), this not only shuts down the HP fuel flow (when commanded by the EEC, overspeed sensor or pilot) but also ensures that even at idle there is enough FMU or Fadec pressure to serve all functions operated by fuel pressure.

**pressure ratio** Ratio of fluid pressures between two points in flow, notably between stages of axial compressor (PRPS, per stage) or between inlet and delivery of compressor spool or entire compressor system (eg fan, IP compressor, HP compressor). For piston engines, term is compression ratio.

**pressure recovery** Also called recovered pressure, that generated in flow through duct by conversion of kinetic energy, esp. after addition of heat as in cooling radiator. When heat added can exceed stagnation pressure.

**pressure-relief valve system** Oil supply, eg for gas-turbine engine, in which delivery oil pressure is opposed by relief valve backed by spring plus atmospheric pressure via oil tank; as engine rpm increases, delivery pressure eventually forces relief valve open, spilling excess back to tank, thus holding steady pressure and flow to bearings at all flight engine speeds.

**pressure rigid airship** One combining features of rigid and non-rigid design to maintain shape and skin tension.

**pressure seal** Inflatable seal between rigid members which is pressure-tight when inflated but when deflated offers no resistance to relative motion of parts; universal in pressurized doors and canopies.

**pressure spike** Sudden change in delivery pressure from aircraft fuel tank [similar to ‘water hammer’]; there are several causes, and the spike can be violent positive or negative.

**pressure stabilized** Having structural rigidity wholly dependent on maintenance of positive internal pressure, eg Atlas missile.

**pressure structure** See *inflatables*.

**pressure suit** Suit which, when rigid-facepiece helmet is attached, completely encloses wearer's body and within which gas pressure is maintained at level suitable for maintenance of bodily function (apart from addition of comment on necessity of adding helmet, this is DoD, NATO). Also called full-pressure suit. Some US definitions call this a pressurized suit, to be distinguished from \*\* because, according to these authorities, \*\* merely ‘provides pressure upon the body . . . a pressure suit is distinguished from a pressurized suit, which inflates, although it may be fitted with inflating parts that tighten the garment as ambient pressure decreases’. This is partial-\*\*, distinction must also be drawn between \*\*, g-suit and water suit.

**pressure surface** Curved and irregular surface corresponding to particular atmospheric pressure at any time; usually plotted for 1,000 (often part below Earth's surface), 900, 800, 700, 500, 300 and 100 mb (see *contour chart*).

**pressure switch** One actuated by reaching preset pressure, esp. that in starter circuit triggered by fuel pressure.

**pressure test** Invariably means response of operative device or, esp., inflated structure, eg fuselage; objective not to measure pressure.

**pressure thrust** Product of pressure difference between rocket exhaust pressure and ambient pressure multiplied by area of nozzle; value may range from negative at SL to positive at high altitude. Rocket thrust = \*\* plus momentum thrust.

**pressure transducer** Device, based on at least eight principles, for generating output current or signal proportional to fluid pressure or pressure difference.

**pressure tube** Tube fitted to aerostat envelope or gas cell to which pressure gauge may be coupled.

**pressure vessel** Container for gas under (usually high) pressure.

**pressure waistcoat** Pressurized covering over torso, as much to resist g as to facilitate breathing at high altitude.

**pressurization** Inflation: increasing pressure in closed system. Term usually means pressurized fuselage; see *pressure cabin*.

**pressurized blade** Patented (Sikorsky) technique for early warning of crack in helicopter main-rotor blade primary structure by inflating with dry nitrogen or other gas and sealing; loss of pressure signals cockpit lamp or other alarm.

**pressurized feed** Supply of liquid rocket propellants under gas pressure.

**pressurized ignition** Piston-engine ignition system sealed and held close to sea-level pressure to reduce arcing and electrode wear at high altitude.

**pressurized tank** Tank for liquid expelled by pressurizing gas.

**Pressurs** Pre-strike surveillance/reconnaissance system.

**pre-stage** Intermediate stage of operation in start-up of large liquid-propellant rocket in which propellants are fed to main chamber by main turbopumps and ignited, but with propellant flow less than 25% of maximum; once

## Prestal

proper combustion has been confirmed, main-stage operation is signalled (ie allowing full flow).

**Prestal** Specially formulated aluminium alloy with exceptional elongation and malleability for large-deformation presswork.

**pre-stall buffet** Aerodynamic buffet induced by turbulence over wing and/or control surfaces or fixed tail giving warning of imminent stall.

**pre-stocked site** Storage of POL/ordnance at remote site which might in emergency (crisis or war) be operating base for V/StOL aircraft.

**Prestone** Trade name of family of coloured and colourless ethylene-glycol coolants.

**prestretched cable** Control cable loaded to 60% uts for 3 min. immediately before installation.

**prestrike recon** Mission undertaken to obtain complete information on previously known targets.

**pre-swirl nozzles** Ring of curved stators which impart swirl to cooling air fed to turbine disc and reduce temperature and pressure. There are many other pre-swirl applications.

**pre-tensioning** Tightening a bolt to such a degree that it is always under tension, reducing stress fluctuation in service.

**pre-TR** Rapid-switching cell which protects radar transmit/receive tube from undesirable input.

**prev** Previous.

**prevailing visibility** Horizontal distance at which targets of known distance are visible over at least half horizon; determined by viewing dark objects against horizon sky by day and moderate-intensity unfocused lights by night. Not necessarily RVR.

**preventive advisory** Resolution advisory instructing pilot to avoid certain deviations from established vertical velocity (TCAS).

**preventive maintenance** Systematic inspection, detection and correction of incipient failures either before they occur or before they develop into major defects (DoD).

**preventive perimeter** Outer perimeter formed during emergency security operations by stationing aerospace security forces at key vantage points and avenues of approach to vital areas of base (USAF).

**preview** Brief series of tests by military customer of new type of aircraft to assess potential. No longer common.

**PRF** 1 Pulse-repetition, or recurrence, frequency.

2 Primary reference fuel.

**PRFD** PRF (1) distribution.

**PRFJ** PRF (1) jitter (2).

**PRFS** PRF (1) stagger.

**PRG** 1 Program review group (US).

2 Photo-Reconnaissance Group.

3 Private pilot, rotorcraft, gyroplane (FAA).

**PRH** Private pilot, rotorcraft, helicopter (FAA).

**PRI** 1 Pulse-repetition interval, ie gap between pulses.

2 Primary.

3 Primary rate interface.

4 Performance Review Institute (Int.).

5 Performance Research Institute (affiliate SAE).

**Pride** Pulse-repetition, or recognition, interval, de-interleaving.

**PriFly** Aircraft-carrier Air Commander in Primary Flying Control.

**PRIM, Prim** Flight-control primary computer.

**primary** 1 Primary body.

## primary instability

2 Primary glider.

**primary air/airflow** 1 That mixed with fuel in primary combustion zone.

2 Airflow through engine core.

**primary aircraft authorization** 1 Total number of particular aircraft type procured in current FY (DoD).

2 Number of aircraft assigned to inventory of squadron or other unit (USAF).

**primary alerting system** Leased-circuit voice communications network formerly linking SAC HQ to operating squadrons of missiles or bombers.

**primary area** Published area along airway within which obstacle clearance is provided.

**primary body** That around which satellite orbits or to/from which spacecraft escapes or is attracted.

**primary circulation** Atmospheric circulation on gross planetary scale.

**primary combustion** That immediately surrounding burning fuel, using only a minor fraction of the total airflow; in a gas turbine most of the air is used in the secondary and dilution regions for diluting and cooling.

**primary configuration** That in which weapon system is delivered or in which its primary mission capability is contained (USAF)

**primary control** See *primary flight controls*.

**primary cosmic rays** Those reaching Earth from outer space.

**primary defect rate** Failures per unit time, usually  $10^5$  flight hours.

**primary failure** Failure of a part that is not the result of a previous failure of another part or system (FAA).

**primary effects** Of NW: blast, radiation, heat, EM pulse.

**primary flight computers** Usually three, for redundancy, link inceptors to surface power units via computers/ACE (10) units to implement control laws, protect aircraft and minimize pilot workload.

**primary flight controls** Those providing control of trajectory, as distinct from trimmers, drag-increasers and high-lift devices. Conventionally ailerons/spoilers (where latter are used for roll), elevators and/or tailplane (or foreplane) and rudder. DLC usually excluded.

**primary flight display** Electronic cockpit instrument telling pilot everything he needs to know in vertical plane, to enable him to fly the aircraft. Partnered by ND, for horizontal plane.

**primary frequency** R/T frequency assigned to aircraft as first choice for air/ground communications in an R/T network.

**primary glider** Strong and simple training glider in which no attempt is made to achieve soaring capability. Often consists of a skid on which is a lattice-frame linking wing and tail.

**primary heat-exchanger** That which removes heat from source and rejects it to atmosphere or to a secondary circuit.

**primary holes** Those through which primary air enters gas-turbine combustor.

**primary inspection** Minimum scheduled periodic lubricating and servicing check applied to aircraft and its removable equipment, including examination for defects and simple functional testing of systems such as flight controls, radio and electrics (ASCC, qualified by 'UK usage').

**primary instability** Failure of strut or other compression

## primary instruments

member through buckling (transverse movement near centre).

**primary instruments** Those giving basic information on flight trajectory and airspeed, eg traditionally horizon, turn/slip,ASI, VSI and altimeter. Heading information not included.

**primary lighting** Usually that essential for safe flight; cockpit lighting, navigation, rotating beacon, icing, formation.

**primary member** Any part of primary structure, though not usually applied to sheet or machined skin.

**primary modulus of elasticity** That for sandwich or other multi-component material below yield point (if applicable) of weaker component.

**primary nozzle** 1 That through which main flow of fuel passes in fuel burner or injector.

2 That for primary air to combustor or airflow through pipe of vaporizing burner.

**primary radar** One using plain reflection of transmitted radiation from target, as distinct from retransmission on same or different wavelength.

**primary runway** Used in preference to others whenever conditions permit.

**primary space launch** One starting from Earth.

**primary stress** Basic applied tension or compression, as distinct from stresses induced by deflection of structures such as buckling.

**primary structure** That whose failure at any point would imperil safety.

**primary surveillance radar** In ATC system, determines aircraft range and azimuth in controlled airspace.

**primary target** Main target of surface-attack mission.

**primary trainer** That on which pupil pilot begins flight instruction, also called ab initio, elementary (but not basic).

**primary zone** See *primary combustion*.

**PRIME, Prime** 1 Precision recovery including manoeuvrable re-entry.

2 Products comprising interdependent mechanical and electronic parts.

**prime** See *prime contractor* or *priming*.

**prime airlift** Number of aircraft of force that can be continuously maintained in cycle: home base, on-load base, off-load base, recycle.

**Prime Beef** Worldwide Base Engineer Emergency Force for direct combat support or to assist recovery from natural disasters (USAF).

**prime contact** That for entire responsibility for design, development and (usually) assembly and test of complete functioning system, eg aircraft, missile etc. Manufacture, esp. in production, may be assigned by prime contractor to other companies or shared by consortium. An essential is control of programme management. (Strict DoD definition: any contract entered into directly by DoD procuring activity).

**prime contractor** That awarded prime contract.

**prime crew** 1 Crew of strategic bomber/tanker/ICBM flight with long experience of combat duty.

2 That assigned to fly space mission (see *back-up crew*) (NASA).

**prime maintenance organization** A maintenance partner to shoulder airline's engineering responsibilities.

**prime meridian** Longitude 0°.

## priority designated

**prime mission** This emerged as Pentagonese in 2004; it varies according to class of aircraft.

**prime mover** 1 Source of mechanical energy, eg engine.

2 In military sense, surface vehicle designed chiefly for towing and normally accommodating crew, ammunition etc.

**primer** 1 Subsystem, usually energized by hand-pump in cockpit, for spraying fuel into piston-engine inlet manifold (rarely, elsewhere) to facilitate starting from cold.

2 Pressure-fed injector of atomised fuel towards igniter in vaporising combustor to initiate combustion in starting cycle.

**priming** 1 Use of primer.

2 Sensitive high explosive for detonating main charge.

**priming pump** Primer.

**principal axes** 1 Traditionally, those orthogonal axes which eliminate product of inertia terms from equations of motion. Modern computers make these redundant.

2 Axis of relative wind.

3 Principal inertia axis.

4 Rectilinear axes in plane of cross-section of structural member about which moment of inertia is maximum and minimum.

5 Loosely, any reference axes OX/OY/OZ.

**principal axis of symmetry** In most aircraft, the longitudinal axis, OX or X-axis.

**principal inertia axis** That line passing through c.g. and usually in place of symmetry about which long, slender body tends to rotate when rolling; in case of aircraft actual axis of rotation normally lies between this and wind axis.

**principal parallel** On oblique photograph, line through principal point parallel to true horizon.

**principal plane** On oblique photograph, vertical plane containing principal point, perspective centre of lens and ground nadir.

**principal point** On oblique photograph, foot of perpendicular to photo plane through perspective centre, usually determined by joining opposite collimating or fiducial marks.

**principal site concept** All prototypes of new combat aircraft do entire flight-test programme at one customer central site under close customer control (USN).

**principal tensile stress** For cutout in pressurized cylinder, that along axis where stress is maximum, hence \*\*\* factor, = maximum \*\*\*/hoop stress. For neutral hole (ellipse in proportions  $2/\sqrt{2}$ ) \*\*\* = hoop stress.

**principal vertical** On oblique photograph, line through principal point perpendicular to true horizon.

**Prind** Present indication.

**printed circuit** Electric or electronic circuit formed by deposition of conductive and/or semiconductive material on insulating base; many techniques and many substrates, eg thin/thick film, foil etc.

**printed-circuit board** Printed circuit on rigid substrate provided with multiple plug-in or other contact terminals and on which are mounted discrete devices.

**printed communications** Telecommunications network providing printout at each terminal of all messages.

**print reference** Identifying reference of each air-reconnaissance photograph.

**print-through** Unwanted transfer of strong signals from one part of magnetic tape to one pressed against it on spool.

**priority designated** Two-digit number from 01 to 20

## priority induction

resulting from combination of assigned force/activity designator and local urgency-of-need designator (USAF).  
**priority induction** Immediate transfer to USAF of Air Force Reserve members who fail to participate in training.

**prior permission** 1 That which must be granted by appropriate national authority before start of flight(s) landing in or flying over territory of nation concerned.

2 Specific permission to land at particular airfield within particular times.

**Prism** 1 Programmed real-time information system for management (Northrop/USA).

2 Panchromatic remote-sensing instrument for stereo mapping.

3 Photo-reconnaissance intelligence strike module.

4 Portable resource for the investigation of suspected Manpads.

5 Planning tool for resource integration, synchronization and management (DoD).

**prisoner nut** Lock nut.

**private aircraft** One owned by private pilot.

**private flight** One made by private pilot from one airfield to another [see *pleasure*].

**private pilot** One licensed by national authority to fly particular type, class or group of aircraft without payment, and precluded from carrying fare-paying passengers.

**private venture** Major product designed, developed and tested at company risk, esp. in case of military aircraft not requested by government.

**PRJMP** Pressure jump.

**PRKG** Parking.

**PRM** 1 Presidential review memorandum.

2 Precision runway monitor[ing].

3 Proposed rule-making.

4 Positive Release Message.

**PRMD** Pilot's repeater map display.

**PRN** Pseudo-random noise.

**P-RNAV** Precision RNAV, accurate  $\geq 1$  nm (1.8 km), adequate for TMAs.

**PrNK** Pritsino navigatsionniy kompleks. Nav/attack system (USSR, R).

**PRNSA** Pseudo-random noise signal assembly.

**PRO** 1 Anti-rocket (ie anti-ICBM/SLBM) forces (USSR).

2 Procedures and Requirements Overview (ICAO).

3 Public Records Office (Kew, UK).

**PROAR** Area forecast, height indicated in pressure units (ICAO).

**Pro-ATN** Prototype aeronautical telecoms network (Euret).

**Proavia** Paris-based international airport trade organization, 39 members.

**PROB** Probable, *probability percentage*, of weather.

**Proba** Project for on-board autonomy.

**probability density function** The probability that a random vector will lie within the differential region  $d\xi$  centred at  $\xi$ .

**probability percentage** Likelihood of prediction in Met. report; only two are used, 30% and 40%.

**probable** 1 See *probably destroyed*.

2 Qualifying term in photo interpretation where facts point to object's identity without much doubt (ASCC).

**probable errors** In range, deflection, height of burst etc, those which are exceeded as often as not (DoD).

## production

**probably destroyed** Assessment on enemy aircraft seen to break off combat in circumstances which lead to conclusion it must be a loss, though not actually seen to crash (DoD, NATO).

**Probag** Installation for heat-shrink-wrapping baggage.  
**probe** 1 Instrument boom; see \* *errors*, \* *parameters*.

2 Rigid receiving tube for fuel passed by flight-refuelling drogue.

3 Any device used to obtain information (esp. quantified) about environment, esp. unmanned instrument-carrying spacecraft.

4 In particular, a sensor which leaves an orbiter and descends to planetary surface.

5 Loop or straight wire for coupling to waveguide and extracting energy from electric or magnetic component of radiation.

6 Transducer which converts shaft speed, sensed as sinusoidal magnetic field from toothed wheel on shaft into alternating signal current; also called MSP.

7 The sensing element in a magnetic chip detector.

**probe and drogue** British (Flight Refuelling) method of refuelling aircraft in flight.

**probe errors** Those originating in probe (1), as far as possible corrected by ADC.

**probe parameters** Subject to particular installation can include AOA, yaw/sideslip, total pressure, total temperature and static pressure.

**PROC** 1 Procedure.

2 Procurement.

**procedure alpha** Ceremonial manning of flight deck of carrier, eg when entering harbour, often with crew arranged to spell vessel's name or a slogan.

**procedure manoeuvre** Accurately flown and/or timed flight manoeuvre for identifying or ATC purpose.

**procedure turn** Flight manoeuvre in which turn is made at constant rate away from track followed by constant-rate turn in opposite direction to enable aircraft to capture and hold reciprocal; precision manoeuvre used in radio range, holding over point fix prior to joining stack, joining ILS without radar vectoring, or in simulator training of traditional (Link) type. Designated left or right depending on first turn direction.

**process annealing** Heating ferrous alloys to below critical temperature followed by cooling in air or other medium.

**Procon** Protocol convertor.

**Procod** Production cost by drawing number.

**Procru, ProCru** Procedure oriented crew-station model.

**procurement** Process of obtaining personnel, services, supplies and equipment (DoD).

**procurement lead time** Interval in months between initiating procurement action and receipt into supply system of production article; composed of sum of administrative lead time and production lead time (DoD).

**prod** Make probe/drogue inflight-refuelling contact (colloq.).

**product definition data interface** Standardizes digital descriptions of part properties and configurations required by manufacturer.

**product improvement** Significant change in design of hardware to improve desirable features, and marketed as such; usually initiated to meet market need, either because of competition or to rectify deficiency.

**production** Ideal \* is manufacture of successive items

## production base

which are identical, also called series \*. With complete aircraft successive items tend to differ in furnishing, equipment and even engine type.

**production base** Total national production capacity available for manufacture of items to meet material needs (DoD).

**production investment** Funding for tooling, or the cost of same.

**production lead time** Time between placing contract and receipt of hardware; subdivided according to whether contract is initial or reorder.

**production phase** Period between production approval until last item is delivered and accepted.

**productive potential** Payload multiplied by range.

**productivity** In airline performance, traffic units (eg LTM) generated per hour per aircraft of particular type or per employee.

**product life cycle** See *life cycle*.

**product support** Assistance provided by manufacturer to all customers throughout period of product's use in form of training, publications, spare parts, modification kits, product-improvement and immediate response to difficulties.

**PROF** Profile.

**Profi** Product, or project, financing (multinational).

**proficiency student** One on refresher course.

**proficiency training** Flight training for desk-bound flight personnel.

**profile** Outline of body in side elevation; many sub-meanings. Common use is to describe shape of cross-section of wing or other aerofoil section. Outboard \* is external shape of body, esp. aircraft fuselage. Inboard \* is longitudinal cross-section showing how interior is utilized. Flight \* is orthogonal projection of flightpath on vertical surface containing nominal track showing variation in height (either AGL or AMSL) along straight bottom axis representing track.

**Profiledata** Library of NC-machining software (Ferranti).

**profile descent** Uninterrupted from TOD (1) to interception of glide-path.

**profile drag** Total drag minus induced drag; sum of form drag and surface-friction drag. One interpretation suggests 'drag of wing with camber and twist removed'.

**profile-drag power loss** That expended in overcoming total profile drag of propeller blades.

**profile line** Profile of terrain, eg near airport drawn as map inset.

**profile milling** Milling variable profile (surface levels) in plate, eg in machined or integrally stiffened skin panel.

**profile template** Template for hand-guided machine tool, eg router.

**profile thickness** Maximum distance between upper and lower contours of aerofoil profile, each measured normal to mean line; essentially wing thickness.

**profilometer** Instrument for measuring surface roughness.

**PROG** 1 Prognosis, prognostic, progress.

2 In particular, progress page on MCDU.

**prognostic chart** Forecast of meteorological elements for specified time and location depicted graphically.

**prognostics and health monitoring** System assigned to notice small change in component performance and trigger maintenance action to prevent failure.

## prohibited area

**prograde** Direct, or progressive orbit; satellite launched into Earth orbit with inclination from 001° to 179°.

**program** 1 Vast topic, covered in EDP (1) dictionaries; simplest definition is group of related instructions which when followed by computer will solve a given problem.

2 Programme (US).

**program acquisition unit cost** Includes average procurement unit cost plus the unit slice of the total R&D cost since program inception. These are sunk costs, and do not affect price paid for production aircraft (DoD).

**Program Aircraft** Total of active and reserve aircraft (USAF).

**programmable** Capable of being controlled by different programs by change of software.

**programmable display generator** Generator of 3-colour raster formats plus calligraphic symbology, all under variable software control.

**programme** Life history of major project, typified by such \* milestones as definition of requirement, feasibility study, project definition, engineering design, hardware manufacture/development/flight test, flight development, service clearance (eg qualification or certification), production, modification and product-improvement, fault-rectification, phasout.

**program(me) element** Portion of giant system (eg, SDI) which is broken down to facilitate assignment of tasks to companies or participating nations.

**programmer** Human being engaged in programming.

**programmer comparator** Versatile automatic testing station providing serial evaluation of all kinds of analog and digital signals, eg in checking avionic systems in aircraft, missiles or spacecraft.

**programming** Art of preparing set of terms and instructions which EDP (1) machine can understand and obey and which when followed by that machine will result in solution to problem for which program was written.

**progressive burning** See *progressive propellant*.

**progressive die** One which performs series of operations (usually on sheet metal) at successive strokes of press.

**progressive feel** Artificial feel proportional to dynamic pressure.

**progressive orbit** See *prograde*.

**progressive powder** Solid fuel, usually not gunpowder, which burns increasingly fast as combustion pressure increases.

**progressive propellant** Solid rocket-motor grain so shaped and ignited that area of combustion, and hence speed of burning, rate of consumption and thrust, all increase throughout period of burn. Any radial burning technique tends to be \* unless original grain has deep star centre such that combustion area is constant (neutral burning).

**progressive servicing** Servicing performed at military airbase where major tasks are subdivided into sections performed at times fitting in best with operational readiness requirements.

**progressive stall** Ideal stall quality where breakdown of wing flow occurs gradually, with well-signalled symptoms; to obtain it a breaker strip or fence may be needed.

**progressive strip** See *Flight progress strip*.

**Proh, proh** Prohibited.

**prohibited area** Airspace of defined dimensions identified by area on surface within which flight by aircraft is prohibited, usually for reason of national security or to

safeguard wildlife. Height ranges from surface to published value such as 4,000 ft or 18,000 ft (FAA).

**Proj** Projection.

**project** Planned undertaking of something to be accomplished (DoD).

**Project Blue Book** Official dossier on UFOs (USAF).

**project cycle** Life history of platform or weapon system [concept, not individual examples].

**project design** Programme phase in which design is refined by evaluating alternative choices, making performance/capability/cost trade-offs and ultimately arriving at optimized configuration on which engineering design can begin. Work possible in this stage includes tunnel testing, cockpit mock-up improvement and basic systems design, but excludes stressing (detail engineering design).

**projected area** Area projected from 3-D surface to plane, or from one plane to another.

**projected blade area** Area of propeller or other blade projected on to plane normal to axis of rotation; solidity is not based on this but on total area.

**projected flightpath** That which aircraft, esp. aeroplane, will follow in immediate future in absence of further disturbance.

**project engineer** Engineer assigned to oversee design and technical management of specific project, reporting to chief engineer or v-p engineering.

**projectile velocity** Resultant of muzzle and aircraft velocities.

**projection** In cartography, any systematic arrangement of parallels and meridians portraying quasi-spherical planetary surface on plane of map.

**project officer** Military or civilian individual responsible for accomplishment of project; usually limited-duration appointment and not one already established within organizational and supervisory channels (USAF).

**projector** 1 Illuminating source sending out pencil beam of visible light, eg vertically up at cloudbase.

2 Long-dash broken line to show projection of line or surface from one plane to another in engineering drawing (drafting).

**projector (approach) sight** Mirror sight or similar landing guidance optical system on carrier.

**proliferation** Spread of NWs to additional nations.

**PROM, Prom** Programmable read-only memory.

**promethium** Pm, radioactive metal, among other things used in small batteries, MPt 1,168°C, density 7.2.

**prominent target** One which predominates over chaff and other decoys.

**Promis** Procurement management information system.

**promulgated** Published openly; eg \* in ACIs, or VOR beacon \* range, in latter case \* in Air Pilot and various flight guides.

**prone** Lying down; invariably \* pilot positions are supported mainly on front of torso and thighs at angle of about 20° with head up to look ahead and toes supported in rear pedals.

**Pronto** 1 Code: as quickly as possible (DoD).

2 Program for NC tool operation, acronym.

**prontour** Chart used to forecast future pressure-surface contours.

**prony brake** Simple mechanical peripheral-band brake whose torque, multiplied by shaft speed, gives brake horsepower.

**proof factor** Arbitrarily assigned factor of safety imposed above proof load; for UK civil aircraft \* is 1, thus proof and limit loads are same; for UK military aircraft \* is 1.125, thus proof load is  $\frac{1}{8}$  higher than limit load. See *ultimate factor*.

**proofing** Treatment of fabric to render it gastight or water-resistant.

**proof load** Design limit load  $\times$  proof factor. Maximum which primary structure is designed to bear whilst remaining serviceable. This vague definition survives in official publications, yet does not mention fatigue effect of repeated loading.

**proof of concept article** Prototype.

**proof positive/negative** Two sets of proof loads established for particular aircraft type and demonstrated in static test.

**proof strength** That required to survive proof loads (pos/neg).

**proof stress** Stress at yield point.

**prop** Propeller, or aeroplane with propeller[s] (colloq.).

**propaganda balloon** Free balloon carrying propaganda leaflets scattered at timed intervals when prevailing wind is expected to carry it over enemy cities.

**propagation constant** Complex quantity of plane wave; real part is attenuation constant (nepers/unit length) and imaginary part is phase constant (radians/unit length).

**propagation error** In ranging system, algebraic sum of propagation velocity error and (important at long ranges and low angles) curved-path error.

**propagation rate** Linear velocity of structural crack.

**propagation ratio** Between two points in path of plane wave, ratio of complex electric field strength.

**propagation velocity** For EM wave (light, radio) in vacuum taken to be  $2.997925 \times 10^8$  m/s.

**propagation velocity error** Difference between assumed and effective velocities over ray path.

**propane** Gaseous hydrocarbon of paraffin series,  $\text{CH}_3\text{CH}_2\text{CH}_3$ , BPt -45°C.

**prop banners** Sleeves, usually bright Day-Glo colour, announcing (eg) FOR SALE, FOR RENT, slipped over blades.

**propellant** Medium used for propulsion, as in \* charge of gun ammunition or material burned to form jet of rocket. Rocket \* can be solid, liquid or gas, or combination. Where two are mixed rocket is bi-\*<sup>1</sup>, common mixture being fuel plus oxidant (oxidiser). Where catalyst is consumed and adds to jet this also is \*. In uncommon case where single liquid is used rocket is mono-\*. In rockets and thrusters where no chemical combustion takes place preferable to use term 'working fluid'.

**propellant mass fraction** See *mass ratio*.

**propellant specific impulse** See *specific impulse*.

**propellant volume** Total volume occupied by propellant, esp. solid grain, V<sub>p</sub>.

**propeller** Rotating hub with helical radial blades converting shaft power into aerodynamic thrust. Shaft power provided by human or prime mover. Tip-drive \* possible (would require modified definition). Most existing definitions state 'power-driven', implying use of engine. Left and right-hand rotation respectively mean anti-clockwise and clockwise seen from behind. Can be pusher or tractor, latter at one time often being called airscrew (now arch.). Types of propellers (co-axial, reverse-pitch etc) are covered separately (see also

## propeller angle of attack

**propulsor**). Similar screw for converting energy of slip-stream into shaft power is windmill or RAT (ram-air turbine). Note : in 1930–50 UK usage resulted in a 1939 glossary having the entry ‘Propeller : colloquial term meaning “airscrew”’.

**propeller angle of attack** Angle between axis of rotation and free-stream airflow, usually close to zero, one symbol  $\alpha_p$ .

**propeller area** Usually means total area of blades obtained by integrating total of areas of elementary chordwise slices, taking blades as having no thickness; ie each slice is projected in plane of its local chord. Essentially same as outline area of blades with twist removed.

**propeller balance stand** Trestle having two horizontal and parallel steel knife-edges (about 1–3 mm radius) on which propeller can be balanced on short slave-shaft.

**propeller bar** Handtool used to loosen or tighten main retaining nut on many lightplane propellers.

**propeller blade** Thrust-generating aerofoil of propeller.

**propeller blade angle** Except in feathered position (when close to 90°) acute angle  $\beta$  between chord line of blade measured at standard radius and plane of rotation, latter being normal to axis of rotation.

**propeller blade-width ratio** Ratio of widest chord to propeller diameter.

**propeller brake** Brake to stop rotation of propeller after engine shut-down, either to speed passenger disembarkation or, in case of free-turbine engine, to prevent prolonged windmilling with aircraft parked.

**propeller camber ratio** Ratio of blade maximum thickness to chord at any station.

**propeller cavitation** Generation of near-vacuum on suction face near tip at high Mach numbers (not necessarily at high flight speed).

**propeller characteristic** Fundamental curve of  $V/nD$  (velocity of advance divided by rpm × diameter) plotted against  $C_c$  (speed/power coefficient) (see Weick).

**propeller disc** Circular area swept out by propeller.

**propeller efficiency** Useful work expressed as thrust imparted divided by power input; thrust  $hp/shp$  = thrust  $\times$  slipstream velocity divided by  $2\pi nQ$  where  $n$  is rpm and  $Q$  is drive torque. Some authorities cite two values of \*\*, one called net (net thrust  $hp/shp$ ) and the other propulsive (propulsive thrust  $hp/shp$ ).

**propeller governor** Usually simple centrifugal governor which keeps shuttle valve oscillating about null position feeding oil to increase or decrease rpm and thus hold rotational speed constant irrespective of aircraft forward speed.

**propeller hub** Central portion of propeller carried on drive-shaft, usually made as separate unit into which blades (with simple fixed-pitch propeller, whole propeller) are inserted.

**propeller interference** Aerodynamic effects, mainly drag, of bluff bodies immediately downstream, eg radiator or cylinders.

**propeller pitch** The angular setting of the blades of a propeller. The *blade angle* ( $\theta$ ) is the angle between the chord at any element (station) on the blade and the axis of rotation. The *helix angle* ( $\phi$ ), also called the *angle of advance*, is the angle between the actual direction of motion (velocity) at any element relative to Earth and the actual direction of motion relative to the aeroplane; it is

## propeller wash

equal to the blade angle minus the angle of attack ( $\alpha$ ). The *geometric pitch* ( $p$  or  $P$ , rarely  $H$ ) is a linear dimension equal to the distance any blade element would move forward in one revolution in absence of any slip ( $= 2\pi \tan \phi$ ); it is likely to be almost constant from root to tip. This is sometimes called *aerodynamic pitch*, represented by  $\lambda$ . *Experimental pitch*, also called *ideal pitch*, is the distance the propeller would move forward in one revolution when giving neither thrust nor drag. Actual pitch, also called *effective pitch*, or *practical pitch* or *advance per revolution*, is the distance travelled forward relative to the atmosphere (not to the slipstream). Standard pitch, also called nominal pitch, is the pitch angle at *standard radius*. The *pitch ratio* is the ratio of geometric pitch divided by the circular distance travelled by the blade tip (circumference). The *effective pitch ratio* is the ratio of effective pitch divided by the tip circumference, often expressed as  $V/\pi nd$  where  $V$  is TAS and  $n$  rotational speed in compatible units. The ratio of effective pitch divided by ideal pitch, expressed as a percentage, is called *slip*. Other characteristics include *power coefficient*  $P/\rho n^3 d^5$ , where  $P$  is shaft power and  $\rho$  air density, and *thrust coefficient*  $T/\rho n^2 d^4$ , where  $T$  is thrust. All the above apply to a fixed-pitch propeller. When pitch is variable, *fine pitch* enables maximum power to be achieved for takeoff, *coarse pitch* enables high TAS to be achieved with fuel economy in cruising flight, *reverse pitch* sets the blades at a negative angle of attack to shorten the landing run, with the engine delivering high power, and *feathering pitch* sets the blades edge-on to the oncoming air so that, with the engine inoperative, torque imparted by the air to the inner part of each blade exactly neutralizes that over the outer part, thus stopping rotation.

**propeller rake** See *rake* (3, 4).

**propeller root** On a simple fixed-pitch propeller, where a blade joins the hub; on a propeller with separate inserted blades, where the blade joins the shank.

**propeller rotational speed** Angular velocity, denoted by  $n$  [usually rps] or  $\omega$ [rad/s].

**propeller shaft** That on which propeller is mounted.

**propeller shank** The innermost part of each blade, normally inside the spinner, gripped by the structure of the hub and incorporating the drive for changing pitch.

**propeller solidity** See *solidity*.

**propeller speed** Propeller rotational speed, but often rpm.

**propeller standard radius** In US by custom, 75% of tip radius; elsewhere, usually 66.6%, symbol  $P_s$ .

**propeller state** Normal condition of helicopter main rotor in which thrust is in opposite direction (upwards) to flow both through and outside rotor disc.

**propeller thrust** That imparted by the aerodynamic force on the blades through the hub to propel the aircraft, symbol  $T$ , normally  $= P\eta/V$  ( $\times 550$  in Imperial measures), where  $P$  is shaft power,  $\eta$  propeller efficiency and  $V$  true airspeed.

**propeller tipping** Metal skin on tip and outer leading edge of soft (eg wood) blade.

**propeller torque** Torque imparted by propeller drive shaft and reacted by aerodynamic rolling moment of aircraft (usually to some degree in-built) or asymmetric load on left/right main gears on ground; symbol  $Q$ .

**propeller turbine** See *turboprop*.

**propeller wash** Slipstream, esp. on ground; also called prop blast; see *propwash*.

## propeller width ratio

## prototype

**propeller width ratio** Product of blade-width ratio and number of blades; akin to solidity.

**propelling nozzle** That at exit from fluid jet system used for propulsion, esp. turbojet or ramjet; for supersonic flight variable in shape (con-di) and area.

**propfan** 1 Advanced propeller for use at high Mach numbers, characterized by having six to 12 blades each with thin, sharp-edged lenticular profile and curved scimitar shape, overall solidity exceeding unity and loading being high. Can be tractor or pusher, shrouded or open, and for highest efficiency at about Mach 0.8 has two contra-rotating units.

2 Complete engine whose thrust is generated by (1).

**propjet** See *turboprop* (colloq.).

**proportional control** Effect at output, eg surface movement, is proportional to input, eg stick movement; opposite of flicker or bang-bang.

**proportional flow control** A fuel control system for large turbofans in which main flow is adjusted by precision control of a small parallel flow [often incorporating a pressure-drop control connected to a kinetic valve].

**proportional navigation** Control of trajectory in order to home on target by changing course by several times (typically 3.5) rate of change of sightline to target; thus angular rate of velocity vector is proportional to angular rate of line of sight to target.

**proposal** Formal and comprehensive document in which manufacturer sets out before government procurement officials complete technical specification and performance of proposed item, including timing and prices of development and, possibly, production programme.

**proprioceptive** Pertaining to stimuli produced within body, esp. human body, by proprioceptors.

**proprioceptor** Internal receptor for stimuli, such as tendon tension, originating in somatic organ. Body balance maintained by \* plus eyes and ear laybrinths.

**propotor** 1 Large propeller[s] of VTOL aircraft whose axis can be rotated 90° to give lift.

2 Convertiplane with fixed-axis propeller[s] and lifting rotor.

**prop strike** Tips of propeller[s] hitting ground, eg on takeoff.

**propulseur d'appoint** Strap-on-booster (F).

**propulsion efficiency** Term not recommended (see *propeller efficiency*, *propulsive efficiency*).

**propulsion integration** The aerodynamic integration of the propulsion system into the air vehicle, ignoring physical [structural] considerations.

**propulsion system** Sum of all components which are required to propel vehicle, eg engine, accessories and engine-control system, fuel system, protection devices, inlets and cooling systems.

**propulsive duct** Not recommended; usually means pulsejet or subsonic ramjet.

**propulsive efficiency** 1 Broadly, energy imparted to vehicle as percentage of energy imparted to jet (from propeller or other prime-moving device) or expended in burning fuel. Basic equation is Froude efficiency  $\eta_F = 1/(1 + \delta V/V)$  where V is velocity of vehicle and  $\delta V$  is total increase in velocity of air in jet measured as difference between air well ahead of vehicle and that at fastest-moving part of jet (with propeller this is well behind plane of blades but with turbojet probably in plane of nozzle exit). Theoretically but not practically  $\delta V$  could

be zero and jet would remain stationary with respect to free-stream;  $\eta_F$  then is 100%. Another expression for same relationship is  $\eta_F = 2/(R + 1)$  where R is ratio of jet velocity relative to vehicle velocity, which in theoretical perfect case becomes unity. This can also be written  $\frac{TV}{p}$ , thrust times free-stream V divided by engine power.

Another treatment is \* =  $\frac{\text{work done on aircraft}}{\text{energy imparted to jet}}$

which reduces to  $\frac{2V}{V+V_j}$ , where V is aircraft speed and  $V_j$  is jet.

2 Some authorities insist definition is input energy from burning fuel divided by energy of jet, allowing for all engine losses, expressed as percentage.

**propulsor** 1 Multi-bladed fan, usually with variable pitch or constant-speed control, used as superior alternative to propeller; in most cases surrounded by profiled duct.

2 Since 1980 US usage has introduced a different meaning: the core of a turbofan engine, comprising compressor, combustor and HP turbine.

**propwash** Airflow caused by propeller alone, usually helical but velocities are measured in axial directions only.

**propylene oxide** Stable liquid used in rapidly dispersed form as fuel/air explosive.

**proration** Actual yield of fares to carrier.

**PRORO, Proro** AFS code: route forecast with height indication in pressure units.

**PROSAB** Parachute flare (USSR, R).

**Prosat** Promotional satellite.

**pro-spin** Tending to initiate, sustain or accelerate spin.

**protected angle** Selected (usually solid) angular limits of DOA within which received signals are accepted and amplified.

**protected range** Limits (eg of radius and altitude) within which ground navaid or landing aid is protected against interference.

**protected system** One incorporating maximum security to allow electrical transmission of classified plain language.

**protection ratio** Ratio of wanted to unwanted received signal strength, eg in VOR, ADF, NDB etc.

**protective breathing equipment** Filtering mask donned by airline cabin crew in event of fire in cabin.

**protocol** Set of rules for format and content of messages between communicating processors or processes.

**protocol control information** Exchanged between peer [open-systems] members to co-ordinate joint information.

**protocol data unit** The N-PDU combines the N-PCI with the N-UD or N-SDU, the total information transferred between peer network members.

**protoflight model** Qualification model of spacecraft that is later actually flown in space.

**proton** Positively charged elementary particle of mass number 1, actual mass  $1.6726231 \times 10^{-24}$  g, forming part of every complete atomic nucleus; charge magnitude equal but opposite to that of electron e.

**proton-magnetometer** Family of devices usually used in space instrumentation in which field strength is measured by investigating effect upon atomic nuclei (eg NMR and Larmor precession).

**prototype** First example(s) built of item intended for

**PROV**

production; as far as possible representative of definitive article but usually inevitably deficient in many respects. In case of modern aircraft traditional \* now rare; with civil programmes production is initiated in parallel with engineering design/development and even first examples are likely to be sold. With military aircraft first batch may be termed development aircraft. Aerodynamic \* merely has correct shape. Breadboard or brassboard \* is used to develop avionics. Purpose of \* is to assist development; secondary role is to permit customer evaluation.

**PROV** Provisional (ICAO).

**proverse rudder** Application of rudder to augment roll commanded by lateral control system.

**proving flight** Unscheduled flight by new type of commercial transport over intended routes by crew at least partly provided by customer to establish compatibility with sectors, aids, airfields and, esp., terminals and airline's ground equipment and staff.

**proving ground** Military area dedicated to testing of ordnance, esp. of new types.

**provisioning** Precisely calculated schedule of necessary spare parts, types, numbers, prices, dates and locations to support operation of functioning system, eg commercial transport, fighter, radar or computer.

**PROX** Proximity, or GPWS.

**proximate splitter** Term coined (Pratt & Whitney) for aerodynamic flow splitter added to eliminate afterburner light-up pulsations in afterburning turbofan from reaching compressor.

**proximity fuze** Fuze which initiates itself by remotely sensing presence, distance and/or direction of target or associated environment by means of signal generated by fuze or emitted by target or by detecting disturbance in natural field surrounding target (DoD). Can be radio (radar), IR, visual (EO), acoustic or magnetic.

**proximity operations work-station** Enables Astronaut or other human to control motion of real or simulated manned or unmanned vehicles in space.

**proximity scorer** Hit/miss device triggered by entry of munition into spherical volume with scorer at centre; indicates only that munition entered this volume, without giving miss-distance.

**proximity switch** Switch today used in place of microswitch in exposed locations (MLG, trim tab etc) to signal mechanical position; usually variable-reactance sensor feeding micro-electronic module. Normal principle is proximity of target plate of high-permeability metal to sensor, giving varying voltage across bridge.

**PRP** 1 Premature-removal period.

2 Pulse recurrence (or repetition) period = 1/PRF).

3 Parent rule point.

4 Power-deployed reserve parachute.

5 Personnel reliability program (DoD).

6 Propulsion replacement program (ICBM, USAF).

**PRPA** Professional Race, or Racing, Pilots' Association [affiliate of NAA, office at VanNuys, CA] (US).

**PRPS** Pressure rise per stage.

**PRR** 1 Premature-removal rate.

2 Power ready relay.

3 Production, or processing, readiness review.

4 Pulse-repetition rate.

**PRRC** Pitch/roll rate changer assembly.

**PRRFC** Planar randomly reinforced fibre composite.

**PRS** 1 Pressure-ratio sensor(s).

2 Public regulated service (satcom).

**PRSD** Power reactant storage and distribution subsystem, LO<sub>2</sub> and LH<sub>2</sub> for fuel cells generating electric power (Space Shuttle).

**PRSG** Pulse-rebalanced strapdown gyro; INS gyro whose dynamic error is reduced by compensating re-balance loop electronically.

**PRSOV** Pressure regulating, or pressure-raising, or pressure-reducing, and shut-off valve.

**PRSS** Passive ranging subsystem.

**PRST** Persist [ent].

**P/RST** Press to reset.

**PRT** 1 Pulse recurrence (or repetition) time.

2 Pulse rise time.

3 Propeller research tunnel.

4 Power-recovery turbine.

5 Processing remote terminal.

**Prt, PRT** Aggregate perimeter of all jets of aircraft.

**PRTB** Mobile ICBM repair technical base (R).

**PRTCS** Portable radar tracking [and] control system (UAVs).

**PTR** Printer.

**PRTV** Production representative, or readiness, test vehicle.

**PRU** 1 Photo-reconnaissance unit (RAF, WW2).

2 Performance reference unit.

**prudent limit of endurance** Time during which aircraft can remain airborne and retain given safety margin of fuel (NATO).

**prudent limit of patrol** Time at which aircraft must depart from its operational area in order to return to base and arrive there with given margin (usually 20%) of fuel.

**Prune** Accident-prone person, esp. pilot, from mythical Pilot Officer Percy Prune, (RAF, WW2).

**PRV** 1 Pressure regulating [or reducing, or relief, or release] valve.

2 Personal or personnel, recovery vehicle [a helicopter].

**PRW** Passive radar warning.

**PS** 1 Pferdestärken = cv = 0.98632 hp = 0.7355 kW.

2 Pitot/static.

3 Passenger-service costs.

4 Procurement, or performance, specification.

5 Photoemission scintillation.

6 Photo squadron.

7 Payload specialist (spaceflight).

8 Primary/search director.

9 Power supply or set.

10 Plus.

11 Positive.

12 See P/S.

13 Polar station [lunar].

**P<sub>s</sub>** 1 Static pressure.

2 Radar power received from target.

3 Time rate-of-change of specific energy.

4 Standard pitch of propeller.

5 Specific excess power.

6 Probability of survival. (Suffix bare, lone unsupported aircraft; Suffix E or enhanced, all possible on-board avionics and EW/ECM systems).

7 Stagnation pressure.

8 Panel-stiffener end load.

**ps** Picosecond ( $10^{-12}$ s).

**P/S, P-S** 1 Pitot/static.

- 2 Primary/search director.  
 3 Pressure-sensitive.  
 4 Primary to secondary (airports).
- PSA** 1 Prefabricated surface, or surfacing, aluminium, or semi-permanent airfield [meanings can be same].  
 2 Provisional site acceptance.  
 3 Pressure-swing absorption.  
 4 Pilot's associate.  
 5 Power-spindle angle (TLA is preferred).  
 6 Lb/in<sup>2</sup> absolute (deprecated).  
 7 Problem-statement analyser.  
 8 Precision Strike Association (US).  
 9 Plasma stealth antenna.  
 10 Power supply, or switching, assembly.  
 11 Process-simulation article.  
 12 Point of service activation [comsat].
- p.s.a.** Passed staff college [air] (RAF).
- PSAC** Presidential Science Advisory Committee (US).
- PSAI** Public Safety Aviation Institute (US).
- PSAS** 1 Pitch, or primary, stability augmentation system.  
 2 Program support/annual sustaining.  
 3 Persistent surface-attack system (USAF).
- PSB** 1 Plough, sweeper and blower [snow].  
 2 Professional Standards Board (RAeS).
- PSBL** Possible.
- PSBR** Public-sector borrowing requirement.
- PSC** 1 Principal site concept (USN).  
 2 Product-support committee.  
 3 Program support contract (NASA).  
 4 Performance-seeking control.  
 5 Photo safety chase [TB adds testbed].  
 6 Plasma-sprayed ceramic.  
 7 Public-sector comparator.  
 8 Photographic sensor control; S adds system.
- PSCMMS** Propulsion-system control, monitoring and maintenance system.
- PSCU** Phase-shifter control unit.
- PSD** 1 Power spectral density.  
 2 Physiological Support Division (SR-71 ops).  
 3 Port-sharing device.  
 4 Preliminary System Design.  
 5 Passive stealth detection.
- PSDF** Power spectral density function.
- PSDN** Packet-, or public-, switched data, or digital, network.
- PSDP** Programmable-signal data-processor.
- PSDS2** Persistent surveillance and dissemination system of systems (USA).
- PSDU** Phase-shifter drive unit.
- PSE** 1 Passenger service equipment (reading lights, call button etc).  
 2 Passive seismic experiment.  
 3 Project support environment.  
 4 Phase-shifting element.  
 5 Packet switching exchange.  
 6 Peculiar synchronization, or support, equipment.  
 7 Problem-solving environment.
- PSEU** Proximity slat, or sensor, or switch, electronics unit.
- pseudo-adiabatic** Process by which saturated air parcel undergoes adiabatic transformation, water being assumed to fall out as condensed.
- pseudo aircraft system** Hi-fi multi-aircraft real-time

- simulation environment to support ATC research (NASA Ames).
- pseudo analog** Electronic display which simulates traditional instrument, eg by using fixed LED matrix to form 'dial' plus computer-driven LEDs to generate 'pointer' and alphanumerics.
- pseudo fly-by-wire** Flight control system in which at least one axis of control is normally, at one point at least, electrical; \* systems have capability for manual reversion or override.
- Pseudolite** A particular scheme using surrogate satellites in a HALE UAV to counter hostile GPS jamming.
- pseudolite** Transmitter of differential GPS signals from ground to improve acquisition and accuracy [from 'pseudo-satellite'].
- pseudonoise** Technique in which PN code generated sends out wideband noise-like signal which is then viewed as carrier on which message is imposed; usually direct-sequence modulation approach is used in which PN code directly balance-modulates carrier.
- pseudopursuit navigation** Homing method in which missile is directed towards target instantaneous position in azimuth while pursuit navigation in elevation is delayed until more favourable attack angle (note: this is not the same as AOA) on target is achieved (DoD).
- pseudo radar** ADS (5) with display.
- pseudo-random noise** See *pseudonoise*.
- pseudorange** Satellite-derived range uncorrected for errors in synchronization between the two clocks.
- pseudo stereo** 1 False impression of stereoscopic relief (ASCC).  
 2 Common audio meaning, simulating stereophonic by using two speakers, one via brief delay, from single channel.
- pseudo-3-D** Large family of techniques for generating subjective impression of three dimensions on (usually) planar display. One is psuedo stereo (1); various methods used in PPI displays and several techniques in computer-driven OTW displays for simulators, some coming under heading of CGI.
- PSF** 1 Phosphosilicate fibre (optical fibre).  
 2 Polystyrene foam.
- psf, PSF** Pounds per square foot (non-SI and in any case strongly discouraged).
- PSFD** Product, or production, sustainment and follow-on development.
- PSFP** Pre-simulator familiarization panel.
- PSG** 1 Post-stall gyration.  
 2 Passing, passage.
- PSGR** Passenger[s].
- PSH** Prime standard and handbook.
- psi, PSI** 1 Pounds per square inch.  
 2 Permanent staff instructor.  
 3 Pulsing, or pulsating, slope indicator; -L or -R shows which side of runway.  
 4 Proliferation security initiative.  
 5 President of the Service Institute.  
 6 Product-support integrator.  
 7 Person of special interest.
- psi** Pounds per square inch.
- psia, PSIA** 1 Pounds per square inch, absolute.  
 2 Pounds per square inch, ambient.
- psid, PSID** Pounds per square inch, differential.

**psig, PSIG**

**psig, PSIG** Pounds per square inch, gauge.

**PSK** 1 Phase [rarely, pulse] shift keying; differentially used in satcom terminals.

2 Prospect[s].

**PSL** 1 Polystyrene latex.

2 Problem statement language.

3 Physical Science Laboratory (NM State Univ.).

**PSLO** Product-support logistic operation.

**PSLV** Polar-satellite launch vehicle.

**PSM** 1 Passenger statute-mile.

2 Post-stall manoeuvring, or mode.

3 Personal safety monitor.

4 Power-system, or supply, module.

**PSMC** Preselected manual control.

**Psmc** GPS packet-mode channel for system management and control. Continuously broadcast by each satellite to inform system configuration and status, plus time and frequency information needed by an AES seeking to log on.

**PSMK** Personal-sensor moding key.

**PSN** 1 Potassium/sodium niobate.

2 Position.

3 Packet switch[ed] network.

**PSO** 1 Pilot systems officer, GIB in dual-control combat aircraft (USAF).

2 Protective service operations (mission).

3 Peace support operations.

4 Program[me] support office.

5 Public-service obligation [air carriers].

6 Passenger Shipping Organization (UK).

**PSOM** Polar strap-on motors.

**psophometer** Instrument which attempts to measure perceived noise level.

**PSP** 1 Pierced steel planking.

2 Programmable signal processor [see 8].

3 Personal (or personnel) survival pack.

4 Product support programme.

5 Primary special pay (DoD).

6 Pressure-sensitive paint.

7 Production software package.

8 Presignal processor [AI radar].

**PSPL** Preferred standard parts list.

**PSR** 1 Primary surveillance radar.

2 Precision secondary radar.

3 Pulsar.

4 Post-strike reconnaissance.

5 Packed snow on runway.

6 Point of safe return.

7 Parts status report.

8 Passive surface resonance.

**PSRE** Propulsion-system rocket engine.

**PSRU** Piston-engine propeller-speed-reducing unit (= gearbox).

**PSS** 1 Precision slab synchro.

2 Proximity sensor system.

3 Primary [flight-control] surface servo.

4 Product-support services.

5 Payload specialist station.

6 Passive surveillance system.

**PSSA** 1 Pilot-stick sensor assembly.

2 Preliminary system safety analysis.

**P<sub>ssk</sub>** SSKP.

**PSSPO** Precision Strike Systems Project Office (USAF).

**PSSSU** Power supply and system selector unit.

**PS stall** Part-span [usually of axial compressor].

**PST** 1 Pacific Standard Time.

2 Propeller STOL transport.

3 Lead scandium tantalate.

4 Pad service tower.

**PSTB** Propulsion-system testbed.

**PSTN** Public switched telephone network.

**PSTS** 1 Public switched telephone service.

2 Precision Sigint tracking system.

3 Propulsion-system test stand.

**PSU** 1 Photosmoke unit (not same as Hartridge).

2 Power supply, or switching, unit (electronic).

3 Passenger service unit.

4 Program-setting unit (IRCM).

**PSV** Public service vehicle.

**psychological warfare** Planned use of propaganda and other psychological actions having primary purpose of influencing opinions, emotions, attitudes and behaviour of hostile foreign groups (DoD); (NATO substitutes for 'hostile foreign' 'enemy, neutral or friendly').

**psychrometer** Instrument for measuring atmospheric humidity, usually comprising dry and wet-bulb thermometers.

**psyops** Psychological operations, psywar plus political, military, economic and ideological ops.

**psywar** See *psychological warfare*.

**PSZ** 1 Ceramic, mix of tetragonal zirconia in cubic zirconia.

2 Public safety zone.

**PT** 1 Power turbine.

2 Primary trainer (USA, USAS, USAAC, 1925–47).

3 Public transport.

4 Pesawat Terbang [company constitution, Indonesia].

5 Procedure turn.

6 Point.

**Pt** Platinum.

**P<sub>t</sub>** 1 Rocket chamber pressure at termination (solid propellant).

2 Total pressure.

3 Pitot pressure, dynamic pressure.

4 Radar power transmitted.

5 Pennant number.

6 Load on a tension member.

**pt** Pint.

**p<sub>t</sub>** Tensile stress.

**P<sub>t2</sub> etc** Gas-turbine total pressures at usual numbered locations, ending with P<sub>t7</sub> for nozzle exit.

**PTA** 1 Prepaid ticket advice in foreign currency.

2 Polskie Towarzystwo Astronautyczne (Poland).

3 Propfan test assessment.

4 Pilotless target aircraft.

5 Part-throttle afterburning (see part-throttle reheat).

6 Practice target area.

**PTAB** Small hollow-charge anti-armour bomblet, usually followed by figure giving weight in kg (USSR, R).

**PTAG** Portable tactical aircraft guidance.

**PTAN** Precision terrain-aided navigation.

**PTAS** Pilotless target aircraft squadron.

**PTB** 1 External tank, or drop tank (USSR, R).

2 Patrol torpedo-bomber (USN 1937).

**PTC** 1 Programming & test centre.

2 Part-through crack.

3 Pitch trim compensator.

- 4** Passive thermal control.  
**5** Personnel and Training Command (RAF).  
**6** Personal Technical Certificate (NATS).  
**7** Pack temperature controller.
- PTCHY** Patchy.
- PTCS** Portable tracking and control station.
- PTCV** Primary temperature control valve.
- PTD** *1* Provisional technical document.  
*2* Performance test domain.
- PTDS** Persistent-threat detection system.
- PTE** Performance test engine.
- PTEH** Per thousand engine hours.
- pterodactyl** Class of aeroplanes without horizontal tail.
- PTF** Permit to fly.
- PTFCe, ptfce** Polytrifluorochlorethylene.
- ptfe** Polytetrafluoroethylene.
- PTH** Path.
- PTI** Packet-type identifier.
- PTID** Programmable tactical information display.
- PTIR** Precision tracking and illuminating radar.
- PTIT** Power-turbine inlet temperature.
- PTK** New hollow-charge bomblet (USSR).
- PTL** *1* Primary technical leaflet.  
*2* Prioritized target list.
- PTLY** Partly.
- PTM** *1* Pulse-time modulation.  
*2* Pressure transducer module.  
*3* Peripheral transition module (SBC).  
*4* Power [and] thermal management.
- PTMS** Power and thermal management system.
- PTMU** Pressure/temperature measurement unit.
- PTN** *1* Procedure turn.  
*2* Position.  
*3* Public telephone network.  
*4* Pattern [S plural].  
*5* Portion [S plural].
- PTO** *1* Power take-off (shaft output).  
*2* Permeability tuned oscillator.  
*3* Participating test organization.  
*4* Overhaul by the customer (R).  
*5* Part-time operation.  
*6* Pacific theatre of operations (WW2).  
*7* Personal ticket office (software).
- P to F** *1* Permit to fly.  
*2* Permission to fire.
- P-tots** Portable transparency optical test system (for rainbowing).
- PTP** *1* Paper-tape punch.  
*2* Programmable touch panel.  
*3* Programming and test panel (CIDS).  
*4* Purchase to payment (electronic delivery).  
*5* Point to point (scheduled US carriers).
- PTPS** Passive thermal protection system.
- Pt-Ps** The difference between pitot and static pressure.
- PTR** *1* Part-throttle reheat.  
*2* Paper-tape reader.  
*3* Power-turbine rotor.  
*4* Peak/trough ratio.  
*5* Production test requirements.  
*6* Program Trouble Report (Stars).
- PTRP** Propfan technology readiness programme.
- PTRS** Program tracking and reporting system (ATOS).
- PTS** *1* Pilot Training Squadron (US).  
*2* Photogrammetric target system.
- 3** Parachute Training School.  
**4** Polar track structure.  
**5** Pre-training screen.  
**6** Problem-tracking system.
- PTSA** Prior to sample-approval.
- PTSD** Production test specification document.
- PtSi** Platinum/silicide.
- PTSN** Public telephone switching network.
- PTT** *1* Part-task trainer (simulator).  
*2* Post, telegraph, telephone (many European nations).  
*3* Press, or push, to transmit, or talk, or test.
- PTTEM** Preliminary tactical technical economical requirement, following UTTEM and leading to prototype(s) (Sweden).
- PTTS** Pressure/temperature test set.
- PTU** *1* Power transfer unit; transmits power but not fluid between hydraulic systems. Can provide vital backup following failure of an engine, esp. left engine.  
*2* Personal transport unit.
- PTV** *1* Propulsion technology validation.  
*2* Propulsion test vehicle.
- PTW** Precision targeting workstation.
- P2P** See PTP(4).
- Pty** Proprietary [company constitution, RSA].
- PU, p.u.** *1* Pick-up.  
*2* Propellant-utilization system.  
*3* Physical unit (SNA).  
*4* Polyurethane.  
*5* See several pop-up entries.
- Pu** Plutonium.
- PUAG** Purpose-use arresting gear.
- Pub** Publication.
- public-address system, PA** Interphone voice circuit used by captain or cabin crew to address passengers.
- public aircraft** *1* Not public, ie used exclusively in government service (US).  
*2* Used by the public, including for hire or reward [see Public Service] (UK).
- public dividend capital** Strange term for direct gift of taxpayer's money to national airline (UK).
- public safety zone** Area adjacent to end of runway where development, such as housing, is restricted.
- Public Service aircraft** Usually helicopters operated by military, police, air ambulance, and similar authorities, principally for disaster relief.
- published route** One for which an IFR altitude has been published.
- puck** Replacement pad for plate or disc brake.
- pucker** Local buckling of sheet metal in compression, eg on flange around inside of bend.
- PUD** Power unit de-icing (CAA).
- puddle welding** Blind attachment [e.g., of stringers to skin, or of sheet to a core] by Argon-arc torch having access to one side of the workpiece only.
- PUDT** Portable user data terminal.
- puff pipe** Pipe taking bleed air to an RCS control valve in jet-lift aircraft. Hence puffer jet (colloq.).
- Pugs** Propellant utilization and gauging system (NASA).
- pukka** True, thus \* Gen = reliable info (from Hindustani, RAF WW2).
- pull** *1* To operate, eg to \* spoilers (colloq.).  
*2* To engage arrester wire.

## **pull away**

3 To engage arrester wire, causing damage or breakage to arrester system.

**pull away** Ability of a gas-turbine engine to accelerate firmly away from initial ignition in starting cycle, especially in high-altitude relight.

**pulled** Arrester wire whose anchorage or shock-absorbing system has been damaged.

**pulling through** Rotating propeller by at least 2 to 3 blades by hand, for whatever reason.

**pull lead** To pull nose of aircraft further round to aim correct distance ahead of target.

**pull-off** 1 Practice parachute jump in which slipstream pulls wearer of opened parachute off wing or other suitable part of aircraft.

2 Weak link in anti-spin parachute, calibrated to break at given IAS.

**pull out** 1 To recover from dive to level flight or zoom.

2 To extend arrester wire or airfield barrier near limits.

**pull-out area** Carrier deckspace kept clear for decelerating arrivals.

**pull-out distance** Distance travelled by hook between engaging wire and coming to stop; also called run-out.

**pull-ring** Parachute operating handle or D-ring.

**pull up** Short sudden climb from level flight, normally trading speed for height (usually general aviation or tactical attack).

**pull-up point** Geographical point at which aircraft must pull up from lo approach to gain sufficient height to make attack or execute retirement (DoD).

**pulsating rubber** De-icer boot.

**pulsator** Engine instrument showing both engine speed and oil circulation by pulsations of oil in glass dome (rare after 1917).

**Pulse** Precision up-shot laser-steerable equipment.

**pulse** 1 Transient phenomenon, esp. in radio or other EM signal, characteriszd by rise, brief finite duration and decay.

2 Single solid-propellant grain, two or more of which are contained in rocket motor casing, hence two-\* rocket can give two impulses, separated by selectable interval.

**pulse-amplitude modulation** Signal is broken down into bits, amplitude of each being measured to give series of discrete values.

**pulse-bias modulation** Following a skid [loss of wheel traction], determines how long before full pilot pedal pressure is restored.

**pulse code** Sequences of pulses conveying information.

**pulse-code modulation** Modulation involving pulse codes, esp. that which translates continuously modulating signal into stream of digital pulses all of uniform height (amplitude), information being conveyed by spacing/duration. PCM output is compatible with all digital EDP (1) and virtually eliminates transmission errors.

**pulse compression** Radar techniques for increasing pulse amplitude and reducing length, see chirp, binary phase modulation, polyphase coding.

**pulse decay time** Time pulse takes to fall from high to low value, normally from 90% peak to 10%.

**pulse-detonation engine** Aircraft propulsion jet engine in which fuel is burned in a high-frequency series of detonations, without moving parts; suitable for up to Mach 5. See constant-volume combustion, *HFPD*.

**pulse Doppler, PD** Radar mode using pulse trains and

## **pulse separator**

Doppler processing in which received signals are examined by mixers and band-pass filters which eliminate everything except genuine targets or objects of interest. Doppler technique injects information on relative ranges as well as eliminating non-targets.

**pulsed production line** Whole line moves regularly to new position at [quite long] intervals.

**pulse duration** Time that single pulse exceeds stated value, usually 10%, of peak; ICAO selects time over 50%.

**pulse-duration modulation** Also called pulse-time modulation, pulse-width modulation, translates CW signal into succession of constant-amplitude pulses of varying width (time duration).

**pulse envelope programming** Surveillance-radar mode in which one beam searches for high-altitude hostile aircraft and a second in PD mode searches for low-level aircraft and missiles; possibly a third searches for surface targets.

**pulse-forming line** Radar circuit generating short high-voltage pulses.

**pulse-frequency modulation** More precisely called PRF modulation; CW signal is translated into succession of constant-amplitude pulses transmitted at frequency proportional to amplitude of original signal.

**pulse interval** Time between consecutive pulses both measured at same point.

**pulsejet** Air-breathing jet engine in which air is intermittently induced or allowed to enter, mixed with fuel, ignited (by electric discharge, residual combustion products or other method) and expelled as single expanded charge of hot gas giving pulse of thrust. Cyclic operation (typical frequency 30–60 Hz) may be inherent in aerothermodynamics of duct or imposed by sprung flap-valves or other oscillating one-way valving at inlet.

**pulse length** Physical length of radar pulse, irrespective of time.

**pulse-light approach slope indicator** Pilot sees red/white lights which pulse with a frequency proportional to deviation from glidepath.

**pulse limiting rate** Highest PRF allowing time for echo to reach receiver in gap between pulses.

**pulse modulation** Variety of methods of translating CW signals into digital pulses to reduce bandwidth required, eliminate errors and, where possible, improve signal/noise ratio (see separate entries).

**pulse packet** Concept of radar signal pulse as physical entity occupying particular 3-D volume, esp. particular length.

**pulse-phase modulation** See *pulse-position modulation*.

**pulse-position modulation** CW signal is translated into succession of constant-amplitude pulses whose position (ie time from start of each frame or timebase period) is proportional to amplitude of original wave at corresponding point.

**pulse radar** Most common type, in which signals are in form of pulses: also called pulsed radar.

**pulse-repetition frequency** Average number of radar pulses transmitted in unit time.

**pulse-repetition period** Average elapsed time between a point [eg, peak] on radar pulse and same point on next.

**pulse rise time** Time required for EM pulse to rise from a low to a high value, normally from 10 to 90% of peak but occasionally from 5 to 95 or from 1 to 99.

**pulse separator** Receiver circuit which removes imposed (regular) pulse train.

## pulse sorter

**pulse sorter** ECM device which selects one pulse from many for detailed measurement.

**pulse spike** Erroneous sharp super-peak superimposed on pulse.

**pulse-time modulation** CW carrier is modulated by pulse train of lower frequency which in turn is modulated with variable characteristic, which may be amplitude, duration, PRF or position.

**pulse train** Succession of pulses.

**pulse width** Unlike duration, this measure of CW signal is normally defined as width (time) between half-power points.

**pulse-width modulation** CW signal is translated into train of constant-amplitude pulses whose widths are each proportional to corresponding amplitude of original signal. (Width in this context has no relevance to half-power points).

**pulsometer** Visual indicator of fluid flow, especially lubricating oil, often showing doses in glass dome calibrated 08-18 [trad. engineering meaning is not used in aerospace].

**pultrude** Fabrication process combining pulling through die and extrusion under back-pressure (eg Grafil CFC).

**pultrusion** Raw material or finished section made by a pultrude-type process.

**pulverized fuel ash** From coal-burning power stations [utilities], brings aircraft to a stop in overrun area with little damage.

**Puma** Parallel unstructured maritime aerodynamics; program to generate flow data, eg to predict noise from helicopter landing gear and other complex shapes.

**PUMP** Pre-upgrade maintenance programme (RAF).

**pump unloading** Automatic opening of the fuel-system spill valve to enable HP delivery to recirculate after shutdown.

**pump-up time** Time taken to inflate gas storage in blow-down tunnel.

**PUN** ICAO code: prepare new perforated tape for message.

**punch, punch out** 1 To eject.

2 Confusingly, to start engine(s).

**punch welding** *Poke* welding.

**pundit** 1 Aerodrome beacon with Morse identifying sequence (arch.).

2 Portable ultrasonic non-destructive digital indicating tester.

**punkah, punkah louvre** Fresh-air jets in passenger cabin, of whatever geometry and location. Typically, overhead each seat, controlled by passenger.

**PUP** 1 Pitch-up, or pull-up, point in pop-up delivery.

2 Performance update programme.

3 Principal-user processor.

**pupil pilot** General British term for student pilot, other terms being (US) undergraduate pilot, trainee and PUT. Pilots seeking higher qualifications are not \*.

**purchase** Single grip on yoke, spectacles or other aileron input; thus full aileron may be two-\* task.

**purchase cable** That connecting pendant to arresting gear under flight deck.

**Pure-clad** Trade name (Reynolds) for Alclad-type material.

**pure jet** Not defined, but usually meant turbojet as distinct from turboprop (arch.).

## push-push actuator

**pure pursuit-course lead** Course in which velocity vector of attacking aircraft is always directed towards instantaneous position of target (ASCC).

**pure research** In case of aircraft, one whose purpose is to obtain knowledge of general application; aircraft employed may be specially designed or modified version of familiar type.

**Purex** Plutonium/uranium extraction.

**purge** 1 To clean and flush device, eg liquid-propellant rocket, by high-rate pumping of inert gas, eg dry nitrogen. This removes potentially dangerous propellants and helps preserve hardware; secondary function may be to trigger various valves and leave inert gas occupying internal chambers and piping. Term also sometimes used to mean inhibiting.

2 To prevent admission of air to space above fuel in aircraft tank by continuously pumping in inert gas (usually dry nitrogen).

**purity** Volume percentage of lifting gas in aerostat gas cell.

**Purulator** Patented lubricating-oil filter of conventional form.

**Purple** Air-intercept code: unit is suspected of carrying nuclear weapons (DoD).

**Purple Airway** Special temporary airway established and promulgated in Notams for Royal flight(s) in UK and certain other areas. Also Purple airspace.

**pursuit aircraft** Interceptor (US, term faded from use in WW2).

**pursuit course** Course in which attacker must maintain a lead angle over velocity vector of target to predicted point in space at which gun- or rocket-fire would intercept target (ASCC) (see *pure pursuit*).

**pursuit missile** One which can be fired only from astern of air target, eg because IR homing head is unreliable from any other aspect.

**PUS** Permanent Under-Secretary of State (UK).

**pushback** Transfer from gate to clear area or taxiway by tractor [AM or tug] attached to NLG, hence \* clearance, \* crew, \* time [usually = OBT], \* tug.

**pushboom** Very long rigid sleeve ahead of aircraft nose, carrying surface radiating elements.

**pushbutton indicator** Pushbutton which when depressed illuminates.

**pushdown effect** Generalized rule that new commercial transports enter service on densest routes, pushing older types down to lesser markets; new type is itself then pushed down over 10 to 20 years.

**pusher** See *stick-pusher*.

**pusher aircraft** One with pusher propeller(s) only.

**pusher propeller** One mounted behind engine so that drive shaft is in compression.

**push fit** Fit just requiring light force to assemble.

**push-off drift** See *kick-off drift*.

**pushover** Nose-down manoeuvre commanded by stick-pusher; in effect same as pitchover.

**push/pull** 1 Throttle, eg on lightplanes, having linear motion sliding through panel.

2 Amplifier having two similar valves or transistors connected in anti-phase and with I/O circuits combined about earthed centre.

3 Installation of tractor and pusher propellers in tandem, possibly separated by entire fuselage.

**push-push actuator** Linear actuator having uni-

**pushrod**

directional output interleaved by weak or slow return stroke.

**pushrod** Rod transmitting cam motion of valve gear to rocker or other drive to poppet valve(s).

**PUT** 1 Pop-up test of ICBM, SLBM, ABM or other launch system of externally energized cold-launch type.

2 Pilot under training, or tuition, also Pu/t.

**put-put** Small underpowered aeroplane [onomatopoeia].

**PV** 1 Pressure/volume or pressure × volume.

2 Private-venture aircraft.

3 Product verification (formerly MQT).

4 Prevailing visibility.

5 Prime vendor.

6 Positive vetting.

7 Post vacant.

8 Parameter value.

**PVA** 1 Polyvinyl acetate (or pva).

2 Plane view area, normally of precision forging.

**PVASI** Para, or pulsating, visual approach slope indicator.

**PVB** Polyvinyl butyral (or pbv).

**PVC** 1 Polyvinyl chloride (or pvc).

2 Permanent virtual circuit.

**PVD** 1 Para-visual director.

2 Plan-view display; -E adds emulator.

3 Peripheral-vision display.

4 Air-data sensor, esp. pitot, pitch, yaw (USSR, R).

**PVDF** Polyvinylidene fluoride (or pdvf).

**PVDU** Portable VOR deviation unit.

**PVF, pfv** 1 Polyvinyl fluoride.

2 Polyvinyl film.

**PVI** 1 Pilot/vehicle interface.

2 Para-visual indicator.

**PVL** Prevail.

**PVLS** Peripheral vertical-launch system.

**PVM** Primary visual marker.

**PVO** Air defence of the homeland, made up of IA (manned interceptors) and ZR (zenith rockets, ie SAMs) (USSR, R).

**PVOR** Precision VOR.

**PVO-SV** Troops of air defence of ground forces (USSR, R).

**PVR** Premature voluntary retirement.

**PVRD** Ramjet (USSR, R).

**PVS** 1 Pilot's vision system, or visual subsystem.

2 Prime Vendor Support (USN).

**Pvs** Pitch of tunnel vane set (distance between vanes).

**PVT** 1 Product verification test.

2 Private [operator].

3 Position/velocity/time.

4 Personal verifier terminal.

**PVTOS** Physical vapour transport of organic solids, for space manufacturing.

**PVU** 1 Portable ventilator unit.

2 Precision velocity update.

**PVV** Proof vertical velocity (MLG demo case).

**PW** 1 Pulse width.

2 Plated wire (memory).

3 Potable water.

4 Pursuit, water-cooled (USA 1919–24).

**PWA** Public Works Administration (US from 1933).

**PWB** Pilot[s] weather briefing.

**PWBLH** Pilot's Weight and Balance Handbook (US).

**PWC** Professional Women Controllers (US).

**pyramidal absorber**

**PWD** Present-weather detector (visibility, precipitation, snow depth).

**PWG** Planning Working Group (Eurocontrol).

**PWHQ** Primary war headquarters.

**PWI** 1 Proximity, or pilot, warning indicator.

2 Preliminary warning instruction.

**PWIN** Prototype WWMCCS intercomputer network.

**PWM** Pulse-width modulation, or modulated: hence PWMI = \* inverter.

**PWP** 1 Pylon weight plug.

2 Plasticized white phosphorus.

**PWQT** Portable-water quantity transmitter.

**PWR** 1 Power.

2 Passive warning radar.

**PWRS** Prepositioned war reserve stocks.

**PWS** 1 Proximity warning system (generally helicopter applications).

2 Performance work statement.

3 Potable water supply.

**PWSC** Preferred weapon-system concept.

**PWSDE** Effective power delivered at shaft of turbo-prop = ehp.

**PWT** 1 Propulsion wind tunnel.

2 Plasma wind tunnel.

**PWTD** Predictive windshear and turbulence detection.

**PWW** Predictive windshear warning.

**PX** Post Exchange, became BX and today AAFEX, which see.

**PY** 1 Program(me) year.

2 Spray.

**P(Y)** Precise encrypted (GPS).

**PYBBN** Pitch yaw balanced-beam nozzle.

**pylon** 1 Rigid pillar-like structure projecting upwards to carry load (eg engine) or protect occupants in overturn (crash \*).

2 Streamline-section structure transmitting stress from external load to airframe, eg engine pod, ordnance, drop tank etc. Can extend above or below wing or horizontally or at other angle from fuselage. For engine pod often extended to \*strut.

3 Object on surface used as landmark for race turning point.

4 Object on surface used as reference for pilots performing flight manoeuvres.

5 Aircraft [usually private or club] tipped on nose, tail in air (colloq.).

**pylon select** I/O device linking crew to WCS (weapon control system) or Navwass, enabling specific pylons, ie particular portions of load, to be selected for attack on particular target.

**pylon spar** Principal structural member of engine pylon normally (in case of wing engine) linking engine mounts direct to wing box.

**pylon strut** Pylon (2) linking engine pod to wing or rear fuselage.

**Pyralin** Cellulose-base transparent plastic formerly used for windows.

**pyramidal absorber** Family of absorbers of EM radiation (ie RAM 2) and noise, characterized by entire surface of structure being covered by long pointed pyramids with apices pointing towards source of radiation. Similar geometry is found in airframe underlying structure of low-observables aircraft.

**pyranometer**

**pyranometer** Actinometer which measures combined solar and diffuse sky radiation, sensor viewing entire visible sky. Also called solarimeter.

**Pyrene** Trade name for fire extinguishers and for carbon tetrachloride filling.

**pyrgeometer** Actinometer which measures terrestrial radiation.

**pyrheliometer** Actinometer which measures only direct solar radiation.

**pyroelectric detector** Sensitive detector of IR; radiation enters via precision window of Ge and light pipe directs it to microscopic flake of TGS which rises in temperature, changing polarization and generating surface charge amplified in low-noise electronics.

**pyrogen** Pyrotechnic generator; ignition squib for solid-propellant motors comprising electric resistance or bridgewire which ignites hotburning powder charge.

**pyroharness** Network joining pyrometers, usually round an engine.

**pyrolytic carbon** Allotrope of carbon derived from controlled pyrolysis of char-yielding resin (eg phenolic resoles or Novolaks) to form matrix used in carbon/carbon composite, with reinforcement by carbon

or graphite fibre. Used in rocket nozzle liners, high-temperature wheel brakes, etc.

**pyrolysis** Chemical decomposition by heating.

**pyromechanical actuator** One energized by solid fuel or other combustible charge.

**pyrometer** Instrument for measuring high temperatures; optical, electrical resistance, thermocouple, radiation, etc.

**pyron** Non-SI unit of EM radiant intensity (no abb.), = calories (Int.)/cm<sup>2</sup>/min.

**pyrophoric** Igniting spontaneously on contact with air.

**pyrotechnic** Today includes not only visual 'firework' devices but also precision igniters for large solid motors, single-shot actuators, hot-gas generators and IR flares giving accurately controlled decoy wavelength.

**Python** Becoming important as a computer language for engineering and science.

**pz** See *pièze*.

**PZD** Petrolatum/zinc dust.

**p<sub>0</sub>, p<sub>zero</sub>** Free-stream static pressure.

**PZRK** Portable rocket (missile) air-defence system (R).

**PZT** 1 Lead zirconate titanate.

2 Piezoelectric translator.

# Q

- Q** 1 Quantity of electricity, esp. electric charge; unit, coulomb.  
 2 Applied shear force [see q2].  
 3 JETDS code: sonar.  
 4 JETDS code: special, or combination of purposes.  
 5 Probability of failure.  
 6 Quantity of light, heat or other EM radiation.  
 7 Static moment of area about any axis.  
 8 Aircraft category, target (USAF 1948–62).  
 9 Modified-mission prefix: drone or RPV (USAF, USN, since 1962).  
 10 Modified-mission suffix: electronic counter-measures (USN 1945–62).  
 11 Generalized symbol for torque.  
 12 Common prefix ‘quiet’.  
 13 Quadrature, and quadrature component of coherent video (radar) signal.  
 14 Squall[s].  
 15 Enthalpy (H is more common).  
 16 Volume of fluid [gas or liquid]; see next.  
 17 Confusingly, also flow rate, especially of fuel consumption [q is preferred].  
 18 Reactive power.  
 19 Calorific value of fuel.  
 20 Interference factor.  
 21 Quality, figure of merit.  
 22 See *Q-factor*.  
**q** 1 Dynamic pressure,  $\frac{1}{2}\rho V^2$ ; see  $\bar{q}$ ,  $q\alpha$ .  
 2 Shear stress [ $\tau$  is preferred].  
 3 Tetrode.  
 4 Heat flux (rate of flow).  
 5 Angular velocity (rate of change) in pitch, i.e. pitch rate.  
 6 Generalized symbol for rate of flow, eg volume, energy, fuel, etc.  
 7 Range (Breguet formula).  
 8 Pitch rate, or AMSU pitch-rate output.  
**Q̄** Störindex; German measure of annoyance-weighted sound pressure level (see *noise*).  
**q̄** 1 Replacing q 1, at least in US [marked with asterisk].  
 2 Non-dimensional pitch rate  $q/\Omega$ .  
**Q-aerial** Combination of dipole plus quarter-wavelength of twin-wire line to match feeder impedance to dipole.  
**Qα, Q-alpha, QA** Free-stream dynamic pressure  $\frac{1}{2}\rho V^2\alpha$ .  
**Q-ball, q-ball** Spherical or hemispherical-nosed instrument package on nose of spacecraft or aircraft sensing q, AOA, AOY, total temperature and other parameters.  
**Q-band** Obsolete EM radiation band with limits 33–50 GHz (US), 26.5–40 GHz (UK), now covered by K, L bands.  
**Q-bay** Heated and pressurized compartment for reconnaissance sensors, including large camera looking through quartz window.  
**Q-code** Basic telecommunications code of three-letter groups in three sections: QAA–QNZ are limits of Aeronautical Code; QOA–QQZ is Maritime; QRA–QUZ

is for all services. Many of the entries which follow are from this code, of which nine are still in use.

**Q-correction** That applied to observed altitudes of star Polaris (because not quite at N celestial pole).

**Q-dinghy** Oval, for a crew of up to 8 (RAF, WW2).

**Q-factor** 1 Figure of merit of inductance, ratio of reactance to resistance.  
 2 Ratio of energy stored to energy dissipated per radian in electrical or mechanical system.

3 Generally, sharpness of resonance or frequency selectivity of vibratory system having one degree of freedom, mechanical or electronic.

**Q-fan** Quiet fan.

**q-feel** Flight-control feel synthetically made to resemble natural feedback from aerodynamic loads by making it approximately proportional to dynamic pressure.

**Q-meter** Instrument for measuring Q (1).

**q-pot** Device, typically a sealed cylinder open to ram pressure, containing a bellows, movable piston or other sensor, to provide an output proportional to IAS.

**Q-series propellants** Patented (Thiokol) slow-burning solid fuels for gas generation with LL-521 coolant keeping flame below 1,093°C.

**Q-Shed** Proposed QRA hangar for three RAF airfields in UK.

**Q-site** Dummy airfield with simulated flarepath and other lights (UK, WW2).

**q, Q-spring** Mechanical connection with stiffness proportional to dynamic pressure.

**q-stops** Mechanical limits on flight-control system response, and thus surface movement, commanded by q-system.

**Q-switching** Extremely rapid switching of laser by means of Kerr cell or similar opto-electronic device; essential for shortest-duration high energy bursts lasting only a few ns.

**q-system** That sensing dynamic pressure, eg drawing processed signal from ADC, and feeding it to flight-control and other q-sensitive systems or devices.

**QA** 1 Quality assurance.

2 Quasi-analog.

3 See *Q-alpha*.

**QAA** Quality Assurance Agency for Higher Education (UK).

**QAAC** Quebec Association of Air Carriers, also called AQTA, [Dorval, PQ] (Canada).

**QAB** 1 Quality Assurance Board (MoD-PE, UK).

2 Code: “May I have clearance for – from – to – at FL –?”

**QAC** 1 Quality action case.

2 Civil aircraft qualification (F).

**QAD** Quick attach/detach.

**QADDM** Quasi-analog DDM(1).

**QAE** Quality assurance evaluator.

**QAF** Code: “Will you advise me when you are/were at –?”

**QAG** Code: “Arrange your flight to arrive at/over at –?”

**QAH** Code: “What is your height above –?”

**QAI** Code: "What is essential traffic regarding my aircraft?"

**QAK** Code: "Is there risk of collision?"

**QAL** Code: "Are you going to land at -?"

**QAM** 1 Code: "What is latest met.?"  
2 Quadrature amplitude modulation.

**QAN** Code: "What is surface wind?"

**QAO** 1 Code: "What is wind at your location at different FLs?"  
2 Quality assurance office (DoD).

**QAR** 1 Quick-access recorder.  
2 Quality-assurance representative.

**QA/RM** Quality assurance and risk management.

**Qasar** Quality assurance systems analysis review (FAA from 1971).

**QAT** Qualified for all three.

**QATS** Quarterly airline traffic statistics (OAG2).

**QAVC** Quiescent automatic volume control.

**QB** Quiet [deceased] Birdmen (US society from 1921).

**QBA** Code: "What is horizontal visibility at -?"

**QBAR** Dynamic pressure.

**QBB** Code: "What is amount, type and height above field of cloudbase?"

**QBI** Code: "Is flight under IFR compulsory?" Hence, QBI conditions = bad weather. Colloquially said to mean 'quite bloody impossible'.

**QC** 1 Quality control.  
2 Quick change, ie from pax to cargo configuration.  
3 Quiet, clean (as prefix).  
4 Quality circle (usually plural).  
5 Quota count (noise).  
6 Quantum computing.  
7 See \* card.

**QCA** Qualifications and Curriculum Authority (UK).

**QC card** Quadrantal correction.

**QCDA** Quickened climb/dive angle.

**QCDP** Quality-control development programme.

**QCE** Quality-control engineer.

**QCG** Qualifiable Code Generator, embedded graphics tool.

**QCGAT** Quiet, clean general-aviation turbofan.

**QCI** Qualified crewman instructor.

**QCIP** Quality-control inspection procedure.

**QC1** Quota count one [quietest].

**QCPSK** Quadrature coherent phase-shift keying.

**QCS** Query control station (ECM).

**QCSEE, QC-see** Quiet, clean short-haul experimental engine (NASA).

**QC2, QC3** Quota count standards.

**QD** 1 Quantity distance (explosives).  
2 Quick dump.  
3 Quick disconnect.  
4 Quantum diode.

**QDB** Quick-disconnect button.

**QDG** Quick-draw graphics.

**QDL** Code: "I intend to ask for series of bearings."

**QDM** 1 Code: "Will you indicate magnetic heading for me to steer towards you, with no wind?"  
2 Quick-donning mask.

**QDR** 1 Code: "What is my magnetic bearing from you?"  
2 Quality-control deficiency report.  
3 Quadrennial Defense Review (US).

**QE** 1 Quality engineering.

2 Qualified Entities [European nations].

**QE** At a cut-out corner, ratio of shear stress to that with cut-out absent.

**QEC** 1 Quick engine change unit, ie ready-to-install powerplant.  
2 Quadrantal error correction, or corrector.

**QEP** Quality-enhancement program.

**QET** Quick engine test.

**QFA** 1 Meteorological forecast prefix.  
2 The Queen's Flight Assoc., office at RAF Benson.

**QFE** 1 Quiet, fuel-efficient.  
2 Code: "To what should I set my altimeter to obtain height above your location?" Usually requests airfield pressure [on large airport, at runway threshold]. Thus, altimeter reads zero on landing there.

**QFF** Code: "What is present atmospheric pressure converted to MSL at your location?"

**QFI** Qualified flying instructor.

**Q-Flow** Quota flow control.

**QFU** Code: "What is [magnetic] direction/designation of runway to be used?"

**QGH** Code: "May I land using – procedure?" Requests letdown procedure using radio aids.

**QH** Queen's Honorary, followed by third [possibly fourth] letter denoting Chaplain, Dental Surgeon, Nursing Sister, Physician, Surgeon, all military appointments (UK).

**QHI** Qualified helicopter instructor.

**QHNI** Qualified helicopter navigation instructor.

**QI** Quality improvement.

**Q/I** Quadrature/in-phase.

**Qibli** Pronounced 'keebly', hot, dry, southerly wind (N Africa).

**QinetiQ** Supposed PPP created 2001 by renaming DERA; when US refused to share classified projects with a PPP, 25% was split off to form DSTL. In fact by 2009 no private shares had been announced, but flotation was still the eventual objective [office, Farnborough GU14 0LX] (UK).

**QIS** Quality information system.

**Qitars** Qualitative intratheatre airlift requirements study.

**QK** Quick-flashing.

**QL** Ethyl-2 (di-isopropylamino) ethylmethylphosphonite, component of VX nerve gas.

**QM** 1 Quartermaster; G adds -General, S -Sergeant.  
2 Quality management.  
3 Quantum mechanics; MA adds material analysis.

**QMAC** 1 Quarter-orbit magnetic altitude control.  
2 Questionnaire on the method of allocating cost[s].

**QMDR** Quality-monitoring deficiency report.

**QML** Qualified manufacturers list (Nadcap).

**QMMA** Quantum-mechanics material analysis.

**QMP** Quality management plan.

**QMS** 1 Quarterly manning statistics.  
2 Quality-management system.

**QMW** Code: "What is/are freezing levels?"

**QN** Quiet nacelle.

**qn** Jet dynamic pressure.

**QNE** Code: "What will my altimeter read on landing at – if set to 1013.2 mb?" Note: answer is pressure height of airfield. Used by all aircraft over FL180 in US.

**QNH** Code: "To what should I set my altimeter to read your airfield height on arrival?" Assuming ISA

throughout, answer is equivalent MSL pressure as calculated by destination ATC. Regional \*, or lowest-forecast \*, is value below which actual \* is predicted not to fall in given period and location; gives supposedly safe terrain clearance.

**QNM** Quantized normal/MTI (video).

**QNT** Quiet networking technology.

**QNY** Code: "What is present weather at your location?"

**q<sub>0</sub>** Freestream dynamic pressure.

**QOC** Quality officer in charge (UK).

**QOI** Qualified Observer Instructor (RN).

**QOP** Quality operating procedure[s].

**QOR** Qualitative operational requirement.

**QoS** Quality of service.

**QOT&E** Qualification operational test and evaluation.

**QP** Quartz-phenolic.

**QPD** Quality procedural document.

**QPL** Qualified products list.

**qpp** Quiescent push/pull.

**QPR** 1 Quality problem report.

2 Quality procedural requirement.

**QPSK** Quadrature, or quadrative, phase-shift, or pulse-shift.

**QR** 1 Quiet radar.

2 Quadrantal receiver.

3 Quadrupole resonance.

**qr** Generalized co-ordinate.

**QRA** 1 Code: "What is name of your station?"

2 Quick-reaction alert (RAF), originally with suffixes (I) or (B) for interceptor or bomber.

3 Quiet reconnaissance airplane (USA).

**QRB** Quick-release buckle.

**Qrb** Generalized force of rth mode due to buffeting pressure field.

**QRC** 1 Quick-reaction, or response, capability, or [IRCM] contract.

2 Quick-release connector.

**QRF** 1 Quick-release fitting.

2 Quick-reaction force.

**Qrf** Generalized forcing function.

**QRGA** Quadrupole residual gas analyser, instrument for measuring ultrahigh vacuum.

**QRH** Quick-reference handbook.

**QRI** Quick-reaction interceptor.

**QRMC** Quadrennial review of military compensation.

**QRP** Quick-reaction package.

**QRS** Quality requirements systems.

**Qrs** Generalized force in rth mode due to sth-mode aerodynamic excitation.

**QRT** Code: "Shall I stop (or please stop) sending?"

**QRTOL** Quiet RTOL.

**QS** Quick scan.

**qs** Quasi-steady.

**QSEG** Qualification systems-engineering group.

**QSH** Quiet short-haul.

**QSJ** Quiet supersonic jet.

**QSP** Quiet supersonic platform, research programme by NASA, Darpa, Northrop Grumman.

**QSR** 1 Quick strike reconnaissance.

2 Quarterly service report.

**QSRA** Quiet short-haul research aircraft.

**QSS** Quality, safety and security.

**QSST** Quiet supersonic transport. In 2006 also used for quiet small SST.

**QSTNRY** Quasi-stationary.

**QSTOL** Quiet STOL.

**QSY** Code: "Change radio frequency now to –".

**QT** Quart, quarter.

**QT** Shear flow in webs and corners of panel due to torsion.

**qt** Thrust-specific rate of fuel consumption.

**QT&E** Qualification test and evaluation.

**QTDN** Qualified tanker [or, to tank] day or night.

**QTE** 1 Code: "What is my true bearing from you?"; today often changed to "line of position" = PL.

2 Qualification test and evaluation.

**Q-tech** Quality technology.

**QTF** 1 Code: "Will you give me position of my station according to bearings taken by D/F stations you control?" (Note: many countries, including UK, can no longer provide D/F fix.)

2 Quarter-turn fastener.

**Q-tip** Propeller with sweptback tips.

**QTM** Quality technical memorandum.

**QTOL** Quiet takeoff and landing.

**QTR** 1 Quiet tail rotor.

2 Quality technical requirement.

3 Quad tilt-rotor.

**qts** Dynamic pressure in wind-tunnel test section.

**QTY** Quantity.

**quad** 1 Group of four attitude-control thrusters indexed at 000°/090°/180°/270° relative to vehicle major axis.

2 Quadrant (ICAO).

3 Loosely, any group of four, especially of air-launched missiles fired from one container or pylon.

**quad actuator** Among other things, central summing/proportioning/switching unit between triply redundant systems to ensure that maximum redundancy and maximum authority are preserved.

**quaded cable** Telecom cable with two twisted pairs (four channels).

**quadjet** Aircraft powered by four jet engines.

**quadrant** 1 Radio range area between equisignal zones (actually much more than 90°).

2 Circular-arc operating lever on control surface of airship or large, slow aeroplane (probably obs.).

3 Circular-arc mounting for throttle, pitch or other operating levers in cockpit.

**quadrantal cruising levels** Quadrantal heights.

**quadrantal error** That caused by presence of metal structure (eg receiving aircraft) distorting radio signal.

**quadrantal heights** Specified flight levels assigned to traffic on heading in each of four 90° quadrants; intention is that traffic on conflicting headings shall be separated in height. See *Quadrantal Rule*.

**quadrantal points** Intercardinal headings: 045°, 135°, 225° and 315°.

**Quadrantal Rule** Quadrantal heights allocated in UK uncontrolled airspace below FL250.

**quadrature** Quarter-phase difference between two wave trains of same frequency, ie displacement of 90°.

**quadrex** Quadruply redundant.

**quadricycle** 1 Landing gear with four wheels or wheel groups disposed at corners of rectangle in plan.

2 Loosely (suggest incorrectly) any aircraft with four landing gears even if three are in line.

## quadruplane

## quietized

**quadruplane** Aeroplane with four superimposed wings.

**quaduple register** Instrument recording wind speed/direction, sunshine and rain (not snow).

**quadruplex** Any fourfold system, ie four parallel channels.

**quadruplex system** Dynamic system that is quadruply redundant and thus provides multiple failure capability, eg SFO/FS, DFO and DFO/FS.

**quadrupole** Idealized noise source made up of four equidistant sources, each diametrically opposite pair emitting positive pressure peaks while the other pair are at peak negative (all having same frequency).

**quadrupole resonance** Method of detecting small quantities of specific material by irradiating with RF tuned to that material's molecules.

**quad tilt-rotor** Aircraft lifted and propelled by four tilt rotors.

**qualification** Clearance for service; thus also for production.

**qualitative limitation** In arms control, eg SALT II, concerned only with weapon-system capability.

**quality control** That management function by which conformance to established standards is assured, performance is measured, and, in event of defects, corrective action is initiated (USAF).

**quantified** Expressed in numerical terms.

**quantitative limitation** One concerned solely with numbers, eg of weapon systems in SALT II.

**quantized** Restricted to particular set of discrete values.

**quantum bit** Atomic electron or photon.

**quantum dot** Semiconductor device with overall dimensions of a few (one definition,  $\leq 10$ ) nanometres.

**quarantine** Secure bonded store for parts which, for whatever reason, are illegal or accompanied by incorrect documentation.

**quart** Non-SI measure of capacity, qt = (UK) 1.137 litres, (US) 0.946 litres.

**quarter-chord** Locus of all points lying at 25% chord (of wing or other aerofoil), each measurement being in plane parallel to longitudinal axis of aircraft. Normal interpretation is that measures are for wing in clean condition, ignoring ancillary items such as stall-breaker strips and anything else attached to wing, but including dogtooth and similar basic modifications to outline.

**quarterlights** Windows at oblique angle between front windshield (UK windscreen) and side.

**Quarter-Million** Aeronautical charts [rarely, maps] published on scale of 1:250,000 (ICAO).

**quarter-phase** Electrically 90° (see *quadrature*).

**quarter-turn fastener** Cowl or panel fastener released by 90° anticlockwise turn.

**quarter-wave aerial** One quarter-wavelength long and resonating at slightly less than  $4l$  where  $l$  is length; hence quarter-wave line is same length of co-axial or twin-wire transmission line.

**quartz** Natural and synthesized mineral,  $\text{SiO}_2$ , with many electrical, electronic and refractory structural uses but noted for piezoelectric properties in perfect-crystal form.

**Quattrocopter** Helicopter lifted and controlled by contra-rotating two-blade rotors on vertical axes at each corner of a square or X-shaped base; largest would be manned, smallest 500 g (1.1 lb).

**Qubit** Quantum bit [pronounced cubit].

**Queen Bee** Senior WAAF or WRAF officer on station (colloq.).

**Queen Mary** Articulated road vehicle for transporting dismantled or crashed aircraft (RAF).

**quenching** 1 Sudden cooling of hot metal in water, oil or other medium to obtain desired crystalline properties.

2 Blanketing solid grain of rocket in mid-operation, by various related techniques, to obtain variable-pulse operation.

**Questol** Quiet experimental STOL.

**QUI** Quito, Ecuador, space tracking-station.

**quick cam** Flap-track profile giving long rearwards travel to increase area/lift and with sharp downwards travel at end which, when full flap selected, rotates flap to landing angle giving high drag.

**quick-change aircraft** One whose interior is configured for passenger or freight operation and whose seat units, passenger-service units, pantries, toilets and often trim can be removed in minutes and replaced by freight restraints (attached to original floor rails) and protective wall panels.

**quick-connect parachute** Chest-type pack which user can clip to harness almost instantly.

**quick-disconnect couplings** Mating fluid-pipe couplings incorporating self-sealing shut-off valves to allow disconnection under pressure without loss of fluid.

**quick-donning mask** Simple oxygen mask, usually of drop-down type but sometimes carried in separate pack, which in theory can be put on with one hand in a few seconds.

**quick dump** Switch for getting rid of entire load of rockets, normally by jettisoning launchers.

**quick-engine-change unit** See *engine-change unit*.

**quickie GCA** GCA or PAR approach conducted in circumstances calling for priority (possibly notified emergency) and eliminating procedure or identifying turns.

**quick-reaction alert** In 1960s it was calculated that Western Europe would have 4 minutes warning of a Soviet strike by nuclear missiles, so RAF bomber squadrons practised getting retaliatory V-bombers airborne within 4 min. of an 'out of the blue' warning at any time of day or night; USAF SAC had parallel exercises.

**quick-release box** Parachute-harness latch released by 90° rotation and blow from hand.

**quick-search procedure** One in which double normal number of aircraft are used and entire area is searched on outbound leg (NATO).

**Quicktrans** Long term contract airlift within Conus in support of USN, USMC and DoD agencies (US).

**quiescent current** Flow cathode/anode in absence of input signal.

**quiescent flow** Small flow of air maintained throughout no-load period to keep bleed-air turbine running; eliminated in modern systems.

**quiescent modulation** Amplitude modulation in which carrier is radiated only during modulation.

**quiet automatic gain control** Automatic variation of bias of one or more amplifying stages preceding detector, in which output is suppressed for all signals too weak to trigger control.

**quietized** Soundproofed (Piper).

**quiet radar** Scans scene continuously with several thousand very narrow beams in rapid random FH sequence.

**quiet Sun** Free from significant sunspots or unusual radiation.

**quiet supersonic aircraft** Specifically means that any sonic boom generated does not reach the ground, or does so innocuously. See QSP, SSBD.

**quill shaft** Slim drive shaft or driven shaft projecting as cantilever and terminating in splined coupling inserted into mating female portion. Requires no key, tolerates small misalignment, and absorbs torsional vibration. Can be keyed at both ends.

**quilted blanket** Thermal insulating blanket with insulator, eg rock-wool, sealed in stainless-steel foil layers joined along criss-cross bonds; tailored to particular application.

**quota flow control** Various methods of metering traffic to congested airports.

**QUJ** Code: "Will you indicate true track to reach you?"; i.e. zero-wind heading.

**QV** Quantitative visualization.

**Q<sub>v</sub>** Shear flow in vertical web[s] due to vertical load.

**QVI** Quasi-vertical incidence, sounder for monitoring ionosphere.

**Q<sub>w</sub>** Net shear flow in vertical web[s].

**QWI** Qualified weapons instructor.

**QWIP** Quantum-well IR photodetector.

**QW mechanism** Quick-wind (reconnaissance camera).

**Q<sub>w</sub>** Net shear flow in vertical web[s].

**QZSS** Quasi-zenith satellite system (Japan).

# R

**R** 1 Generalized term for range [aircraft, missile, radar or other signal].

2 Generalized term for radius, from sheet-metal work to aircraft mission.

3 Resistance (electrical, fluid flow, marine aircraft on water), or resistor; see ohm.

4 Reynolds number (also Re, RN).

5 Resultant.

6 Gas constant [which see].

7 US piston-engine code: radial.

8 Aircraft category, racer (USA 1919–24, USN 1922–28); transport (USN 1931–62); helicopter (USAAF 1941–47), reconnaissance (USAF 1948–62).

9 US Navy modified-mission prefix reconnaissance, suffix transport conversion (to 1962).

10 Generalized term for reliability, and probability thereof.

11 Moment of resistance (also M).

12 Radiance.

13 JETDS code: radio.

14 JETDS code: receiving only, ie passive detection.

15 Revenue.

16 Restricted area (ICAO), followed by identifying number, usually effective SL to 9,000 ft.

17 Received, or receive only (ICAO).

18 Repair facilities available (FAA).

19 Right, right-hand.

20 Suffix: radial (thus 234°R = VOR bearing).

21 Generalized term for rate (eg code rate, data rate, rate of roll or turn).

22 Total rainfall.

23 Modulus of rupture.

24 US missile code for vehicle type; unguided rocket.

25 US missile code for launch environment: ship.

26 Rüstsatz, field conversion kit (G, WW2).

27 Microlight aircraft category (FAI).

28 Reject, rejected (EFIS or nav display).

29 Suffix, area navigation plus altitude-encoding transponder.

30 Red.

31 Airport surveillance radar.

32 Route, or route-tuned (navaid).

33 Reluctance [also denoted as S].

34 Horizontal distance from the intersection with the ground of the vertical from the point where the aircraft starts to flare to the intersection with the ground of the glideslope.

35 General symbol for a vertical load, usually with a suffix.

36 Ratio [when r is unavailable].

37 Requirement [followed by system number].

**r** 1 Radius, or radius of rotation.

2 Suffix: required.

3 Rotational speed (eg rpm); angular velocity in roll.

4 Ratio, especially reaction \* in axial compressor, or \* of bending to torsion in wing.

5 Rocket burn rate.

6 Angular velocity, in yaw; AMSU yaw-rate output.

7 Resistivity [ $\rho$  is preferred].

8 Spherical, or cylindrical, co-ordinate.

**R̄** In a composite panel, the ratio of 45° plies to 0°/90°.

**R<sub>0</sub>, R-zero** 1 Equivalent radius of body or fuselage, =  $d/2$ .

2 Helicopter rotor-blade root cutout area.

**R\*** Universal gas constant, 8.31432 J k mol<sup>-1</sup> K<sup>-1</sup>.

**R\*** Radar range at which probability of detection is \* per cent.

**R̄** Range rate.

**°R** 1 Rankine, =  $5/9$  K.

2 Réaumur.

3 Radial [test].

**R** Radial [graphics].

**R<sup>2</sup>P** Repair and return packaging.

**R<sup>2</sup>W** Robot[ic] rotary wingman.

**R<sub>3</sub>** Reduced ricochet [angular] range.

**R<sup>3</sup>** Reduced runway reliance, or reduced reliance on runways.

**R-12** Refrigerant 12.

**R-channel** Though sometimes said to mean radio, R here means random-access. Used for air/ground signalling and data, see Rd and Rsmc.

**R-display** Extended A-display enabling particular radar echo to be magnified for close examination.

**R<sub>res</sub>** Range [of radar] resolution.

**R-stoff** Mixture of 57% crude oxide monoxylidene and 43% triethylamine (G).

**RA** 1 Rain (ICAO).

2 Receiver attenuation.

3 Research association(s) (UK).

4 Right ascension.

5 Reliability analysis.

6 Radio altimeter.

7 Restricted article.

8 Runway/final approach.

9 Resolution advisory; see \*TA, \*/VSI.

10 Research announcement (Darpa).

11 Research Author (NACA, NASA).

12 Risk analysis.

13 Regional augmentation.

14 Reference axis, or [STA] altitude.

15 Rocket-assisted.

16 Relay assembly.

17 Radar summary map.

18 Radius of action.

19 Rate alarm [lightning frequency].

20 Region Aérienne (F, defence; NE, Atlantic, Mediterranean).

21 Routing area.

22 Reportable accident.

**R<sub>A</sub>** Common rendering of aspect ratio.

**RAA** 1 Regional Airline Association [Washington, DC 20036–2422] (US).

2 Roll-augmentation actuator.

3 Regional Airport Authority (UK).

**RAAA** 1 Regional Airline Association of Australia.

2 Repaired and awaiting allocation (RAF).

**RAAF** Royal Australian Air Force.

**RAAFA** Royal Australian Air Force Association [office, Sydney, NSW 1230].

**RAAKS** Russian association of aviation and space insurance companies.

**RAAL** Radio-activated airfield lighting.

**RAAS** Runway awareness and advisory system, upgrade to EGPWS.

**RAATS** Rules of the Air and Air Traffic Services.

**RAAWS** Radar altimeter and altitude warning system.

**RAB** 1 Registrar Accreditation Board (US).

2 Régiment Aérienne de Bombardement (F).

**rabbit** Video display of beacon response to two unsynchronized [e.g., alien] interrogating radars; also called running rabbits, or rabbit tracks.

**rabbit lights** Sequentially flashing lead-in approach lights (colloq.).

**Rabdat** Rapid aircraft battle-damage augmentation repair team.

**Rabfac** Radar beacon, forward air control.

**RAC** 1 Rules of the air and traffic control services (UK, and all AIPs).

2 Radiometric area correlation (guidance).

3 Radar-absorbing chaff.

4 Radar-aiming complex (R, Anglicized form).

5 Rulemaking Advisory Committee (FAA).

6 Régiment Aérienne de Chasse (fighter) (F).

7 Radar analysis cell.

**RACC** Regional Air Cargo Carriers Association (US).

**RACE** Real Aero Club de España [main office, Madrid (Spain)].

**race compound** Secure park where aircraft are scrutinized by handicappers.

**racecourse** Race pattern.

**race pattern** Closed flightpath comprising two semi-circles joined by two parallel straight legs; one FL of stack.

**race-pattern hold** Normally selected for hold of longer than 2 min., latter being time for 360° turn; straight legs adjusted to give required hold unless pattern is established and published.

**race rotation** Gross rotation of spiral nature imparted by propeller to slipstream.

**racetrack** See *race pattern*.

**raceway** Major conduit or linear attachment along which are installed multiple cable looms and possibly fluid pipe-runs.

**RACGAT** Russian-American Co-ordination Group for ATC.

**RACH** Remotely actuated cargo hook.

**Rachel** Reperage acoustique d'hélicoptères (detection system, F).

**racing the count** Inaccuracy when using Consol or related navaid when flying across position lines close to station.

**rack** 1 Attachment for air-dropped store (see *hardpoint*, *pylon*, *ejector rack*, *station*).

2 Framework inside aircraft for accommodation of avionic equipments.

**rack control** Powered flight control with surface actuation by linear rack/pinion drive (suggested obs.).

**racking** Arrangement of installation of avionics according to boxes and attachment racks of standard dimensions published by ATR, Elfin etc.

**RACO** 1 Roll attitude cut-out.

2 Radar/video convertor.

**racon** Radar beacon transponder carried in aircraft for interrogation by ground station, eg SSR.

**RACP** Revolutionary Aeropropulsion Concepts Program (NASA).

**RACR<sup>3</sup>A** Royal Aero Club Records, Racing and Rally Association (UK).

**RACS** Redundant attitude-control system.

**RACT** Royal Aero Club Trust (UK).

**RAD** 1 Radar approach aid (FAA).

2 Radiation accumulated dose.

3 Rigid-aircraft dynamics.

4 Rapid application development.

5 Rapid-access data.

6 Ram-air drogue.

**rad** 1 VOR radial.

2 Radian.

3 Radiation dose absorbed, unit of radiant energy received: non-SI, = 0.01 J/kg.

4 Radius.

**R&D** Requirements analysis and design.

**RADA** Random-access discrete address.

**Radag** Radar aimpoint [or area] and guidance.

**Radalt, Rad Alt** The reading on a radio altimeter.

**Radan** Radiation direction and nature (ECM).

**radar** Use of reflected EM radiation, normally with wavelength in RF spectrum between 30 m and 3 mm, to give information on a distant target. Information may include range, range rate, bearing, height and relative velocity, or may be pictorial for reconnaissance purposes. From 1941 US acronym, from radio detection and range, or ranging, in 2001 rendered as radio aid to detection and ranging.

**radar-absorbent material** Range of surface coatings, those in use security-classified, which greatly reduce strength of RF energy reflected back along incident path. It is not known if RAMs extend to substrates and structures.

**radar advisory** Message providing advice and information based on radar observation.

**radar advisory service** Outside controlled airspace, controller provides heading, distance (and, if known, FL) of conflicting non-participating traffic, together with any advice necessary.

**radar aerial** Portion of radar system used to radiate or intercept signals; US, = antenna.

**radar altimeter** See *radio altimeter*.

**radar altimetry area** Large and comparatively level terrain with defined elevation which can be used in determining altitude of airborne equipment by means of radar (DoD, NATO).

**radar altitude** Automatic FCS mode in which height AGL is maintained constant by autopilot slaved to radio altimeter.

**radar approach** Approach executed under direction of radar controller.

**radar approach control** Facility providing approach control service by means of ASR and PAR (USAF).

**radar beacon** Transponder carried by aircraft, missile or spacecraft which, when it receives correct pulse code from ground radar, immediately retransmits identifying code on same or different wavelength.

**radar beam** Energy emitted highly directionally because of antenna geometry, eg centimetric dish, decimetric yagi.

**radar blip** See *blip*.

**radar bombing** Level bombing using radar bombsight.

**radar bomb scoring** Aircraft transmits a signal at

## radar bombsight

moment of simulated release of free-fall bomb. Plotters on ground determine precisely where an actual bomb would have fallen.

**radar bombsight** Sight for level bombing in which, irrespective of whether target can be viewed optically, numerical data on target relative position and velocity are fed by radar carried in aircraft.

**radar boresight line** That along axis of aerial.

**radar calibration** 1 Use of radar direction and distance information to check another system.

2 More often, use of accurately positioned aerial target to check accuracy of ground radar.

**radar camouflage** Use of radar-absorbent or reflective materials to change radar-echoing properties of object's surface; does not include dispensed countermeasures, jamming or other active technique.

**radar clear range** Bombing or firing range which accepts responsibility for avoiding danger to aircraft straying into it.

**radar clutter** See *clutter*.

**radar command** Command guidance in which target and missile positions and velocities are continuously determined by radar.

**radar contact** Identification of echo on radar display, esp. as that sought. When thus advised, in civil ATC, aircraft ceases normal reporting.

**radar control** Control of air traffic based upon position/height information supplied by radars.

**radar-controlled gun** AAA gun, aircraft turret or other gun system whose aim is controlled by radar and computer which feeds all information necessary (sightline spin, lead etc).

**radar controller** Air traffic controller whose positional information is provided by radar displays, and holding radar rating appropriate to assigned functions.

**radar countermeasures** See *countermeasures, ECM*.

**radar coverage** Limits within which objects can be effectively detected by radar(s) at given site or installation; may be angular, polar diagram or in other terms.

**radar cross-section, RCS** Apparent size of target as judged by its displayed echo, determined (in absence of ECM activity) by true size, range, aspect, geometric shape, materials, surface texture and treatment and other factors including intervening dust and precipitation. Normally defined by ratio  $P_r/P_s$  where  $P_r$  is radar power received at target and  $P_s$  is power reflected, plotted as polar (1) in horizontal plane.

**radar display** Visual electronic display of radar information.

**radar distance** Distance to target and return, thus 1 radar-ft = 2 ft.

**radar echo** Signal indication of object which has reflected energy back to radar.

**radar element** Radar as portion of large system. e.g. PAR as part of overall GCA.

**radar fire** Gunfire guided by radar, or against radar-tracked target.

**radar fix** Obtained from PPI radar map display.

**radar flight-following** General observation of progress of identified aircraft targets sufficiently to retain their identity or observation of specific radar targets (FAA).

**radar foot** *Radar distance.*

**radar fuzing** Comprehensive duplicated radar altimeters

## radar prediction

are installed in many NW to detonate device at selected height above surface.

**radar gunlaying** Aiming using radar target position/velocity and, usually, radar input of range; can be manual, automatic with manual override or fully auto.

**radar handover** Transfer of control using radar.

**radar horizon** At any location, line along which direct radar rays are tangential to Earth's surface; in practice, usually same as radio horizon., in the region of 185 km, 115 miles, from a height of 10,000 ft.

**radar identification** Use of transponder or procedure manoeuvre to establish positive identification of object seen on radar.

**radar imagery** Imagery produced by recording radar waves reflected from target surface in air/surface reconnaissance.

**radar indicator** Radar display.

**radar information service** Controller informs pilot of heading, distance (and, if known, FL) of conflicting traffic, but does not offer advice.

**radar integration** Automatic integration of information from air-defence, naval and other primary and secondary radars.

**radar intelligence** Self-explanatory, information gleaned from radar images of both friendly or hostile subjects.

**radar intelligence item** Feature which is radar-significant but which cannot be identified exactly at moment of its appearance.

**radar map** Cartographical information superimposed on radar display.

**radar mapping** Cartography based upon radar, esp. SLAR.

**radar mile** Unit of time equal to 10.75  $\mu$ s; time for EM radiation to reach target 1 statute mile distant and return. Rarely, 12.369  $\mu$ s [also given as 12.359] for nautical mile.

**radar monitoring** One of three types of radar service afforded by civil controllers; radar flight-following of aircraft navigated by own pilots or crews, and advice on deviations from track, possible conflicting traffic or progress on instrument approach from final approach fix to runway.

**radar navigation guidance** One of three types of radar service, ground vectoring of aircraft to provide course guidance.

**radar netting** Linking of several radars (surveillance, HFR or similar air-defence radars) to single centre to provide integrated target information.

**radar netting station** Centre which can receive data from radars and exchange these among other radar stations, thus forming netting system.

**radar netting unit** Optional electronic equipments converting air-defence fire-distribution system command centre to radar netting station.

**radar performance** Usually means peak power divided by minimum detectable signal power, but there are other meanings.

**radar picket** Ship, aircraft or vehicle stationed at distance from surface force for purpose of increasing radar detection range. Hence, \*\* combat air patrol.

**radar picket escort** Surface vessel dedicated to ESM, ECM and electronic search facilities. USN designation DER.

**radar position symbol** Computer generated.

**radar prediction** Graphic portrayal of estimated radar

## radar range

intensity, persistence and shape of cultural and natural features of specific area (USAF).

**radar range** Commonly means distance at which particular object can be detected with (1) 100% reliability or (2, more usual definition) 50% reliability.

**radar ranging** Use of radar to obtain continuous input of target range.

**radar receiver** Ambiguous term when used alone; can mean receiver of radar that also transmits, or passive equipment used in ESM, ECM or radar warning.

**radar reconnaissance** Reconnaissance using radar(s) to determine nature of terrain and enemy activity.

**radar reflectivity** As in optics, fraction of incident radiation reflected by target, normally measured on unit area perpendicular to radiation. Modified by radar camouflage and RAM (2).

**radar response** Visual indication on radar display of signal transmitted by target following radar interrogation.

**radar return** See *radar echo*.

**radar scan** See *scan*.

**radar scanner** Radar aerial (antenna) able to scan.

**radarscope** Radar display in which information is presented visually for human assessment.

**radarscope overlay** Transparent overlay for comparison and identification of radar returns.

**radarscope photography** Film record of radar display [cassette giving way to CD].

**radar screen** Radar display.

**radar separation** Radar service in which air traffic is spaced in accord with established minima.

**radar service** Monitoring, navigation guidance or separation.

**radar signal film** Film on which are recorded all signals acquired by a coherent radar and viewed or processed through optical correlator to permit interpretation.

**radar signature** See *signature*.

**radar silence** Imposed discipline prohibiting transmission by radar on some or all frequencies.

**radarsonde, radar-sonde** Meteorological facility in which balloon carries instrumentation recording temperature, pressure and other atmospheric data which are transmitted when triggered by secondary radar whose observation of balloon position when related to time and known rate of ascent gives wind velocities at different heights.

**radar surveillance** Radar observation of given geographical area or airspace for purpose of performing radar function, eg traffic control or defence.

**radar target designator control** Automatically moves acquisition symbology to bracket target prior to lock-on.

**radar tracking station** Radar facility with capability of tracking moving targets.

**radar track position** Extrapolation of aircraft future position by computer based upon radar information and used by computer for tracking.

**radar vector** Heading (course to steer) issued as part of radar navigation guidance.

**radar weather echo intensity** Scale of six levels of intensity giving rough idea of likely turbulence (NWS).

**Radat** Freezing-level data.

**RAD/BAR** Radio/pressure altimeter, or selector switch between both.

## radial staging

**RADC** Rome Air Development Center, New York state (USAF).

**Radcon** Rapid detection of concealed time-critical targets.

**RADE** Receive antenna distribution equipment.

**Radel** Trade name for resins and thermosetting plastics (Amoco).

**Radex** 1 Rapid-deployment exercise.

2 Ground-based calibrated transmitter/receiver for testing navaids.

**rad-hard** Hardened against radiation, especially from NW.

**Radhaz** Radiation hazard.

**radiac** Adjective meaning radioactivity detection, indication and computation; applied to radiological instruments and equipment.

**radiac dosimeter** Measures aggregate ionising radiation received by that instrument.

**radial** 1 Piston engine whose cylinders are arranged radially, like spokes of wheel; unlike rotary, cylinders fixed, propeller driven from crankshaft.

2 Magnetic bearing extending from point-source navaid, eg VOR, Tacan, Vortac; usually QDR.

3 Tyre [tire] construction in which rubber casing is coated with ply cords arranged transversely and extending to but not under the bead, stabilized by stiff circumferential belt.

**radial cancellation** Methods of reducing propeller or propfan noise by sweeping [usually back] the blades.

**radial compressor** Centrifugal compressor.

**radial displacement** Distortion of tall buildings in low-level reconnaissance photos.

**radial drill** Machine tool having drill chuck carried on pivoted radial arm of variable length.

**radial driveshaft** In a gas-turbine engine, this transmits the drive fromn the mainshaft or internal gearbox to the external accessory gearbox; it also transmits cranking torque during starting.

**radial engine** See *Radial* (1).

**radial error** Distance between desired point of impact of munitions and actual point, both points projected and measured on imaginary plane perpendicular to munition flightpath.

**radial error probable** That circle drawn on radial error plane through which 50% of actual munitions pass, with centre at projected target position.

**radial flow** Fluid flow inwards or outwards along substantially radial path, usually outwards in supercharger or centrifugal compressor and inwards in \*turbine.

**radial flyability** Unquantifiable measure of ease with which pilot can accurately hold radial (2), esp. when near station; varies with terrain-induced errors and other factors which distort or otherwise influence signals.

**radial GSI, RGSI** Replaced DME in many aircraft; essentially DME panel instrument with inbuilt wind correction facilitating choice of FL giving best ground speed.

**radial staging** 1 Gas-turbine or reheat combustor with fuel fed selectively to two or more rings of burners at different radii from engine axis.

2 Rocket vehicle able to shed stages at different radii from major axis.

## radial struts

**radial struts** Those connecting inner and outer ridge main joints of airship transverse frames.

**radial temperature distribution factor** Circumferentially measured combustor outlet peak gas temperature minus outlet mean temperature divided by mean combustor temperature rise.

**radial velocity** Velocity of approach or recession between two bodies, ie component of relative velocity along line connecting them.

**radial wall jet** Outward flow along ground beneath jet-lift aircraft or helicopter hovering in ground effect.

**radial-wing configuration** Use of several, eg four, wings mounted radially to permit flight manoeuvre instantaneously along any plane containing longitudinal axis without prior need for roll.

**radial wires** Join vertices of airship's main transverse frames to central fitting or to those diametrically opposite.

**radian** SI unit of plane angle; angle subtended at centre of circle by arc equal in length to diameter, rad =  $57.2958^\circ$  =  $57^\circ 17' 44.8''$  = 0.1592 revolution.

**radiant energy** EM radiation, eg heat (IR), light, radio and radar. Arguably, also occasionally used for other energy, esp. acoustic.

**radiant-energy density** Instantaneous value for amount of energy in unit volume of propagating medium, symbol  $u$ . With pulse radars depends on pulse length and position.

**radiant-energy thermometer** Instrument which determines black-body temperature; emitter need be 'black' only over range of wavelengths studied.

**radiant flux** Time rate of flow of radiant energy,  $\phi$ .

**radiant-flux density** Radiant flux per unit area; when applied to source, called radiant emittance, radiancy, symbol  $W$ ; when applied to receiver, called irradiance or (not recommended) irradiancy, symbol  $H$ .

**radiant intensity** Radiant flux per unit solid angle, measured in given direction, SI unit  $W/sr$ .

**Radiant Mercury** Software for sharing information, including classified (DoD).

**radiant temperature** That recorded by total-radiation pyrometer; when sighted on non-black body is less than true temperature.

**radiating element** Any portion of radar aerial, esp. one of electronically scanned type, which emits or reflects transmitted energy.

**radiation** 1 Process by which EM waves are propagated.

2 Process by which other forms of energy are propagated, eg heat from solid body, kinetic by ocean waves and sound waves through atmosphere or other medium.

3 Other forms of energy propagation such as nuclear \*, high-energy ionising \*, radioactivity.

**radiation area** Place where human being could receive 5+ mrem/h or total of 150 mrem in 5 consecutive days.

**radiation belts** Belts of charged particles trapped within planetary magnetic field, esp. Van Allen belts.

**radiation burn** Damage to skin caused by ionising radiation.

**radiation constants** Two physical constants: First \*\* =  $2\pi hc^2 = 3.7418 \times 10^{-16} \text{ Wm}^2$ ; Second \*\* =  $hc/k = 1.4388 \times 10^2 \text{ mK}$ .

**radiation cooling** Cooling by direct radiation from surface, normally implying high temperature (eg rocket thrust-chamber skirt).

**radiation dose** Amount of ionising radiation absorbed

## radiator header

by substance, esp. over short period of time (see *rad* [3], *roentgen*, *rem*).

**radiation dose rate** Dose per unit time.

**radiation efficiency** Ratio of power radiated to power supplied to transmitting aerial at given frequency.

**radiation field** Volume occupied by radiation (1), esp. that around conductor carrying AC or RF, comprising electrical and magnetic (inductive) components.

**radiation fog** Usually shallow fog caused by radiative cooling (often at night) of ground to below dewpoint, combined with gentle mixing, saturation and condensation.

**radiation hardening** Gradual hardening and embrittlement of most metals exposed to intense nuclear radiation, resulting in limited choice of metals for high-integrity structures in such environments.

**radiation illness** Disorders, some fatal, caused by excessive exposure to ionising radiation.

**radiation intelligence** That derived from collection and analysis of non-information-bearing radiation unintentionally emitted by foreign devices, excluding that generated by detonation of NW.

**radiation intensity** Radiation dose rate, normally that measured in air. RI-3, eg, is value 3 h after NW burst.

**radiation laws** Those describing black-body radiation: Stefan-Boltzmann, Planck, Kirchoff and Wien.

**radiation lobe** See *lobe*.

**radiation medicine** Branch dealing with radiation and human beings.

**radiation pattern** Graphical representation of radiation (1) of device, esp. radio, radar or similar emitting aerial, plotted as field strength as function of direction. Normally plotted as plan-view polar or as vertical cross-section, but can be in plane of magnetic or electrical polarization of waves. Free-space \*\* depends on wavelength, feed system and reflector. Field\*\* takes account of real situation in which waves are reflected from ground or other objects so that direct and reflected waves interfere with each other. Also called coverage diagram, aerial (antenna) pattern, lobe pattern.

**radiation pressure** That exerted on solid body by incident radiation (1), symbol  $P_r$ .

**radiation pyrometer** Pyrometer measuring light wavelengths and giving readout in terms of temperature.

**radiation scattering** Diversion of radiation (EM, thermal or nuclear) caused by collision or interaction with atoms, molecules or large particles between source (esp. NW explosion) and remote site; thus radiation is received from many directions.

**radiation sickness** See *radiation illness*.

**radiation situation map** One showing actual and/or predicted radiation situation, usually intensity, in particular ground area.

**radiation source** Generally a man-made, portable, sealed source of radioactivity.

**radiator** 1 Source of radiant energy, esp. EM or RF, eg hostile operating radar.

2 Heat exchanger, esp. for rejecting unwanted heat to a sink. Common usage restricts term to devices that dump heat overboard, eg to atmosphere, and to call those that use heat sink on board (eg fuel) heat-exchangers.

**radiator header** Tank in which liquid coolant is received from heat source, eg engine, and distributed to cooling elements, ie radiator(s).

**Radic** Rapidly deployable integrated command and control system, links navies to Nadge.

**Radil** ROCC/Awacs digital information link.

**Radint, radint** Radar intelligence.

**radio** 1 Use of EM radiation between about 5 kHz and 3 THz to convey information.

2 Qualifying adjective denoting that a height above ground has been measured by radio altimeter, thus '50 ft \*'.

**radioactive ionization gauge** Measuring device in which ions produced by radiation (usually alpha particles) from radioactive source discharge a capacitor.

**radioactivity** 1 Spontaneous disintegration of nuclei of unstable isotope yielding alpha and/or beta particles, often accompanied by gamma radiation.

2 Number of spontaneous disintegrations per unit mass per unit time, usually measured in curies.

**radioactivity concentration guide** Published values (DoD, NATO etc) of quantities of listed radioisotopes permissible per unit volume of air and water for continuous consumption.

**radio altimeter** Instrument, invariably of CW FM type, giving readout of height AGL by time-varying frequency and measuring difference in frequency of received waves, this being proportional to time and hence to height. Sometimes called radar altimeter.

**radio approach aids** Those which assist landing in bad visibility, notably ILS, MLS; also called radio or electronic landing aids.

**radio astronomy** Study of radio emissions received by Earth, esp. those which can be associated with source of EM emissions on visible, X-ray or other wavelengths.

**radio bands** Artificially divided segments of the EM spectrum, listed in Appendix 2.

**radio beacon** Fixed ground station emitting RF signals, esp. those containing identifying information, which enable mobile stations to determine their position relative to it.

**radio beam** Transmitted by directional antenna to maximize radiated power at long range.

**radio bearing** Usually, angle between apparent direction of fixed station and a reference direction, eg, true or magnetic N. Hence true \*\*, magnetic \*\*.

**radio biology** Often written as one word, study of effects of radiation on life.

**radio channel** One band of frequencies sufficient for practical radio communication; sum of emission bandwidth, sideband spread (interference guard bands) and tolerance for frequency variation.

**radio check** Request to ground station to transmit to confirm audibility [readability].

**radiochemistry** Chemistry of radioactive materials.

**radio command** Command guidance using a radio link.

**radio compass** Originally, fixed-loop receiver with which aircraft could home on to any selected fixed station. Later superseded by ADF and other navaids.

**radio control** Vague, but generally means control of vehicle trajectory with commands transmitted over radio link.

**radio countermeasures** Those branches or activities of ECM concerned with telecommunications.

**radio coupling box** Inputs ADF, VOR, ILS, etc, to autopilot.

**radio deception** Use of radio to deceive enemy; includes

sending false despatches, using deceptive headings and employing enemy callsigns (DoD, IADB).

**radio detection** Detection of object's presence by radio, without information on position.

**radio determination satellite system** Satellite system which enables receiver stations to determine position, velocity or other characteristics by propagation of radio waves.

**radio direction-finding** See *direction finding*.

**radio direction-finding database** Aggregate of information, provided by air and surface means, necessary to support radio D/F operations to produce fixes on target transmitters/emitters.

**radio duct** Shallow quasi-horizontal layer(s) in atmosphere wherein temperature and moisture gradients result in abnormally high refraction lapse rate, causing RF signals to become trapped within layer (see *anomalous propagation, skip effect*).

**radio energy** That which propagates at radio frequencies.

**radio facility chart** Original series of US airway maps based on radio range; name still common for modern air maps showing all facilities, airways, control zones, TMAs, etc.

**radio fix** 1 Fix of mobile station, eg aircraft, obtained by use of radio navaid, esp. by traditional crossings of position lines.

2 Geographical location of friendly or, esp., enemy emitter obtained by various ESM and D/F techniques.

**radio frequencies** Abb. RF, those EM frequencies used for radio or related purposes. Common-use subdivisions are: VLF, below 30 kHz; LF, 30–300 kHz; MF, 300 kHz–3 MHz; HF, 3–30 MHz; VHF, 30–300 MHz; UHF, 300 MHz–3 GHz; SHF, 3–30 GHz; EHF, 30–300 GHz; unnamed, 300 GHz–3 THz. See Appendix 2.

**radio goniometer** See *direction-finder*.

**radiography** Photography using X-rays, gamma rays or other ionizing radiation; important NDT method, often using radiation source inside test object and film outside.

**radio guard** Radio station, eg aircraft, which listens out on assigned frequencies and handles traffic and records transmissions.

**radio guidance** Guidance or navigation system using radio waves, eg point-source aids, area coverage (R-Nav), global (Omega) and command methods.

**radio height** Height above ground measured by radio altimeter.

**radio hole** Direction of propagation suffering abnormal attenuation or fading, usually caused by local refraction.

**radio horizon** At any location, line along which direct rays from RF transmitter become tangential to Earth's surface; extends beyond visual horizon because of atmospheric refraction, and varies according to whether propagation is sub-, normal or super-standard.

**radio-inertial guidance** Various systems combining inertial and radio tracking and/or command (probably obs.).

**radio interferometer** Interferometer operating at RF.

**radioisotope** Unstable isotope that decays spontaneously, emitting radiation.

**radioisotope thermoelectric generator** Self-contained power system in which a radioisotope is used to heat one junction in a circuit containing dissimilar metals and thus generate sustained electricity.

**radiolocation** Original UK name for radar.

**radiological defence** Measures taken against radiation hazard resulting from use of NW and RW.

**radiological survey** Directed effort to determine distribution and dose rates of radiation in an area. Hence \*\* flight altitude.

**radiological weapons** Established forms of radioactive materials or radiation-producing devices, including intentional employment of NW fallout, to cause casualties or restrict use of terrain; abb. RW.

**radiology** Science of ionizing radiation in treatment of disease.

**radio loop** D/F loop aerial.

**radioluminescence** Emission in visible EM range, typically with characteristic hues, in radiation from radioactive materials.

**radio-magnetic indicator** Magnetic and radio panel instrument in which card (dial) rotates so that heading appears opposite index mark at top of case while needle rotates to show magnetic bearing (QDM) of tuned beacon.

**radio marker beacon** See *marker*.

**radio mast** Mast projecting above or below aircraft, esp. older aircraft, usually as one anchor for MF/HF wire aerial. Modern VHF blade seldom thus termed.

**radiometeorograph** Meteorograph transmitting readings by radio (see *radio-sonde*).

**radiometer** Instrument for detecting, and usually also measuring, IR and closely related radiation (see *bolometer, actinometer, photometer*).

**radiometric resolution** This is usually measured in bits.

**radio navigation** All uses of radio to determine location, obtain heading information and warn of obstructions or hazards.

**radionuclide** Nuclide spontaneously emitting radiation. **radiophotoluminescence** Photoluminescence exhibited by substance after irradiation by radionuclide or other source of beta or gamma rays.

**radio proximity fuze** See *proximity fuze*.

**radio range** Original radio navaid (US), a land (rarely, ship) fixed station of aeronautical radio service broadcasting continuous coded signals which on one side of an airway are heard as a Morse N (--) and on other as A (-); in a less common system signals are I (..) and A. In the equisignal zone along centre of airway both signals combine, A and N forming continuous note and I and A cancelling to send no signal to pair of reeds which, as soon as aircraft strays from centreline, vibrate visually and aurally. Now replaced by VOR and later navais.

**radio rangefinding** Use of radio (essentially in this case not radar) to determine range.

**radio-range orientation** Technique needed when flying radio range of finding and identifying station and then accurately flying correct leg to next station or destination.

**radio recognition** Determination by radio means of another station's identity; DoD wording is 'friendly or enemy character, or individually, of another'.

**radioresistance/radiosensitivity** Measures of resistance or sensitivity of living cells to injurious radiation.

**radio silence** Period during which some or all RF emitters (eg of military force) are kept inoperative.

**radio-sonde** Instrumentation for measurement of atmospheric data, usually temperature, pressure and humidity, carried aloft by balloon together with electronics for converting answers into code for RF

transmission to ground station at intervals (see *radar-sonde*).

**radio sonobuoy** Sonobuoy which transmits information to friendly receivers.

**radio telegraphy** Transmission of telegraphic codes by radio; often one word.

**radio telephony** Transmission of speech by radio, R/T, often one word.

**radio-telephony network** Integrated group of aeronautical fixed stations which use and guard frequencies from same family and co-operate to maximize reliability of air/ground communications.

**radio telescope** Radio receiver capable of greatly amplifying, recording and determining source-direction of radio waves received on Earth from outer space.

**radio waves** EM radiation with wavelengths from tens of kilometres (VLF) down to tens of microns (above EHF, so-called decimillimetric waves). See Appendix 2.

**radius** See *radius of action*.

**radius block** Steel block with edge of accurate radius for sheet-metalwork.

**radius dimpling** Pressing dimples in thin sheet with hemispheric or cone-shaped mating tools.

**radius gauge** Hand instrument for measuring inside or outside-bend radii.

**radius of action** Maximum distance aircraft can travel away from its base along given course with normal combat load and return without refuelling, allowing for all safety and operating factors. Today, esp. with gas-turbine propulsion, \*\*\* varies greatly with mission profile, fuel consumption being several times higher in lo regime with afterburner lit.

**radius of damage** Radius from ground zero within which there is 50% probability of achieving desired damage.

**radius of gyration** Distance from body's centre of gyration to selected axis; square root of ratio of moment of inertia, about selected axis, divided by mass.

**radius of integration** Radius from ground zero within which effects of NW and conventional weapons are to be integrated.

**radius of safety** Horizontal distance from ground zero within which NW effects on friendly troops are unacceptable.

**radius of turn** For conventional aeroplane  $R = V^2/g \tan \theta$  where V is TAS and  $\theta$  is angle of bank.

**radius rod** Major bracing strut in retracting landing gear; normally pivoted near lower end of main leg and upper end pinned to backlink, actuator or sliding block, but many arrangements all with same name.

**radius vector** Vector connecting body with object which may have relative motion; specif., vector joining primary body to satellite, as in Earth/Moon system.

**radix point** In any number system, index separating numbers having negative powers from those having positive; eg decimal point, binary point.

**Radnet** Radar-data interchange network [Eurocontrol].

**radome** Protective covering (and in aircraft aerodynamic fairing) over radar or other aerial, esp. one with mechanical scanning; made of dielectric material selected according to operating wavelength and other factors.

**Radop** Radar/optical tracking methods.

**Radot** Recording automatic digital optical tracker.

**Radpac** Radar package (Panavia); versatile software to extend radar capability, esp. in air-to-air missions.

## RADS, Rads

rain static

**RADS, Rads** Retardant aerial delivery system.

**rad/s** Radians per second.

**RADU** Range and azimuth display unit.

**RAE** 1 Royal Academy of Engineering [London SW1P 3LW] (UK).

2 Royal Aerospace (until 1988 Aircraft) Establishment (MoD PE), later called DERA Farnborough, now defunct. Britain's greatest aeronautical research centre, at Farnborough, Hampshire; in 1912 called Royal Aircraft Factory, 1918 Royal Aircraft Establishment, in 1988 Royal Aerospace Establishment, now closed; an out-station opened as RAE Bedford in 1955.

**RAeC** Royal Aero Club, founded 20 October 1901 as The Aero Club of Gt Britain, prefix Royal 15 February 1910, GB changed to UK 2003, numerous affiliates [office, Leamington Spa, CV31 1UT] (UK).

**RAeS** Royal Aeronautical Society, founded 12 January 1866 as the Aeronautical Society of Gt Britain, prefix Royal 1913, main affiliates HAGB, IAeE, SLAET London W1V 0BQ.

**RAEng** Royal Academy of Engineering [London SW1P 3LW] (UK).

**Raevam** RAE variable-aerofoil mechanism; infinitely adjustable flexible leading edge.

**RAF** 1 Royal Aircraft Factory [1912–18](UK).

2 Royal Air Force.

3 Recursive adaptive filter.

4 Requirements analysis folder.

**RAFA** The Royal Air Forces Association [1943–, office, London W4 3RX] (UK).

**RAFBF** Royal Air Force Benevolent Fund;[founded October 1919, office London W1B 1AR.] (UK).

**RAFBFE** RAFBF Enterprises, the Fund's commercial arm [office, Fairford, Glos.] (UK).

**RAFC** 1 Regional area forecast center/centre.

2 RAF College [Cranwell, Lincs.]

**RAFCS** Redesignated AFCS.

**RAFES** RAF Escaping Society, charity for assisting those who helped Allied aircrew evade or escape capture in WW2.

**Rafic** Radar and flight-information capture (noise-monitoring software).

**Rafis** Radar-assisted flight-information service.

**RAFL** Rainfall.

**RAFO** Reserve of Air Force officers (UK).

**RAFs** Rubidium atomic frequency standard.

**RAFSEE** RAF Signals Engineering Establishment (Henlow).

**RAFSPA** RAF Sport Parachute Association, office, Weston-on-the-Green, Oxon (UK).

**Rafts** Reconnaissance/attack/fighter training system (USAF).

**RAG** 1 Replacement Air Group, supplying aircrew to carriers (USN).

2 Runway arrester gear.

3 Ragged cloud.

4 Range/azimuth gating.

**rag and tube** Constructed from tubing, with fabric covering (US, colloq.).

**RAGS** Mixed rain and hail.

**rag-wing** Fabric-covered aircraft (US, colloq.).

**RAHE** Ram-air heat-exchanger.

**RAHR** Royal Artillery Hebrides Range (UK).

**RAI** 1 Registro Aeronautico Italiano; national licensing authority [office, I-00187 Rome] (Italy).

2 Runway alignment indicator (ICAO).

3 Remote attitude indicator.

4 Regional Airspace Initiative.

5 Radio-altitude [or altimeter] indication [or indicator].

6 Reconnaissance/attack interface.

7 Ram-air inflation.

8 According to AIDU, “automatic information transmitter.”

**RAID** 1 Redundant array of independent disks.

2 Rapid alerting and identification display.

3 Rapid aerostat initial deployment (USA).

4 Real-time adversarial intelligence and decision-making (Darpa).

**Raider** Replacement advanced intelligent dual ejector rack.

**Raidrs** Rapid attack identification detection and reporting system [satellites] (USAF)..

**Raids, RAIDS** 1 Rangeless airborne instrumented debriefing system, see Urts.

2 Radar airborne intrusion detection system.

**RAIL** Runway alignment indicator light[s]; S adds system (FAA).

**rail** Launcher on ground or aircraft mount for missile requiring support and/or guidance while accelerating.

**rail antenna** T/R or receive only antenna having the form of a long straight rod aligned with the aircraft longitudinal axis.

**rail-drive airbridge** Can move in/out telescopically, and in vertical plane, but not in azimuth.

**rail garrison basing** Deployment of ICBM (LGM-118A) units wholly contained within US railroad trains.

**railgun** General term for family of actual or possible space weapons whose projectiles are accelerated by EM effects.

**rail launch** See rail.

**RAILS** See RAIL.

**RAIM** Receiver autonomous integrity monitor(ing).

**Rain** Reduction of airframe and installation noise.

**rain** Precipitation in form of water droplets making noticeable individual impact, diameter roughly 1 to 5.5 mm.

**rain band** Spiral cloud area of tropical revolving storm where there is heavy rain.

**rainbow(ing)** Appearance in laminated transparency of multicoloured (spectral) stress patterns.

**rainfall** Term for radioactive precipitation from base-surge clouds after underwater NW burst (DoD).

**rain gauge** Various forms of precipitation gauge designed primarily for measuring fall of water droplets, usually by funnelling fall over known area into calibrated container.

**rain ice** Most dangerous airframe icing; similar to glaze ice and caused by supercooled raindrops which take sufficiently long to freeze for flowback to be extensive.

**rain loop** See drip flap.

**rainmaking** See seeding (2).

**rain-out** 1 Removal of solid particulate pollution by rain.

2 Radioactive material in atmosphere brought down by precipitation and present on surface (DoD).

**rain static** Radio interference believed to be caused by rain bearing electrostatic charges.

## RAIS

## ramp status

**RAIS** Redundant array of inexpensive systems [architecture].

**RAISD** Research and Acquisition Information Systems Division (Andrews AFB).

**RAIU** Receiver autonomous integrity unit.

**RAJ** Ring-around jammer (ECM).

**Rajpo** Range Joint Project Office.

**RAKA** Russian aerospace agency, also called Rosaviakosmos, since 2003 the FKA.

**rake** 1 Angle between local vertical and swivel or castor axis of swivel-mounted wheel, eg tailwheel.

2 Angle between quasi-straight edge of wingtip and aircraft longitudinal axis, called positive \* when leading edge is shorter than trailing edge and negative \* when trailing edge is shorter.

3 Distance, measured parallel to aircraft longitudinal axis, between front of propeller blade at tip and plane of rotation through axial mid-point of hub (simple fixed-pitch propeller).

4 Acute angle between line joining centroids of propeller blade from root to tip and plane of rotation (often zero and possibly synonymous with 3).

5 Comb, linear or other array of pitot heads.

**raked tip** Sharp sweepback on extreme outer section of wing, propeller/helicopter blade or other aerofoil.

**raking shot** Gunfire almost aligned with hostile aircraft longitudinal axis.

**RAL** Rutherford Appleton Laboratory [SERC, now part of CLRC; Chilton OX11 0QX] (UK).

**Ralacs** Radio-altimeter low-altitude control system (RPV).

**RAL-BCN** See next.

**RAL beacon** Downwind of threshold, shows runway alignment.

**RALS, Rals** Remote augmented lift system.

**RALT** Radar altitude.

**RAM** 1 Random-access memory.

2 Radar-absorbing [or absorbent, or attenuating] material(s).

3 Research and applications module (Space Shuttle).

4 Rapid area maintenance (AFLC).

5 Raid-assessment mode (radar).

6 Reliable/available/maintainable.

7 Rolling-airframe missile.

8 Route-adherence monitoring.

**ram** 1 Increase in pressure in forward-facing tube, duct, inlet etc as result of vehicle speed through atmosphere: if fluid flow were brought to rest in duct pressure would be q, dynamic pressure. Hence \* inlet, \* pressure, \* jet, \* air, \* effect.

2 Main movable portion of hydropress; term not encouraged for most hydraulic devices having linear force output, for which actuator is preferred.

**ram air** Air rammed in at forward-facing inlet.

**ram-air parafoil** Flexible double-membrane wing inflated for rigidity by ram air.

**ram-air temperature** That of ram air brought to rest with respect to vehicle; stagnation temperature. Local temperature on a surface subject to full kinetic heating, as at the peak line along a leading edge, symbol  $T_{\text{ram}}$ , normally taken as  $T_{\text{amb}}(1 + 0.2M^2)$ .

**ram-air turbine** Small windmill extended into slipstream to provide shaft power for essential services [eg., flight

control or electric power] following total engine or electrical failure.

**Ramana** Role of agile management in aerospace.

**Raman effect** Scattering, with change in polarization and wavelength, of light passing through transparent solid, liquid or gas.

**ramark** Fixed radio beacon continuously transmitting (sometimes coded signal) to cause radial line on PPI radars.

**ramburner** Turbofan which at Mach 2.5–4 closes off core to become a ramjet.

**RAMCC** Regional Air-Movement Control Center (US).

**ram compression** See *ram* (1).

**RAMCS** Rapid airborne mine-clearance system (USN).

**Ramdi, RAMDI** Radioactive miss-distance indicator.

**ram drag** See *momentum drag*.

**Ramics** Rapid airborne mine-clearance system (USN).

**ram inlet** Forward-facing inlet designed to achieve maximum ram recovery, also called ram [or ram-air] intake.

**ramjet** Air-breathing jet engine similar to turbojet but without mechanical compressor or turbine; compression is accomplished entirely by ram (1) and is thus sensitive to vehicle forward speed and non-existent at rest (hence \* cannot start from rest). Inefficient at Mach numbers below 3 but extremely important for unmanned vehicles, esp. in conjunction with rocket (eg ramrocket). Also called athodyd, Lorin duct; not to be confused with pulsejet or resonant ducts.

**RAM net** Camouflage net made of RAM (2).

**Ramos** Remote automatic meteorological observing station.

**RAMP, Ramp** 1 Robotic applications for modular payloads (USA).

2 Radar modernization program.

3 Reconnaissance avionics maintainability program (USAF).

4 Ramp control service.

**ramp** 1 Main aircraft parking area at airport, airfield, airbase.

2 Sharp-edged wedge with sloping wall forming inner wall of supersonic inlet duct to create oblique shock(s) and improve pressure recovery, esp. at supersonic speeds; usually has variable geometry.

3 Inclined track for launch of target, RPV, UAV or missile under moderate acceleration.

**ramp capacity** Number of aircraft, of specified general size class, for which ramp (1) is designed, including nose-in and off-terminal parking.

**ramp check** Visual external inspection of aircraft plus replenishing hydraulic fluid, oil, water and other consumables, plus checking tyres and brakes.

**ramp extension** Increase in size of ramp (1) to augment capacity or allow for larger aircraft with wide turning circles.

**ram pressure** Ram (1).

**Ramps** Resource allocation and multipath scheduling.

**ramp services** All services needed by civil aircraft on transit stop or turnaround, normally excluding mechanized freight handling and supplies (eg pantry/bar stocks) brought from terminal.

**ramp status** Accorded a new prototype after it has gone 'out the door' and is being readied for taxi tests.

## ramp-to-ramp

**ramp-to-ramp** See *block time*.

**ramp up** To increase (US).

**ramp weight, MRW** Maximum weight permissible for aircraft, equal to MTOW plus fuel allowance for main engines and APU for start, run-up and taxi.

**ram recovery** Pressure actually achieved in ram inlet, expressed as absolute value or as percentage of total available dynamic pressure.

**ramrocket** Important species of propulsion system for unmanned vehicles, comprising rocket (solid, liquid or hybrid) and integral ramjet propulsion. Vehicle is launched by rocket, at conclusion of whose burn at supersonic speed nozzle is jettisoned, leaving larger con-di nozzle, air inlet is extended or opened and ramjet operation takes place with combustion of liquid or hybrid type in original solid motor case and chamber (see *ducted rocket*).

**Ramrod** Day attack by bombers escorted by fighters with primary objective destruction of target (WW2).

**RAMS, Rams** 1 Remote automatic multipurpose station.

2 Removable auxiliary memory set.

3 Rapid assembly of munitions system, refined procedures for assembling munitions over sustained period (USAF).

4 Reliability, availability, maintainability and safety.

5 Reorganized ATC mathematical simulator (Eurocontrol).

6 Regional atmospheric modelling system.

**Ramsbottom** A standard procedure for determining carbon residue left after combustion of lubricating oils.

**Ramses** 1 Radar mode-S evaluation system.

2 Reduced acoustic mode scattering engine system.

**ram's horn** 1 Pilot flight-control yoke generally resembling ram's horn, more upright than spectacles.

2 Microwave aerial of spiral (usually exponential) form.

**RAMU** Removable auxiliary memory unit.

**ram void pressure** Achieved pressure (pressure recovery) inside inlet duct, esp. at supersonic speed; ratio \*\*\*/freestream total pressure is function controlling dump doors on SSTs.

**ram wing** Vehicle designed to fly in ground effect; arguably synonymous with ekranoplan.

**ram yoke** Carrier, usually one of a pair, for AAM, powered by cartridge to separate missile under peak negative-g conditions.

**RAN** 1 Regional Air Navigation panel (ICAO).

2 Radio Access Network [2005–] (Int.).

3 Royal Australian Navy.

**RANC** Radar attenuation, noise and clutter (US, DNA).

**RAND** From 'research and development', pronounced Rand, non-profit institution [Santa Monica, CA90407–2138] (US).

**R&A** Report and accounts.

**R&C** Rolled and coined.

**R&D** Research and development.

**R&E** Radio and electronic, as distinct from A&E.

**R&M** 1 Reports and memoranda (UK).

2 Reliability and maintainability (US).

**R&O** Repair and overhaul.

**random access** Ability of computer memory to remember contents and addresses of all memory stores

## range/azimuth display unit

immediately; access time is independent of location of preceding record.

**random-demand planning** Planning for supplies necessitated by in-service failures.

**random energy** That of fluid particles in disordered motion, rapidly degrading to heat, eg downstream of shock.

**random error** Unpredictable, caused by short-period disturbances in system or in measuring method, normally having Gaussian distribution over period; excludes major failures, human errors and errors of systematic nature.

**random flight** Unplanned local flight by light aircraft, esp. one without radio.

**random R-nav routes** Direct routes making full use of R-nav capability.

**random scatter** See *scatter (1)*.

**R&QA** Reliability and quality assurance.

**R&R** 1 Routeing and record.

2 Rest and recreation, or Rest and recuperation.

3 Recovery and repair.

4 Repair and return.

**Rands** Range, nose, distance, speed.

**R&SU** Repair and Servicing Unit (RAF).

**R&T** Research and technology [A adds acquisition].

**range** 1 Distance aircraft can travel, under given conditions, without refuelling in flight. By itself has little meaning, except for very small, simple aircraft. Maximum-fuel \* normally taken to mean IFR reserves for multi-engine aircraft, VFR for single. Calculations for military aircraft traditionally assume external tank(s) retained, ammunition not fired, includes distance during climb but not fuel for warm-up, takeoff or reserve. Definitions of what constitute short- \*, ultra-long \* etc, have never ceased to proliferate, but may soon firm up. One formula is  $R = W_f V/c' F$  where  $W_f$  is mass of fuel [in practice, of usable fuel],  $V$  is TAS,  $c'$  thrust sfc and  $F$  net propulsive force. See Breguet.

2 Limiting distance, over intercontinental \* measured as great circle, missile, RPV or other unmanned vehicle can travel with specified load and following specified flight profiles.

3 Distance between observer or weapon launch point and target.

4 Land and/or water area equipped and designated for vehicle testing, esp. missile, UAV or RPV, or testing ordnance or practice shooting at targets.

5 Difference between upper and lower limits for variable, eg frequency or wavelength coverage of receiver, pitch of propeller blades or many other variables.

6 To organize aircraft on carrier flight deck into desired sequence with closest packing.

**range ambiguity** In several early radio navaids, eg radio range, possibility of flying reciprocal or obtaining misleading distance indication.

**range analog bar** Horizontal bar appearing in some optical, HUD or radar sight displays once full lock-on has been achieved, its length showing range.

**range and bearing launch** Missile has these parameters preset, flies on bearing and at last possible moment switches on radar seeker to acquire target.

**range attenuation** Inverse-square decrease in radar power density with range.

**range/azimuth display unit** Various instruments, esp. HSI giving VOR/DME information.

## range bar

**range bar** Bold, usually horizontal, failure warning flag for panel instruments.

**range bin** Store location in SSR plot extractor; each range increment on given azimuth has store location from range 0 to range limit in which detected targets are stored until end of scan, when each is extracted and, together with scan azimuth, passed out as a plot.

**range error** Distance measured from imaginary line drawn through desired impact point and one drawn through actual impact point, both parallel and perpendicular to axis of attack (USAF); distance means perpendicularly distance.

**range error probable** Distance between two parallel lines drawn perpendicular to axis of attack and equidistant from desired mean point of impact between which fall 50% of impact points of independently aimed weapons.

**range gate pull-off** Basic ECM jamming technique usually used to pull hostile radar off target and thus provide infinite JSR for angle jamming; JSRR depends on many variables and is seldom effective technique when radar is manually controlled.

**range gating** Limiting radar or laser to detect targets only within upper and lower (often narrow) range limits.

**range lights** Row of green lights marking each end of usable runway at simple airfield.

**range markers** 1 Parallel lines, concentric circles or other fixed graticule on display giving indication of range.

2 Single synthetic echo(es) injected into radar display timebase to give sharp blip, circle or other clear indication at selected range.

3 Two upright markers, illuminated at night, placed so that, when aligned, they assist piloting or in beaching amphibious craft.

**range mean pairs** Continuous analysis of peaks and troughs of variable function.

**range octagon** Computer-generated octagon around HUDS sight target which unwinds at rate of one side lost for each 100 m closure.

**range-only tracking** System for accurately measuring vehicle range by phase-comparison technique; vehicle transponder is interrogated by transmitter and replies are recorded by three or more widely separated receivers. In US operated on 387 and 417 MHz.

**Ranger** Deep penetration of hostile territory looking for air or surface targets (RAF, WW2).

**range rate**  $\dot{R}$ , rate at which range changes,  $\frac{dR}{dT}$  [range being to a target, or of radar signal, etc].

**range resolution** Ability of radar to discriminate (separate) two targets on same bearing but with small range separation; determined mainly by pulse length.

**range ring** Any circle or arc on PPI display indicating range.

**range safety officer** Person charged with supervising safety to personnel on range (4) and ensuring that no object travels beyond range boundary.

**range strobe** See *range markers* (2).

**range tracking element** Radar subcircuit which monitors received-echo times and operates range gate immediately before each return is received.

**ranging** Process of establishing target distance, by radar, optics/lasers, echo, intermittent, manual, gunfire, explosive-echo or navigational means.

**ranging time** Time taken by EM (e.g., radar) signal to

## rapid deployment force

travel to target and return, approximately  $6.7 \mu\text{s}$  per km,  $10.7 \mu\text{s}$  per mile,  $12.4 \mu\text{s}$  per n.m. (nautical mile).

**RANK** Replacement alphanumeric keyboard.

**rank** Position in airline fleet: e.g. \* 7 is seventh of type to be delivered.

**Rankine** Absolute Fahrenheit scale of temperature,  $^{\circ}\text{R} = ^{\circ}\text{F} + 459.67$ , hence  $K = 5/9R$ .

**Rankine cycle** Thermodynamic cycle forming basis of modern steam plant, including many vapour-cycle machines for aerospace, all having closed circuit: boiler/prime mover/condenser/pump/boiler. In space power systems working fluid is usually metallic vapour, eg Hg, Cs.

**Rankine-Hugoniot** Relationship between pressure and density on each side of plane shockwave (Rankine 1870), from which  $p$ ,  $V$  and  $\gamma$  for inclined shocks can be deduced.

**Ranntac** Reduction of aircraft noise by nacelle treatment and active control.

**Ranrap** Random-range program (ECM).

**Rans** Reynolds-averaged Navier-Stokes.

**Ransac** Range-surveillance aircraft.

**Ransu** Regional air-navigation service unit.

**RANT, Rant** 1 Re-entry antenna test (ABRES).

2 Radio-aids navigation tutor, or trainer.

**RAO** Régiment Aérienne d'Observation (F).

**Raob** Radio-sonde observation.

**RAOC** Regional air operations centre.

**RAOD** Ram-air overboard dump.

**RAP** 1 Reliable acoustic path (sonar).

2 Resource allocation plan.

3 Reliability analysis program(me).

4 Rocket-assisted projectile (ECM).

5 Radar-absorbent (or absorbing) paint.

6 Radio, or random, access point.

7 Recognized air picture.

8 Rack and pinion.

9 Replacement acoustic processor.

10 Air reconnaissance regiment (R).

11 Repair assessment program (FAA).

**Rapcon, RAPCON** Radar approach control (FAA).

**RAPD** Recognized air picture display.

**Rapec** Rocket-assisted personnel ejection catapult (Martin-Baker).

**Raphael** Radar de photographie aérienne électronique; -TH adds transmission herzienne (F).

**RAPID** Met. change [esp. significant] expected within 30 minutes.

**Rapid** 1 Real-time acquisition program of inflight data (Sikorsky).

2 Retrorocket-assisted parachute inflight delivery.

3 Rugged[ized] advanced pathogen identification device.

4 Radar passive identification.

**Rapid aerostat initial deployment** Use of [usually static] airship[s] with multiple sensors to warn surface force of guerilla attack (USA).

**rapid area supply support** Ability to deliver supply/transport/packaging teams where needed (USAF AFLC).

**rapid-bloom** Chaff or other ECM dispensed payload which quickly (within 0.1 s) assumes dimensions or emission properties resembling those of actual aircraft.

**rapid deployment force** Military force, usually trained in amphibious, urban and peacekeeping operations, ready

## Rapide

rate

for near-immediate deployment to distant trouble spot. American RDF includes armour, air and naval power.

**Rapide** Reliability and performance in demonstrated engines.

**rapid engineer deployment** Quick-reaction civil-engineer squadrons that provide heavy construction and repair capability for theatre commander (USAF).

**rapid-extraction parachute** One designed to deploy in less than 0.5 s from initial mechanical or electrical signal, eg for lo-alt delivery or crew escape at minimum altitude.

**rapid-fracture surface** That left by high-rate crack propagation, showing as dark (often arrowhead) zones separated by bright zones of slow fatigue failure.

**rapid-intervention vehicle** Fast off-road vehicle, first at scene of crash on or near [usually military] airfield, equipped to rescue crew.

**rapid prototyping** Standard life-cycle method of software development.

**rapid pucker-factor take-off** One on a favourable unbalanced field.

**rapid-reload capability** Ability of single ICBM silo or SLBM tube system to fire at rapid rate; not defined in SALT II but generally taken as more than one round per 24 h. Note: in West, no reload missiles exist.

**Rapids** 1 Radar passive identification system.

2 Real-time acquisition and processing integrated data system [satellite ground station].

**Rapnet** Regional air-traffic service packet-switched network.

**RAPP** Recognized air-picture production.

**Rapport** Rapid alert programmed power-management of radar targets.

**RAPPS** Remote-area precision positioning system.

**RAPS, Raps** 1 RPV advanced payload system(s) (USAF RPV ECM).

2 Radar prediction, or protection, system.

3 Recording, analysis, playback and simulation [radar data].

4 RPV autoland position sensor.

**Rapsat** Ranging and processing satellite.

**RAPT, Rapt** 1 Radar procedures trainer.

2 Recognized air-picture troop.

**Raptor** Responsive aircraft program for theater operations [USAF UAVs, not connected with name of F-22].

**RAPTR, Raptr** Resonant antenna pulsed transient radiator (AFRL).

**RAR** 1 Request radar blip identification (RBI) message.

2 Radar arrival route.

**Rara, RARA** Reusable active RF augmentation.

**RARDE** Royal Armament Research & Development Establishment, (Fort Halstead, Sevenoaks and Chertsey, UK).

**rare-earth** General adjective for electric machines using \*\* magnetic materials, notably SmCo.

**refraction** Supersonic flow through diverging duct, in which pressure decreases while velocity increases.

**Rareps** Radar [weather] reports.

**RARF** Radar, antenna and RF, integrated system in which multiple radar functions are performed with single electrically scanned aerial on time-shared non-interference basis (Emerson).

**RARO** Remote aerial refuelling operator, or operation.

**RARS** 1 Radar recording system.

2 Ram-air recovery system.

**RAS** 1 Rectified airspeed, see *airspeed*.

2 Rough air speed, for flight through gust (2).

3 Replenishment at sea.

4 Radar-absorbing, or absorbent, structure.

5 Remote active spectrometer.

6 Radar Advisory Service; A adds Area.

7 Row address strobe.

8 Runway alert system.

9 Royal Astronomical Society [office, Burlington Ho, London W1V 0NL] (UK).

**RASA** 1 Russian Aviation and Space Agency.

2 See *RAS6*.

**RASC** Regional AIS system centre.

**Rascal** 1 Responsive-access, small-cargo, affordable launch (Darpa).

2 Ramjet, small-calibre.

3 Radar do scoperta e controllo aereo locale (short-range air surveillance) (I).

**RASD** Requirements and system definition.

**Rasda, RASDA** Replicated air support decision aid.

**RASE** Rapid automatic sweep equipment (ECM).

**RASER, Raser** Revolutionary aerospace engine research (NASA).

**RASH** Rain showers.

**RASI, Rasi** Radar and navaid simulator.

**RA/SI** Rate alarm/storm intensity (thunderstorms).

**RASM** Revenue per aircraft, or available, seat-mile.

**RASN** Rain and snow (ICAO).

**Rasos, RASOS** Regional Aviation Safety Oversight System, a Coscap group for Central America (ICAO).

**Rasp, RASP** 1 Recognized air and surface picture.

2 Radar Applications Specialist Panel (Eurocontrol).

3 Rapid-acquisition spectrum processor.

**Raspberry ripple** Colour scheme [red/white] of training and research aircraft (RAF/RN/Qinetiq).

**RASS** 1 Rapid area supply/support (USAF).

2 Radio acoustic sounding system.

3 Radar analysis support system.

**Rast, RAST** 1 Recovery assist, secure and traverse (shipboard helicopter).

2 Radar-augmented sub-target.

3 Replacement aerial subsonic target.

**Rastas** Radiating site and target acquisition system (airborne ECM).

**raster** Generation of large-area display, eg TV screen, by close-spaced horizontal lines scanned either alternately or in sequence.

**raster scan** See *scan*.

**RaSTI** Rapid speech transmission index.

**Rasur** Radio surveillance for intelligence purposes.

**RASV** Reusable aerospace vehicle.

**RAT** 1 Ram-air turbine.

2 Ram-air temperature.

3 Rock abrasion tool (Martian exploration).

4 Radar active target.

**Rat** Hostile intruder aircraft flying alone.

**Rata, RATA** Resolution advisory/traffic advisory.

**RATC** Radar air-traffic control [C adds centre, F facility].

**Ratchet** Rapid ATC HMI evaluation tool.

**ratcheting** See *roll* \*.

**rate** Rate of change, first derivative of variable with respect to time; thus angle \*, \* gyro. Symbol is dot placed

centrally above value, thus if  $a$  is acceleration along flight-path  $\dot{a}$  is rate of change of acceleration, or acceleration\*.

**rated** Qualified for specific flight duty, especially to fly particular aircraft type.

**rated altitude** That at which piston engine gives maximum power, for supercharged engine usually at height considerably above S/L; lowest altitude at which full throttle is permissible (or, usually, obtainable) or maximum boost pressure can be maintained at maximum rpm in level flight.

**rated coverage** Area within which strength of NDB vertical field of ground wave exceeds minimum value specified for geographical area where situated.

**rated power** Any of several specified limits to gas-turbine power, eg take-off, 2½ min. contingency, maximum continuous.

**rate gyro** Gyro whose indication gives a rate term, rate of change of attitude; single degree-of-freedom gyro with primarily elastic restraint of spin axis about output axis.

**rate integrating gyro** Single-degree-of-freedom gyro whose output axis is linked to spin axis by viscous restraint so that angular displacement is proportional to integral of angular rate of change of attitude. Abb. Rig (not recommended).

**rate of climb** Rate of gain of height, vertical component of airspeed of aircraft (normally aerodyne) established in climbing flight at quasi-constant airspeed (ie not in zoom trading speed for height). For helicopter, two values; maximum \*\*\* and maximum vertical \*\*\*.

**rate-of-climb indicator** See *VSI*.

**rate of temperature-rise indicator** Fire-warning system; does not respond to temperature but to positive rate of change.

**rate of turn** Rate of change of heading, proportional to bank angle  $\theta$ ;  $R$  (turn radius), for constant speed, is exactly proportional to  $\tan \theta$ . See *turn rate*.

**rates of exchange** Tradeoff multipliers, eg numerical value linking takeoff field length or MTOW for unchanged takeoff field length per °C change in ambient temperature.

**Rate 1 turn** Sustained  $3^\circ s^{-1} = 180^\circ \text{ min}^{-1}$ . See *turn rate*.

**rate structure** Comprehensive and in general internationally agreed prices for air carriage of unit mass of all commodities.

**RATG** Ram-air turbine generator.

**rating** 1 Authorized operating regimes, with limiting numerical values, for engine or other functional device or system. For gas-turbine engine can include takeoff, maximum climb, maximum cruise, OEI contingency, etc; for piston engine can include METO, maximum weak mixture, etc.

2 Anti-knock value of piston-engine fuel.

3 Endorsements, additional qualifications, privileges and limitations added to airmen certificate (US) or pilot's licence (UK), eg night \*, IMC \*, seaplane \*, multi-engine \*, instrument \* and flying instructor \*. See *Type*.

**rating spring** Spring, usually with linear output, whose change in length is accurately proportional to applied force.

**ratio changer** Device for varying the response of a flight-control surface, especially rudder, to input demand, usually in proportion to  $q$  (dynamic pressure).

**ratio of specific heats** For a gas, ratio of specific heat at

constant pressure divided by specific heat at constant volume; for air  $\gamma = C_p/C_v = 1.401$ .

**Rato, RATO** Rocket-assisted takeoff; G or g adds gear, meaning not landing gear but equipment.

**Ratrace** Radar transmitter waveguide shape facilitating use of common aerial for transmitting and receiving.

**RATS, Rats** 1 Rapid area transportation support (USAF).

2 Rescue advanced-tactics school.

3 Roving aerodynamic test system.

**Ratscat** Radar-target scatter; more fully, radar-target test scatter facility.

**RATT** Radio teletype.

**Rattlr, RATTLR** Revolutionary approach to time-critical long range; S adds strike (USN).

**RAU** Radio access unit.

**RAV** Robotic air vehicle [also called Rave].

**Rave** 1 Rapidly adjustable variable exhaust.

2 Reconfigurable advanced visualization environment, virtual-reality display.

**raven** Electronic-warfare officer, specialist flight crew member (US).

**RA/VSI** Resolution advisory/vertical speed indicator.

**raw** Versatile word meaning ready for next stage of processing; thus \* AC is ready for precise frequency control before being supplied to avionics; \* data can be of many forms (instrument readings, reconnaissance photos, tabular statistics); and \* material is in fact anything but \* yet still unmanufactured into product.

**rawin** Wind velocity at different heights computed by radar tracking of balloon (usually with transponder).

**rawinsonde** See *radar-sonde*.

**RAWS** 1 Radar altitude warning system.

2 Radar attack (and) warning system.

3 Remote-area weather station.

4 Role-adaptable weapon system.

**Rayleigh atmosphere** Ideal atmosphere devoid of all particles larger than about 0.1 wavelength of incident radiation.

**Rayleigh flow** First (1876) theory since Newton for lift of inclined-plane wing; streamlines travel direct to surface, where they are brought to rest, losing all relative energy.

**Rayleigh formula** Another Rayleigh equation gives loss of pitot pressure caused by presence of normal shock, in terms only of Mach numbers, pressures and  $\gamma$  (ratio of specific heats of gas).

**Rayleigh limit** One-quarter of an EM wave, maximum difference in optical path.

**Rayleigh number** Non-dimensional ratio  $Nra =$

$gd^3 \propto (\theta_2 - \theta_1)$  where  $g$  is acceleration due to gravity,  $d$  is  $v k$

vertical separation of two horizontal planes in fluid system (eg atmosphere),  $\theta_2 - \theta_1$  is temperature difference across planes,  $\propto$  is coefficient of thermal expansion,  $v$  is coefficient of kinetic viscosity and  $k$  is thermal conductivity.

**Rayleigh scattering** Normal scattering of radiation by particles whose ruling size is 0.1 or less that of radiant wavelength; explains why sky is blue above and red/orange at sunset.

**Rayleigh wave** 2-D barotropic fluid disturbance or wave propagated along free solid surface.

**RB** 1 Rescue boat (ICAO).

- 2 Rapid-bloom (ECM).  
 3 Radar-blip identification message.  
 4 Reduced blast (NW).  
 5 Relative bearing.  
 6 Readback.  
 7 Rain began [time].  
 8 See \* *switch*.  
 9 Rudder boost.
- R<sub>B</sub>** See *Rockwell*.
- R<sub>b</sub>** Robot, = guided missile (Sweden).
- R<sub>b</sub>, r<sub>b</sub>** Solid rocket motor burn rate; also r.
- r<sub>b</sub>, R<sub>b</sub>** Bypass ratio.
- RBC** Rapid-bloom countermeasures (or chaff).
- RBCC** Rocket-based combined cycle, also called RBC2.
- RBCI** Radio-based combat identity, or identification.
- RBD** Radar-beacon digitizer.
- RB/ER** Reduced blast, enhanced radiation (neutron bomb).
- RBF** 1 Remove before flight.  
 2 Radial basis function.
- RBG** Right back-up generator.
- R-BGAN, RBGAN** Regional broadband global area network.
- RBGM** Radar-beam, or real-beam, ground-map operating mode.
- RBI** 1 *Relative-bearing indicator*.  
 2 Radar-blip identification (ICAO).
- RBIM** Rudder-boost internal monitor.
- RBL** Range and bearing launch.
- RBM** 1 Wing-root bending moment.  
 2 Real-time batch monitor.
- RBN, RBn** Radio beacon.
- RBOC** Rapid-bloom offboard countermeasures.
- RBPS** Rotor-blade protection system.
- RBS** 1 Radar beacon system (FAA).  
 2 Rutherford back-scattering.  
 3 Radar bomb scoring.
- RBSJ** Recirculating-ball screwjack.
- RB switch** Selects radio or barometric altitude, eg on HUD.
- RBT** 1 Remote batch terminal.  
 2 Resistance-bulb thermometer.
- RBV** Return-beam vidicon.
- RC** 1 Rotating-combustion, engine of Wankel type.  
 2 Reaction control.  
 3 Resistance/capacitance (also R-C).  
 4 Rotating components of gas-turbine engine.  
 5 Rate of climb at MTOW, or r/c.  
 6 Radio-controlled, or R/C.  
 7 Rounds counter.  
 8 Reverse course [= back course].  
 9 Radar computer.  
 10 Rotary coupler (AWACS).  
 11 Remote command.  
 12 Radar corridor.
- R-C** Resistor/capacitor network.
- Rc** See *Rockwell*.
- r<sub>c</sub>** 1 Radius of inlet core bullet over hub of gas-turbine fan or LPC.  
 2 Radius of helicopter vortex core.
- r/c** Rate of climb.
- RC-1** Rate of climb, one engine inoperative.
- RC-2** Rate of climb, all engines operating.
- RCA** 1 Reach cruising altitude (ICAO).  
 2 Radar coverage area.  
 3 Radio Communications Agency (UK).
- RCAFA** RCAF Association [office, Ottawa, PQ] (Canada).
- RCAG** 1 Remote center air/ground (FAA).  
 2 Rescue, or remote, communications air/ground.
- RC&W** Rack connectors and wiring.
- RCB** Remelted cast bar.
- RCC** 1 Reinforced carbon/carbon.  
 2 Rescue co-ordination [or control] centre.  
 3 Resistance/capacitance coupling (often r.c.).  
 4 Research Consultative Committee (UK).  
 5 Repetitive chime clacker.  
 6 Remote charge converter.  
 7 Regional control centre.  
 8 Ring case configuration [turbofan].
- RCCB** Reverse-current circuit-breaker.
- RCDI** Rate of climb/descent indicator, = VSI.
- R-CDL** Radar common data link.
- RCDS** 1 Royal College of Defence Studies [London SW1X 8NS] (UK).  
 2 Radio-controlled destruction system.
- RCDU** Radar control display unit (UK E-3D).
- RCE** 1 Rotating-combustion engine.  
 2 Radio control equipment.
- RCF** 1 Radio communications failure message (ICAO).  
 2 Remote-control facility.
- RCFAM** Roll-coupled fuselage aiming mode.
- RCFCA** Royal Canadian Flying Clubs Association [office, Ottawa, PQ].
- RCFWT** Radio-controlled fixed-wing target.
- RCG** Reaction-cured glass, covers thermal-protection tiles (Space Shuttle).
- RCH** Reach, reaching.
- RCJ** Reaction control jet.
- RCL** 1 Runway centreline; L adds lights, L30m [for example indicates light spacing].  
 2 Radio communications link.
- RCLM** Runway centreline marking (FAA).
- RCLR** Recleared.
- RCLS** Runway centreline light system (FAA).
- RCM** 1 Radio countermeasures.  
 2 Reliability-centred maintenance.  
 3 Rollercoaster manoeuvre.  
 4 Restricted corrosive material.  
 5 Reciprocating chemical muscle.  
 6 Requirements criteria and methods (ICAO).
- RCMAT** Radio-controlled miniature aerial target.
- RC/MC** Rounds counter, magazine controller.
- RCMG** Rifle-calibre machine gun.
- RCMP** Radar control and maintenance panel.
- RCMS** 1 Resonator-controlled microwave source.  
 2 Remote control [and] monitoring system.
- RCMU** Remote control and monitoring unit.
- RCO** 1 Remote communications outlet.  
 2 Range control officer.  
 3 Remote control officer (or operator).
- RCOH** Refueling and complex overhaul [CN, previously CVN] (USN).
- RC/OI** Reaction control/orbital insertion subsystem.
- RCP** 1 Role-change package.  
 2 Radio control panel.  
 3 Required communications performance.

**RCR** 1 Runway condition reading.  
2 Route contingency reserve (fuel).  
3 Routeing and circuit restoral.

**R-CRS** Report on course.

**RCS** 1 Reaction-control system.  
2 Radar cross-section.  
3 Ride-control system.  
4 Range control station.  
5 Remote control system.

**RCSM** Resident customer-support manager.

**RCSR** Radar cross-section reduction.

**RCSS** 1 Remote-controlled signals-intelligence system.  
2 Remotely controlled surveillance system.

**RCSU** Remote-control and status unit (navaids).

**RCT** 1 Reply code train (IFF, SSR).

- 2 Royal Corps of Transport (UK).
- 3 Reverse-conducting thyristor.
- 4 Rear-crew trainer.
- 5 Rear cargo tank.

**RCTC** Rear-crew trainer cabin.

**RC2P** Rehosted command and control processor.

**RCU** 1 Range converter unit.

- 2 Reaction, or receiver, or rudder, or recorder, or remote control unit.

**RCV** 1 Reaction-control valve.

- 2 Robotic command (or remotely controlled) vehicle.

**rcv** Receive [**rcvr** receiver, **rcvs** receives].

**RCW** 1 Roll-control wheel.

- 2 Reaction control wheel.

**RD** 1 Ramp door, thus \* uplock.

- 2 Random discontinuous fibre.

- 3 Rigged dry, for dusting rather than spraying (agriculture).

- 4 Report departure, or departing.

- 5 Relative density.

- 6 Restricted data.

- 7 Long-range (R)

- 8 Radar ranging (R).

**Rd** Radio channel for data.

**r/d** Rate of descent.

**RDA** 1 Runway de-icing agent.

- 2 Requirements, development and analysis.

**RDAF** Royal Danish air force [UK usage].

**RD&A** Research, development and acquisition.

**RD&E** Research, development and engineering.

**RDARA** Regional domestic air-route area.

**RDAS** Reconnaissance data annotation set.

**RDAU** Remote data acquisition unit.

**RDB** 1 Requirements data bank (originally AFLC).

- 2 Raw-data buffer.

**RDBM** Relational database management (more often RDM); S adds system.

**RDC** 1 Rate-of-descent computer.

- 2 Regional dissemination center (NASA, technology transfer).

- 3 Radar data converter, or correlator.

- 4 Ramp door control.

- 5 Remote data concentrator.

- 6 Routeing-domain confederation.

- 7 Resolver-to-digital convertor.

- 8 Rapid deployment capability (USN).

**RDCE** Radio distribution and control equipment.

**RDCP** Refuel/defuel control panel.

**RDD** 1 Routine dynamic display (maritime/ASW navigation as distinct from tactical situation).

2 Radar data display.

**RDDBS** Redundant distributed data-base system.

**RDDMI** Remote (or radio) digital direction magnetic indicator.

**RDDU** Remote demand and display unit.

**RDAF** Royal Danish air force [UK usage].

**RDE, R&DE** Research and development engineering (or evaluation).

**RDEC** Rapid data-entry cassette.

**RDECom, RDECOM** Research, Development and Engineering Command (from 1 March 2003) (USA).

**RDF** 1 Radio direction-finding, security cover for radar, 1936–42 (UK).

2 Rapid Deployment Force (US).

3 Routeing-domain format.

**RDG** Ridge of high pressure.

**RDH** Reference datum height of ILS.

**RDI** 1 Radar Doppler à impulsions (F).

2 Reference designated indicator.

3 Routeing-domain identifier.

**RDIDS** Rapid-deployment intrusion-detection system.

**RDJTF** Rapid Deployment Joint Task Force (US).

**RDL, rdl** 1 Radial (bearing, heading).

2 Rapid-deployment launcher.

**RDM** 1 Random-deflection monitor.

2 Relative-distance measurement.

3 Radar Doppler multifunction (F).

**RDMA** Remote direct memory access.

**RDMI** Radio directional (or distance) magnetic indicator.

**RDMS** Relational database management systems.

**RDMSS** Redmiss.

**RDO** Redistribution order.

**rdo** Radio (FAA).

**RDP** 1 Radar data, or disk, processor, or processing; S adds system, U unit.

2 Range Doppler profile, or profiling.

**RDPPS** Radar data processing and presentation system.

**RDPS** Radar data processing system.

**RDPU** Radar display processing unit.

**RDR** 1 Radar.

2 Radar departure route.

**RDS** 1 Rudder-disconnect speed (Autoland).

2 Remote diagnostics server.

3 Radial driveshaft.

**RDSS** 1 Rapidly deployable surveillance system.

2 Radio determination satellite service (Inmarsat).

3 Replacement data-storage system.

**RDT** Radar-data transfer.

**RDT&E** Research, development, test and engineering (or evaluation).

**RDTS** Remote detection and tracking sensor (USAF).

**RDU** 1 Remote display unit.

2 Receiver/decoder unit.

3 Receipt and Despatch Unit [RNAs Anthorn] (FAA).

**RDV** Requirements development and validation.

**RDVS** Rapid-deployment voice switch (FAA).

**RDX** 1 Powerful explosive ( $\text{CH}_2\text{N}_\cdot \text{NO}_2$ ); also called Hexogen, Cyclonite. Now family of explosives still used as bomb, mine and other fillings, though under other names and designations.

2 Radar-data extractor.

**RE** 1 Recent, ie qualifying as 'actual' met data.

2 Rain erosion, hence \* resistance.

3 Re-engined.

4 Role equipment.

5 Random energy.

6 Research establishment.

7 Random echo.

8 Rain ended (time).

9 Range error.

**R/E** Receiver/exciter.

**R<sub>e</sub>** Radius of Earth at S/L, taken as 6,356,766 m.

**R<sub>e</sub>, R<sub>E</sub>** Reynolds number, if for any reason R is unavailable.

**REA** 1 Radar echoing area (suggest = RCS [2]).

2 Rapidly elevated aerostat.

**REAC** Real Estate Aviation Chapter [Berkeley IL 60163] (US).

**Reach** Realisable integrated modular avionics common access helicopters.

**reach** Length of threaded portion of sparking plug.

**reachback** Having immediate access to many sources of information and intelligence located far [back] from scene of conflict.

**React** 1 Reliability evaluation and control technique.

2 Rain echo attenuation compensation technology.

3 Rapid execution and combat targeting (Minuteman upgrade).

**reactance** Component of impedance in AC circuits due to inductance or capacitance; value is  $2\pi fL$  for inductance and  $1/2\pi fC$  for capacitance where f is frequency, L is henrys and C is farads; unit is ohm, usual symbol is X.

**reactant** Any substance consumed in reaction, esp. in rocket motor combustion or other generation of working fluid.

**reactant ratio** Ratio of mass flow of oxidant to fuel.

**reacted pressure** See *stalled pressure*.

**reaction** See *positive feedback, regeneration* (2).

**reaction chamber** One in which chemical reaction takes place, specifically that in which reactants produce gas to drive turbopump or to power MEPU.

**reaction-control jet** Thruster or RCV jet.

**reaction-control system** Primary attitude/trajectory control system of spacecraft, or of V/STOL aircraft at speeds too low for conventional controls to be effective. Control moments are imparted by *thrusters* or *reaction-control valves*.

**reaction-control valve** Small nozzles supplied with hot, high-pressure main-engine bleed air at extremities of V/STOL aircraft; at low airspeed pilot operates \* to control attitude and trajectory of aircraft.

**reaction-control wheel** Rapidly-rotating wheel used for single-axis control of spacecraft without consumption of rocket fuel.

**reaction engine, reaction propulsion** Vague; all aerospace propulsion is by Newtonian reaction.

**reaction factor** In a landing, the ratio of the peak vertical load on a landing gear to that with the aircraft parked, symbol  $\lambda$ .

**reaction ratio** In an axial compressor, the ratio of the mean pressure rise in each rotor stage to that in each stator stage; often expressed as a percentage, usually close to 50.

**reaction sphere** Spacecraft orientation control system comprising free-running dense sphere surrounded by

three magnetic coils, one for each attitude axis. Also called free sphere.

**reaction time** 1 Elapsed time between stimulus and response, eg between command to launch missile and actual launch, between first receipt of warning and dispatch of weapon system, or between pilot seeing conflicting aircraft and initiation of manoeuvre to avert collision.

2 In particular, elapsed time between command to launch vehicle (bomber or ICBM) with live NW and actual departure [1959-72] (US, UK).

**reaction turbine** One in which main tangential driving force comes from acceleration of working fluid through converging passages between rotor blades; rare in gas turbines, which are usually impulse/reaction or impulse.

**Reaction Wheel** Patented advanced gyro for spacecraft stabilization (Honeywell).

**reactive employment** Use of device in retaliation to appearance of hostile threat, esp. of ARM in response to operative and threatening emitter; opposite of pre-emptive.

**reactive-material warhead** Classified metal/plastics assembly which, upon impacting a target, triggers a reaction which releases intense pressure and heat.

**reactive mission plan** Taking account of previous errors, losses or failures.

**reactor** 1 Choke or high-inductance coil.

2 Core in which nuclear fission (thermal or fast) or fusion reaction takes place.

**read** 1 To obtain information from EDP (1) storage and transfer it to another device or address.

2 Of humans, to receive and understand telecommunications message.

**readability** Numerical scale [1 is best] of audibility of voice radio.

**read across** To have direct relevance to quite different programme or problem; eg use of LH<sub>2</sub> in space propulsion solved problems which \*\* to LH<sub>2</sub> in future commercial airline operation.

**readback** Procedure whereby receiving station repeats all or part of message to originator to verify accuracy.

**Readiness State** Quantifiable measure of length of time needed to launch combat mission, especially one to deliver NW; thus RS30, RS15 and RS05 give launch time in minutes.

**readout** 1 Data played back from tape or other store, eg from flight recorder.

2 To broadcast data either from storage or as received.

3 In EDP (1), to transfer word(s) from memory to another location.

**Reads, READS** Re-entry air-data system.

**read/write memory** Each cell is selected by appropriate signal, and stored data may be sensed at output or by changes in response to other inputs.

**ready** Weapon system is available for use with no delay save reaction time.

**ready CAP** Combat air patrol aircraft on standby status; ready for take-off.

**ready light** Indicates particular munition is ready for use.

**ready position** Designated place where stick (4) waits for helicopter or for order to emplane.

**ready room** Where hardware is prepared for use, esp.

## real fluid

missiles, RPVs and other unmanned vehicles and esp. aboard warship.

**real fluid** One exhibiting viscosity.

**real precession** That induced in gyro by applied force, eg friction or imbalance, and not by Earth's rotation.

**real time** 1 In EDP (1), operation in which event times are controlled by portions of system other than computer and cannot be modified for convenience in processing; not necessarily simultaneous with time in everyday sense.

2 Absence of delay, except for time required for transmission by EM energy, between occurrence of event or transmission of data, and knowledge of events or reception of data at some other location (DoD). Neither definition has anything to do with time computer is processing as distinct from warm-up time or rest periods, which incorrectly figure in some popular definitions.

**real-time clock** One indicating actual time.

**real-time reconnaissance** Sensing, recording and relaying information 'as it happens'.

**real wander** See *real precession*.

**REAP, Reap** Rapidly elevated aerostat program (USA).

**Reaps, REAPS** Rotorcraft external airbag protection system.

**rear area** That behind combat and forward areas in battle.

**rear bearing** In single-shaft gas turbine, that supporting turbine.

**rear-box wing** Usually means three-spar.

**rear cover** Aft closure of piston-engine [esp. radial] crankcase, incorporating drives and mounting faces for accessories.

**rear crew** This usually means flight crew other than pilots.

**rear echelon** Elements of air-transport force not required in objective area.

**rear gunner** Member of crew of [usually large] military aircraft charged with defence against fighter attack from the rear, after 1939 usually occupying a power-driven turret.

**rear-loading** Provided with door(s) and ramp extending across full cross-section of fuselage interior for loading of vehicles and other bulky cargo, and for air dropping.

**rearming** Replenishment of consumed ordnance between missions.

**rear pit** Back seat in tandem cockpit, hence rear-pitter (military colloq.).

**rearplane** Rear wing of tandem-wing aircraft. Not justified when foreplane is clearly for control rather than lift but correct term where front and rear wings are comparable in size.

**rear port** Aperture, usually circular, in solid rocket motor case at end or on face opposite to nozzle which can be opened to reduce internal pressure for thrust cutoff.

**rear stagnation point** That at which fluid is at rest on surface of body on downstream side and from which a streamline emanates.

**rear step** That at trailing edge of seaplane (flying boat) afterbody, where planing bottom terminates; in some designs a point, but usually either vee-step or a sharp-edge discontinuity sufficient to break hydrodynamic attachment to skin.

**rear turret** A [usually power-driven] gun turret at, or

## reciprocating engine

very near, the tail end of the fuselage, also called tail turret.

**rear view display** HUD system in which information is fed from behind pilot's helmet via optical fibres to collimating lens and combiner glass close in front of eyes.

**REAs** Responsible engineering activities.

**Réaumur** Non-SI temperature scale on which ice point (1 atmosphere) is 0° and water boiling point 80°, symbol R.

**REB** Rolling-element bearing.

**ReB** Re-entry body.

**rebaselining** Term coined to describe programme to refine turboprop cruise rotational speeds, e.g. on A400M aircraft.

**rebated blade** Solid light-alloy (rarely, wood laminate or GRP) propeller blade whose leading edge is cut away to accommodate encapsulated electrothermal anticing element.

**Rebecca** Pioneer DME used by airborne interrogation of Eureka beacon (1942). Still in production in 1970 as \* 12 for airborne forces and used in conjunction with MR 343 air-dropped beacon.

**re-blueing** Return to USAF after period [e.g., on liaison or training] with another service.

**rebreather** Closed-circuit oxygen system from which CO<sub>2</sub> and water are continuously removed, pressure being maintained by adding fresh oxygen (see \* bag).

**rebreather bag** Gastight sac in oxygen line near mask so that incoming gas is diluted with exhaled breath; normally feature of airline passenger system.

**Rebro** Relay broadcasting.

**REC** 1 Received, receiving (ICAO).

2 Radio-electronic combat (USSR, R).

3 Recommend.

**recalescence point** Temperature, exhibited only by iron and some other ferromagnetic materials, at which on cooling from white heat exothermic change in crystalline structure halts cooling and can cause momentary rise in temperature.

**Recap** Reliability evaluation and corrective-action program.

**recapture** Regain of revenue from spilt passengers (*spill effect*) who rebook on later flight by same carrier.

**Recat** Reduced-energy for civil air transport.

**recce** Reconnaissance (UK, colloq., pronounced rocky).

**RECD** Received.

**receiver autonomous integrity monitoring** Can detect a satellite malfunction if five satellites are in view, and can identify the failed satellite if six are in view, thus meeting requirement for sole means of oceanic navigation.

**reception** All arrangements for receipt of air drop.

**recession** Linear rate at which ablating material is eroded, normally measured normal to local surface.

**Rechlin** Location near Neubrandenburg of largest and oldest German aircraft/air armament test establishment before 1945.

**reciprocal** Heading 180° from previous heading, or from that intended.

**reciprocal bearing** Bearing of observer from remote station.

**reciprocal latching** Use of phase-shifters to generate computer-controlled sequence and distribution pattern for electronically scanned radar transmission.

**reciprocating engine** One in which piston(s) oscillate to and fro in cylinder, eg Otto, diesel, Stirling, etc.

## Recirc

## rectangular input

**Recirc** Recirculation.

**recirculating ball system** Mechanical friction-reducing technique in which contact between spiral thread of screwjack and surrounding nut or runner is transmitted via no-gap stream of bearing balls with rolling contact only, which after reaching end of nut are returned via external tube to start.

**reclaiming** Repairing or otherwise modifying a part or tool or material to fit it for further use.

**Reclama** Please reconsider proposed action or decision (DoD).

**RECMF** Radio and Electronic Components Manufacturers' Federation (UK).

**recognition** In imagery interpretation, determination of type or class of object without positive identification (ASCC).

**recoil** For automatic weapons in aircraft usual measures are average, peak and counter-\*; all are reduced by fitting muzzle brake.

**recommended practices** Not mandatory but published by ICAO.

**recon** Abb. reconnaissance.

**reconciliation** Reclaim of baggage by the correct individual, ie the owner. System has many uses, such as automatic offload if passenger does not board.

**reconfiguration** Change in aerodynamics and external form of aircraft, especially while in flight.

**reconnaissance by fire** Firing on suspected enemy to draw retaliatory fire.

**reconnaissance exploitation report** Written, accompanies imagery.

**reconnaissance pallet** Multi-sensor pallet (1) installed in or under tactical aircraft in lieu of other load.

**reconnaissance pod** Pod housing reconnaissance sensors carried externally.

**reconnaissance reference point** Conspicuous geographic location from which reconnaissance objectives can be found.

**reconnaissance slipper** Fairing housing reconnaissance sensors carried scabbed against exterior skin.

**recontouring** Improving leading edge of fan or compressor blade[s] after erosion in service.

**record as target** Code for listing target for reference or future engagement (DoD).

**record card** Sheet of card, fitting into filing box, issued for each aircraft, on which were recorded all significant modifications or repairs to Service aircraft prior to about 1955, when newer systems became available.

**recorder** Device translating data into hard-copy record on magnetic tape, wire, film, punched paper tape or other medium.

**recorder data package** Integrated airborne systems providing record of subsystem performance in flight, eg arming and fuzing of Mirved warheads, for recovery and ground analysis.

**recording accelerometer** Counts and stores vertical acceleration.

**recording altimeter** Barograph providing permanent [originally paper] print-out.

**recording storage tube** Electronic tube which accepts CRT or other display picture, stores for period (eg 12 h) and reads out as often as required for analysis, monitor activation or various conversion processes.

**recovered pressure** That measured inside duct downstream of ram inlet.

**recovery** 1 Retrieval, in air or on surface, of part or whole of used RPV, target, test missile, spacecraft, instrument capsule or other inert body.

2 Retrieval of glider (sailplane) that has landed away from own airfield.

3 Return to base and safe landing (on land or aircraft carrier) of aircraft.

4 Return of combat aircraft from post-strike base to home base or designated recycle airfield.

5 Retrieval, normally by crane helicopter, of crashed or shot-down aircraft, in friendly or enemy territory.

6 Retrieval, by special trailers and vehicles, plus airbags or jacks, of belly-landed or disabled aircraft.

7 Completion of flight manoeuvre and resumption of straight/level flight.

8 Conversion of kinetic to pressure (potential) energy in fluid flow (see *ram* \*).

9 Returning late programme to schedule.

**recovery airfield** One at which aircraft might land post-H-hour but from which combat missions are not expected to be conducted (DoD).

**recovery air temperature** The air temperature outside the boundary layer on surfaces not subject to ram. Symbol  $T_{rec}$ .

**recovery base** Rear-area airfield used for maintenance and servicing to eliminate need for such services at airfields in combat zone (USAF).

**recovery capsule** Capsule containing reconnaissance pictures, instrumentation records or other data designed to separate from satellite, ICBM or other carrier and survive re-entry at preplanned location.

**recovery footprint** Area within which recovery capsule, returning manned spacecraft or other object is expected to fall.

**recovery guidance system** Displays on flight-director command bars pitch guidance for recovery during continuous windshear; also for TOGA to maintain familiarity.

**recovery initiation window** Small block of airspace within ASW(4) from which UAV can be guided to touch-down point.

**recovery package** Contains devices to assist recovery and retrieval of re-entry body, eg brightly coloured buoyant balloons, radio beacons and coloured pyrotechnics.

**recovery parachute** Parachute fitted to UAV, pilotless aircraft or test vehicle.

**recovery station** Occupied by carrier deck crew who run out to attend each landing aircraft.

**recovery temperature** See *adiabatic recovery temperature*.

**recovery time** Time for gas-discharge tube to return to neutral under grid control.

**REC/PLB** Recording and playback.

**recreational** Self-explanatory; \* pilot certificate is issued by FAA in US for pilot of \* vehicle. By 2007 the RPL was no longer being issued.

**RECT** Rectangular.

**rectangular co-ordinates** See *cartesian*.

**rectangular input** Input, eg to FCS, which instantaneously jumps from null to a maximum commanded value, to give a rate command.

## rectenna

**rectenna** Rectifying aerial (antenna), especially of directionally beamed microwave power.

**rectification** 1 Process of projecting tilted or oblique photograph on to horizontal reference plane.

2 See *rectifying*.

**rectified airspeed** See *airspeed*.

**rectified altitude** Sextant altitude corrected only for inaccuracies in reference level (dip, coriolis) and reading (index, instrument and personal).

**rectifier** Static device exhibiting strongly unidirectional conduction properties such that it can convert a.c. to d.c.

**rectifying** 1 Elimination of errors which convert compass heading into track, eg deviation, variation and wind.

2 Converting a.c. to d.c., by any means.

**rectifying antenna** Receives radar wave and separates its two components, the electric field and magnetic field, the former being conducted into the hot jet[s] from the engine[s], which become[s] ionized and cooled, and the magnetic component being dissipated in the hot engine and degaussed.

**rectifying valve** Thermionic valve which rectifies by virtue of unilateral conductivity of cathode/anode path.

**rectilinear flight** Straight and level, and 0g imposed and thus in aeronautical sense called +1g.

**rectilinear propagation** Sent out in straight lines (ignoring relativistic effects).

**rectilinear scanning** TV raster (see *scan*).

**recuperation** Recovering heat from engine [turboprop or piston engine] exhaust and inserting it at useful place in operating cycle, hence recuperator.

**recurrent training** Regular review of human performance in normal, abnormal and emergency situations.

**recycle** 1 To stop countdown and re-enter count at earlier point.

2 To return to start of EDP (1) program without entering fresh data.

3 To give completely new checkout to missile or other device (USAF).

4 To remove part or complete module from engine, avionic device or other hardware and put through re-manufacturing or inspection sequence to clear it for reuse with undiminished life.

**recycle airfield** One from which combat aircraft can be prepared for reuse away from home base.

**RED** 1 Reconnaissance Engineering Directorate (US AFSC).

2 Reference engineering drawing or data.

3 Retractable ejector duct.

**red** Hostile. Thus, colour of threat on radar, or of any team in exercise or R&D effort acting part of enemy.

**Redac** Research Engineering Development Advisory Committee (US Congress).

**Red airway** One running more or less east/west.

**Redar** Range engineering data acquisition and reduction.

**Redars** Reference engineering data automated retrieval system.

**Redcap** Real-time electromagnetic digitally controlled analyser processor.

**Red channel** Airport route for arrivals declaring the possession of dutiable goods.

**REDCOM** Readiness Command (USA).

**Red endorsement** Manuscript endorsement in flying

## reduction gear

logbook confirming bad airmanship or other [usually potentially dangerous] act or failure to act.

**redeployment airfield** One not occupied in peacetime but available upon outbreak of war for use by units redeployed from peacetime locations; substantially same facilities as main airfield (DoD, NATO).

**redeye** Long overnight flight.

**Red Flag** Major tac-air exercises based on Nellis AFB, taking place several times per year over instrumented air/air and air/ground ranges under various 'real war' scenarios.

**Red Force** Hostile force in exercise.

**Red Horse** Rapid engineering deployment and heavy operations repair squadron, engineering (USAF).

**REDL** Runway edge lights.

**Red Label** Hardware used in first build, or other early development, that is physically representative but not cleared for flight.

**red-line value** One never to be exceeded, eg  $V_{NE}$  or \* fan speed.

**Redmiss** Remotely deployable mission support system.

**red-on-red** Traditional rule for setting up simple magnetic compass and avoiding mistakenly flying reciprocal.

**red-out** Loss of vision in powerful and sustained negative acceleration, ie where subject is restrained in seat only by harness over shoulders. Vision is replaced by primarily blood-coloured input.

**red pole** North-seeking.

**redrive** Propeller drive incorporating speed-reducing gears or belt (homebuilts).

**red-to-red** Following nautical practice, the rule that aircraft on opposing courses pass left side to left side, left wingtip having a red light at night.

**reduced frequency** Ratio of product of frequency of oscillation and representative length of oscillating system to airspeed ( $n/V$ ); dimensionless parameter determining flutter amplitude.

**reduced modulus of elasticity** Theoretical value expressing relationship between modulus of elasticity and tangent modulus beyond limit of proportionality.

**reduced vertical separation minima** Progressive introduction of reduced minima [initially, 1,000 ft, 305 m] for aircraft whose altitude measuring, maintaining and reporting systems meet RVSM numerical standards. Introduced on N Atlantic between FL310–FL390, and extended 2002 to include all airspace of ECAC member states above FL290.

**reducing mask** Metal-sheet stamping enabling small instrument to be mounted in space on panel for larger one.

**reducing valve** Valve which reduces pressure in fluid system to precise lower value at \* output.

**reduction** 1 Removal of oxygen or other electro-negative atom or group; hence reducing flame.

2 Conversion of raw measured values of flight performance or met. observations into standard forms, limiting values and, esp., graphical plots and derived values for comparative purposes.

**reduction factor** Large number, usually power of 10, used as divisor of all values in calculations to reduce size of whole numbers involved.

**reduction gear** Speed-reducing gear, ie output turns slower than input, torque being increased in the same ratio.

## redundancy

**redundancy** 1 Provision of two or more means of accomplishing task where one alone would suffice in absence of failure. In parallel \* several usually similar systems all operate together so that failure of one either leaves remainder operative or, in majority-rule \*, can always be over-powered by remainder. Standby \* has primary systems automatically switched in by malfunction-detection system.

2 Design of primary structure so that even after failure of any component there will remain enough load paths to carry all expected loads with adequate margin of safety.

3 In EDP (1) or information handling, amount by which logarithm of number of symbols available at source exceeds average information content per symbol.

**redundant attitude-control system** Cold-gas jet control of roll during powered flight, three-axis control during periods coasting.

**redundant structure** Basically, one possessing too many members; in practice one not amenable to simple stress analysis, eg because it has joints that are fixed instead of pinned or more than one member sharing load in way calling for elegant analytical solution. Not synonymous with fail-safe structure.

**Redux** Family of adhesives for most structural materials, including metals, normally applied in form of sheet, powder or liquid and cured (bonded) under heat and pressure (Aero Research Ltd./CIBA).

**Redwood** Together with \* Admiralty, a traditional instrument for measuring kinematic viscosity; rare in aerospace.

**Red X** Flying prohibited by weather (USAF).

**REDZ** Recent drizzle.

**Red zone** Zone of intersection on Red airway (US) in which Red traffic maintains height and conflicting traffic procedure is published.

**Reed & Prince screw** Recess-head crosspoint screw driven by tool with single taper.

**reed valve** Leaf valve, usually of thin spring steel, giving unidirectional flow of fluid, eg in air-conditioning system or pulsejet.

**reef** 1 To make sudden deliberate maximum-rate departure from straight flight [normally fighter combat].

2 To fit restraining cord round parachute, see next.

**reefed parachute** One in which canopy is (usually temporarily) restrained against full deployment by encircling cord.

**reefing sequence** Systematic timed deployment of parachute, first in reefed condition and later to full deployment (eg Apollo CM recovery).

**reeeling** Paying out or drawing in cable for a tow-target; hence RM = \* machine and RMCS \* machine control system, offering: out, stop (preselected length), in, and other functions.

**re-entrant angle** Sudden change in direction of external surface (of aircraft skin, structural member etc) such that angle measured externally is less than 180°; in case of \*\* on surface of body, one causing local acceleration of airflow and, in supersonic flight, local attached shock-wave.

**re-entry** Process of travelling [returning is implied] from outer space into and through planetary (esp. Earth's) atmosphere, in case of Earth proceeding down to planetary surface where *recovery* takes place. Strictly the term should be entry.

## reference landing distance

**re-entry body** Body designed to survive extreme aerodynamic heating, high temperatures and large sustained deceleration of re-entry, eg ICBM RV, manned spacecraft, instrument or reconnaissance capsule.

**re-entry corridor** Optimum trajectory through atmosphere for lifting body returning to Earth.

**re-entry plasma** Plasma inevitably formed around all bodies arriving in Earth's atmosphere from outer space due to kinetic heating and ionization, forming barrier to radio signals.

**re-entry system** That portion of ballistic missile designed to place one or more RVs on terminal trajectories so as to arrive at selected targets. Includes penaids, spacers, deployment modules and associated programming, sensing and control devices.

**re-entry vehicle** That part of a strategic ballistic missile or space vehicle designed to re-enter Earth's atmosphere in terminal portion of its trajectory; can be manoeuvrable \*\*, or one of several multiple \*\* or multiple independently targeted \*\*.

**REF** 1 Reference.

2 Refuge.

**refan** To replace original fan or LP compressor of turbojet, bypass turbojet or turbofan with fan having larger diameter but fewer stages, for greater economy and less noise; hence refanned engine.

**reference area** Area used in components or coefficients of aerodynamic forces acting on a body.

**reference axes** Those in relation to which a body's attitude and motion are described; in case of aircraft they normally include body axes, all normal to each other and passing through c.g., called O (OX fore/aft, longitudinal; OY laterally, lateral or axis of pitch; OZ vertically, vertical or axis of yaw); wind axis (direction of free-stream relative wind); and principal inertia axis passing through c.g. in plane of symmetry and at small angle to OX.

**reference datum** 1 Arbitrary location at or beyond extremities of structure, eg aircraft, or on centreline or other major axis, from which all distances are measured and station numbers derived. Normally \*\* remains throughout life of aircraft even if stretching of fuselage or alteration of span of wing changes actual distances to established stations.

2 Imaginary vertical plane at or near nose of aircraft from which all horizontal distances are measured for balance purposes; called balance station zero (NATO).

**reference designated indicator** Display which enables aircraft [with or without input by ground engineers] instantly to identify any electronic or mechanical fault.

**referenced parameter groups** In studying [turbine engine] performance, if second-order terms are ignored, the parameters can be referred to temperature and pressure only.

**reference eye position** Typical position of pilot's eyes used in design of cockpit or flight deck.

**reference fix** Known position inserted into INS at start of flight.

**reference frame** For practical purposes = *reference axes*.

**reference fuel** Piston-engine (Otto) fuel of known anti-knock rating used as reference to fuel whose octane or performance number is to be established.

**reference humidity** That specified for mandatory performance information; whichever is lesser of 70% RH to 33°C or 35 mb vapour pressure.

**reference landing distance** Abb. RLD, BCAR procedure

for calculating landing distance on wet runways [especially jet transports] assuming 3° approach at constant thrust and 15 kt excess speed at 30 ft, excessive [usually 7s] float and slow application of decelerating devices.

**reference line** 1 Convenient line on surface used by observer, eg FAC, as line to which spots (4) are related.

2 Single horizontal level showing correct operation by group(s) of systems or measured parameters indicated on vertical-tape instruments; thus a malfunction immediately stands out as a discontinuity.

**reference meridian** That selected to establish grid north or local time (ASCC).

**reference phase** Non-directional signal emitted by VOR having constant phase through 360° azimuth.

**reference plane** See *datum plane*.

**reference plate** Minimum-size plate cut from cheap material or scrap containing witness holes or slots cut from every tool in NC program and incorporating part of every sub-routine in program.

**reference point** Fixed datum near centre of airfield landing area (obs. except general aviation).

**reference pressure**  $\frac{1}{2}\rho V^2$  where  $\rho$  is fluid density and  $V$  is relative velocity.

**reference pressure ratio** Pressure ratio published for engine, and specialized meanings.

**reference section** Traditional definition: a section of structure, displacements of which are taken as co-ordinates in a semi-rigid representation.

**reference signal** That against which telemetry data signals are compared to check differences in time, phase etc.

**reference sound** Commonly a random noise of one octave bandwidth centred on 1,000 Hz presented frontally.

**reference speed** On its own, too vague.  $V_{REF}$  is a reference speed used for comparative purposes in takeoff and landing modes; commonly stall speed  $V_s$  or target threshold speed  $V_{AT}$ , but needs to be defined whenever used [for example, whether clean or full flap]. Reference speeds [plural] invariably means  $V_1$ ,  $V_R$  and  $V_2$ .

**reference wet hard surface** Numerically specified slippery runway surface for determining braking standards.

**reference zero** Datum point from which horizontal and vertical distances are measured to each point on takeoff net flightpath.

**refire time** Time required after initial launch to fire second missile (ICBM is assumed) from same silo or other launcher (see *rapid-reload*).

**REFL** Reflection.

**reflectance** Ratio of reflected to incident radiant flux, symbol  $\rho$ .

**reflected interrogation** A misnomer, as reply is fresh signal (SSR).

**reflected memory bus** High-speed parallel data bus connecting all nodes or subsystems in a large EDP system.

**reflected shockwave** That reflected when a shock-wave strikes a boundary between its original medium and one of greater density; part of energy generates shock which continues through denser medium but remainder is reflected in original medium, important case being in boundary between tunnel wall and tunnel working fluid.

**reflection coefficient** Measure of mismatch between two

impedances; \*\*  $a = (Z_1 - Z_2) / (Z_1 + Z_2)$  where  $Z_1$ ,  $Z_2$  are impedances.

**reflection-interference waves** Intermittent peaks in sea state caused by reinforcement of incident and reflected waves near cliff or sea wall.

**reflection interval** Time for radar pulse to reach target and return.

**reflection-plane model** Tunnel model comprising one half of model aircraft sliced down axis of symmetry which rests on floor of tunnel.

**reflection suppression** False echoes (ghost aircraft) in radars, esp. SSR, are usually suppressed by a suppression transmitter feeding a separate Yagi which, at moment main interrogator scans reflecting surface, sends two pulses, first larger than second; this suppression pair take direct path to aircraft and suppress its transponder before arrival of interrogation signal via reflector; thus no spurious reply is received.

**reflectivity factor** Measure of the fraction of incident radar energy reflected by a target, symbol  $Z$ .

**reflectometer** Instrument for measuring transmission-line reflection coefficient.

**reflector** 1 Reflecting surface, usually copper gauze, so sited and shaped as to reflect radiation from primary radiator (eg of radar) in correct phase relationship to reinforce forward and reduce backward radiation; usually paraboloidal but flat in modern fighter radars.

2 Parasitic element located near primary radiator to reduce emission in all directions other than main lobe.

3 Repeller electrode of reflex klystron and similar tubes.

4 Material of high scattering cross-section surrounding core of nuclear reactor.

**reflector sight** Gunsight (rarely, for anti-tank missiles) in which reticle aiming mark(s) are projected as bright points on glass screen through which pilot or other aimers views target. Lead angle (aim-off) is assessed by gyro-electronics that measure rate of sightline spin and, in conjunction with range set by pilot, adjust aiming mark so that rounds should hit if reticle is superimposed on target.

**reflex camber** Shape of aerofoil in which mean line curves upwards towards trailing edge; eg to provide download well aft of c.g., increasing with airspeed, in tailless aircraft.

**reflex ratio** Measure of structural flexibility of propeller blade tested as cantilever beam (loaded in direction parallel to axis of rotation; US standard is that all blades of same propeller must exhibit tip movement uniform within 0.4 in [10 mm]). Test not applicable to certain blade types, eg hollow steel.

**Reflex** Detachments on ground alert [with NW] to overseas base[s] (SAC).

**Reflex Program** Cold-War rotation of bombers US-Bermuda-UK-North Africa (SAC).

**reflex sight** ASCC term for reflector sight.

**reflex trailing edge** See *reflex camber*.

**refly** To make second test flight to clear snag [verb or noun].

**REFRA** Recent freezing rain.

**refraction** Change in direction of travel of supposed linear radiation, eg EM radiation or sound, due to variation in properties (eg refractive index, air temperature) of transmitting medium. Can be gradual over a distance or instantaneous at boundary between two media; for

## refractive index radar

radio/radar important forms are atmospheric \* (low-altitude temperature, pressure, humidity; also responsible for errors in apparent altitude of celestial bodies), coastal \* (change in propagation path at land/sea boundary) and ionospheric \* (change of direction in passage through ionized layer).

**refractive index** Ratio of phase velocity of EM radiation in free space (vacuum) to phase velocity in medium considered; normally related to air, though in fact \*\* for air is not unity, common S/L value being 1.003. For radio normally refined to modified \*\* ( $n + h/a$ ) where  $n$  is \*\* at height  $h$  and  $a$  is radius of Earth.

**refractory** Resistant to high temperatures; normally implies able to retain precise structural shape and bear appreciable stress at temperatures up to 2,200° C (4,000°F) without significant long-term change.

**refresh rate** Rate at which data on electronic display, eg radar, are resupplied in order to maintain bright picture free from flicker; early radar had no refresh and picture was generated only once on each scan; today data are updated at each revolution but are refreshed 100 to 200 times between updates. Panel-instrument \* is usually 40–80 Hz.

**refrigerant** Working fluid pumped round closed circuit to extract heat, usually by repeated evaporation/condensation.

**Refrigerant 12** Difluorodichloromethane (DDM).

**refrigerant injection** Water injection into gas turbine.

**refrigeration capacity** Common unit is 'tons', normally a heat-extraction rate sufficient to convert one short ton of water at 0°C to ice every 24 h, equivalent to 3.517 kW = 4,715 hp.

**refrigeration icing** Caused by sudden drop in temperature of airflow, notably by depression in choke tube and/or evaporation of fuel.

**refrigeration tunnel** Wind tunnel used for icing tests.

**REFS** Reconfigurable engineering flight simulator.

**refusal speed** That at which a takeoff can no longer be aborted, equivalent to  $V_1$  (RAF).

**REG** 1 Registration, registered.

2 Regular.

3 Regulation.

**Rega, REGA** Swiss air ambulance association. Not an acronym, but French and Italian counterparts GASS are.

**Regal** Range and elevation guidance for approach and landing (FAA test 1960).

**regard** Total solid angle of 'vision' of a sensor trainable to point in different directions; FOV may be much less.

**regeneration** 1 Introduction of closed-circuit operation in gas-turbine plant in which by various methods part of exhaust heat is extracted and used to increase temperature of incoming airflow; hence regenerative gas turbine. Essentially synonymous with use of heat exchanger.

2 Increase in radio detector sensitivity by positive feedback.

3 Favourable heat transfer between rocket thrust chamber nozzle and propellant (see *regenerative cooling*).

4 In EDP (1) rewriting to prevent memory deterioration.

**regenerative cooling** Use of a cool incoming liquid, eg rocket-engine propellant, to remove heat from hot hardware, eg rocket nozzle skirt and exit cone. Essential feature is that heat transfer is beneficial to both cooled item and coolant.

## reinforced carbon/carbon

**regenerator** See *heat exchanger*.

**RegFD** Regulation fair disclosure (US Securities and Exchange Commission).

**regime** One defined mode of operation, clearly distinguished from other types of operation of same device; eg USAF fighter flight-suit pressure regulator has lo \* maintaining 3 lb/sq in and hi \* maintaining 6.5.

**region** See *flight information region*.

**regional airport** One serving a number of (usually modest-sized) local communities.

**Regional augmentation** Navsat transponders broadcast ground-derived GPS integrity assurance and accuracy enhancement.

**regional carrier** Civil operator whose route network covers only a minor part of a large country, and not over 500 nm sectors; often same as third-level. In the US, a traditional definition included "an operator whose aircraft do not exceed c70 seats."

**regional QNH** See *QNH*.

**register** Small array of bistable circuits storing one EDP (1) word.

**registering balloon** Small free balloon carrying recording meteorological instruments; ballonsonde.

**registration** Entry of civil aircraft into records of national certification authority, with allocation of letter/number code displayed on aircraft [*Appendix 9*] and \* certificate which in most countries must be displayed inside aircraft.

**REGL** Regional.

**REGR** Recent hail.

**regression** Precession of nodes; eg Moon completes revolution in 18.6 years.

**regression rate** Linear rate at which solid-propellant grain burns, measured normal to local surface; in 1970 typically 0.25 mm/s, in 2002 over 5 mm/s.

**regressive burning** Solid-motor combustion in which burn surface area and hence chamber pressure and thrust all fall throughout period of burn.

**regressive orbit** See *retrograde*.

**regroup airfield** Military or civil airfield at which post-H-hour, aircraft would reassemble for rearming, refuelling and resumption of armed alert, overseas deployment or further combat missions (DoD, IADB).

**REGS** Regulations.

**regular airfield** One which may be listed in flight plan as intended destination.

**regular airport** That at which scheduled service calls (UK usage).

**regulated take-off weight** See *WAT-limited*.

**REH** Rapid-erect hangar.

**reheat** Original [UK] term for *afterburning*.

**REHM** Recording engine health monitor.

**REI** 1 Repair engineering instruction.

2 Reusable external insulation

**Reid vapour pressure** Absolute pressure of liquid [usually hydrocarbon fuel] in enclosed volume at given temperature, usually 100°F (37.8C).

**REIL** Runway-end identification or identifier lights (FAA); S adds system.

**reinforced carbon/carbon** Composite material comprising high-strength carbon fibres bonded in matrix of pyrolytic carbon; or can be thought of as pyrolytic carbon reinforced with CF.

## reingestion stall

## remanufactured

**reingestion stall** Gas-turbine compressor stall induced by reingestion of hot gas during reverse-thrust mode.

**Reins** Radar-equipped inertial navigation system (Autonetics 1956).

**Rejac** Receiver/jammer capability.

**reject** To dump heat out of system into supposed sink, eg atmosphere.

**rejected take-off** One aborted after it has begun, ie between brakes-release and decision point.

**rejecter** Inductance/capacitance in parallel to reject one resonant frequency.

**Rejex** Soil-barrier protection for painted surfaces.

**rejoining aircraft** One returned to service after [for whatever reason] having been parked for long period.

**REK** Radio-equipped keypad.

**REL** 1 Relative direction.

2 Runway edge light[s], lighting.

**rel** Relative.

**relateral tell** Relay of air-defence information between facilities via third; appropriate between automated centres in degraded communications environment.

**relative altitude** See *vertical separation*.

**relative bearing** Normally means bearing of surface feature or other aircraft relative to current heading.

**relative-bearing indicator, RBI** Shows bearing of tuned fixed station related to aircraft longitudinal axis; unlike RMI, does not show heading.

**relative density** 1 Density at height in atmosphere related to that at S/L,  $\rho/\rho_0$ , symbol  $\sigma$ .

2 Specific gravity.

**relative efficiency of biplane** Ratio of wing loadings of upper and lower wings.

**relative humidity** Water content of unit volume of atmosphere expressed as percentage of saturation water content at same temperature.

**relative inclinometer** Flight instrument indicating attitude with respect to apparent gravity (resultant of gravity and applied acceleration).

**relative permittivity** See *permittivity*.

**relative scatter intensity** Ratio of radiant intensity scattered in given direction to that in direction of incident beam; symbol  $F(\phi)$ , relative scattering function.

**relative target altitude** Vertical difference between altitudes of interceptor and target.

**relative wind** Velocity of free-stream air measured with respect to body in flight, in case of aircraft normally same as true airspeed but seldom exactly aligned with longitudinal axis.

**relaxation time** 1 Elapsed time between removal of disturbance and restoration of equilibrium conditions among molecules of fluid (eg air), operative parts of system or other dynamic components of system.

2 Time for exponentially decaying quantity to decrease in amplitude by  $1/e = 0.36788$ .

**relaxed static stability** CCV-derived manoeuvre enhancement for air-combat fighter, involving rear c.g., longer nose, smaller fin etc, with artificial stability imparted by AFCS.

**relay** Device in which small control signal, usually electrical, is made not only to operate at a distance but also to control large and possibly high-power devices; most serve switching functions or to protect devices against supply faults.

**relay time** Elapsed time between instant message is

completely received and that when it is completely transmitted.

**release** Clearance of aircraft for line service, eg after original development or overhaul.

**release altitude** Altitude of aircraft AGL at actual time of release of ordnance, tow target etc (DoD).

**release blade** That selected in FBO test.

**released** 1 Of aircraft to unit, clearance for inventory service.

2 Of drawing, approval for transmission to manufacturing or production department.

3 Of air-defence unit, crews and/or weapons no longer needed at readiness; when \* they will be informed when state of readiness will be resumed (NESN).

**released, available** Ready at 20 min. notice (FAA).

**release point** Point on ground directly above which first paratroop or cargo item is air-dropped (NATO).

**release time** Departure time issued by ATC to avoid conflicts.

**reliability** Probability that hardware will operate without failure for specified time; in practice also a result of operations already accomplished (see *despatch* \*, *MTBF*).

**reliability coefficient** Percentage probability that aircraft can fly route on particular day with x% load factor and y% likelihood of diversion. Note: not a measure of hardware reliability.

**relief hole** Drilled in metal sheet to allow intersecting bends to be made to that point without buckling.

**relief on station** Two UAVs simultaneously worked by same ground control station.

**relief tube** Personal urinal pipe normally discharging overboard.

**relief valve** Fluid system valve which releases pressure at preset value.

**relight** 1 To restart combustion in gas turbine after mid-air flameout.

2 To use ridge lift to prolong glide of sailplane.

**relight envelope** Published diagram of permissible limits of TAS and height outside which engine relight should be attempted only in emergency. \*\* forms part of flight manual of civil gas turbine aircraft, and for military aircraft is given for main combustion and afterburner.

**relighting altitude** That up to which safe and reliable restarting of power unit (gas turbine is implied) is possible (CAA).

**reluctance** Opposition to magnetic flux, property of magnetic circuit akin to resistance in electric circuit which limits value of flux for given MMF; symbol R or S, numerically =  $l/\mu A$  where l is length of magnetic path,  $\mu$  is permeability and A cross-sectional area.

**Relvel** Relative velocity.

**REM** 1 Rocket engine module.

2 Remaining.

**rem** Quantity of ionizing radiation which, when absorbed by body, produces same physiological effect as 1 roentgen of X-ray or gamma radiation; from roentgen-equivalent man.

**remanence** Flux density remaining (residual) in material after removal of magnetizing force. Also called retentivity.

**remanufactured** Aircraft completely stripped and inspected, usually by original builder, and with new structure added where necessary before reassembly and

delivery with clearance for specified long life free from fatigue. Usually opportunity is taken to update systems and equipment also.

**Remap** Research maximization and prioritization (NASA).

**Rembass** Remotely monitored battlefield-area surveillance (or sensor) system.

**Remco** Reference Materials Committee (ISO).

**Remdeg** Reliability military data exchange guide.

**Remis** Reliability and maintainability information system[s].

**remnant** In assessment of handling, an arbitrary value inserted to bridge the difference between model values and human-pilot results.

**Remoco** Remote monitoring and control.

**remote aerial refuelling operation** With boom-equipped aircraft, using CCTV from flight deck instead of boom-operator station.

**remote augmented lift system** Arrangement for providing enhanced jet lift for V/STOL on demand in which large airflow bled from engine(s) is piped to auxiliary combustion chamber, usually near nose of aircraft, to provide additional high-energy lift jet. Latter may have means for modulation and linked vectoring, and RALS always requires large pilot-controlled diverter valve(s).

**remote augmentor** *Remote nozzle.*

**remote communications outlet** Remotely controlled unmanned air/ground com. station providing UHF and VHF transmit-and-receive capability to extend range of FSS (FAA).

**remote fan** Mechanically independent fan driven by tip-driven turbine blades fed by hot gas from main engines via switch-in deflectors; used to provide jet lift for V/STOL or, rarely, to increase thrust at low speeds.

**remote frequency display** Shows details and status of all on-board radios.

**remote indicating compass** Magnetic compass whose sensing element is installed in extremity of aircraft where deviation is minimal, with transmitter system serving repeater dial(s) facing crew.

**remote interface units** These collect data and feed it to the VMS computers.

**remotely piloted vehicle, RPV** Aerodyne usually of aeroplane type whose pilot does not fly with it but controls it from another aircraft or from station on surface. Authority of remote pilot is usually absolute, though to ease pilot workload some RPVs have choice of preselected auto pilot/computer programs for at least part of each mission.

**remote magnetic indicator** Principal panel instrument of a VOR.

**remote mass balance** Connected by linkage to surface where \* cannot be accommodated.

**remote nozzle** Substantially vertical nozzle in RALS fed with air from main-engine fan and burning fuel to generate about 45% of total lift thrust.

**remote receiving station** Friendly station remote from UAV or RPV control station at which its transmission (eg reconnaissance information) can be received.

**remote-source lighting** Use of [possibly very long] fibre optics.

**remoting** Transmission of ATC, SSR or air defence

radar display by landline, microwave link or other means to distant centre.

**remous** Air turbulence (F, commonly used by English-speaking aviators pre-WW1).

**removables** All items flight crew must remove from outside of aircraft before take-off.

**REMP** Replacement and modernization program[me].

**Remro** Remote radar operator.

**REMS** Remote sensor.

**REMSA** Requirements for emergency and safety airborne equipment, training and procedures (ECAC).

**Remsevs** Remote-control secure-voice system.

**rendering** Th acceptance by a Contracting State of another's C of A or licence.

**rendezvous** Meeting of two aircraft or spacecraft at preplanned place and time. For aircraft can include air-refuelling hook-up but for spacecraft physical connection is docking.

**rendezvous orbit insertion** Establishment by one spacecraft of orbit almost identical to that of another before actual rendezvous.

**rendezvous radar** Esp. in spacecraft, small ranging and range-rate radar carried to facilitate rendezvous and subsequent docking.

**René alloys** Family of American high-temperature alloys with Ni base plus Cr, Mo, Co, Ti, Fe, Al, and small amounts of C, Bo.

**reneg** To go back on previous agreement (US, colloq.).

**renegotiation** Procedure not uncommon in US where manufacturer is required (usually by government) to renegotiate an existing active contract; usual cause is allegation of excessive profit.

**renewal** Procedure, usually annual, for inspection of civil aircraft for certification \* and of civil pilot \* of certificate or licence. Hence \* rate, total of fees payable, and \* inspection, by authority-approved organization.

**RENL** Runway-end lights [normally red].

**R/EO** Radar/electro-optical.

**REP** 1 Reporting point (ICAO).

2 Reference eye position (or point).

3 ECM (R).

4 Replacement.

5 Representative.

6 Range error probable.

7 Recognised environmental picture.

**repair-cycle aircraft** Those in active inventory in or awaiting depot maintenance (DoD).

**repairman certificate** Issued by FAA to skilled tradesman engaged in repair or maintenance of aircraft or parts.

**Repairnet** Reconstitution post-attack interoperable radio network.

**repeater jammer** ECM receiver and transmitter which receives hostile signals and amplifies, multiplies and retransmits them for purposes of deception or jamming. Basic deception mode is to give false indication of range, azimuth or number of targets.

**repetition rate** 1 In radar, number of pulses per second.

2 In automatic gun, cyclic rate.

**repetitive chime clacker** Gives aural warning indicating fault in aircraft configuration.

**repetitive flight plan** Kept on file for frequent [eg. scheduled] identical flights.

## Repin (G)

reserve fuel

**Repin (G)** Replacement inertial navigation unit with GPS added.

**RePLACE** Reconfigurable processor for legacy avionics code execution.

**replaceable panel** Aircraft maintenance access panel which has to be replaced; not an interchangeable panel, which can be opened in about one-tenth the time.

**replacement factor** Estimated percentage of hardware items that over given period will need replacing from all causes except accidents.

**replenishing** Refilling of aircraft with consumables such as fuel, oil, liquid oxygen and compressed gases to authorized pressure; rearming is excluded (NATO).

**replenishing phase** Part of operating cycle of pulsejet in which depression in duct induces fresh charge.

**reply code** That repeated series of pulses transmitted by SSR transponder in aircraft when interrogated; typically up to 12 information pulses between two framing pulses 20.3 µs apart.

**reply-code evaluator** Automatic avionic subsystem which reads reply code and determines if valid, what identify and in case of military IFF whether friendly or hostile.

**reply efficiency** A transponder's valid responses as percentage of interrogations.

**reporting point** Geographical point in relation to which aircraft position is reported.

**repositioning** Moving aerobatic aircraft from end of one manoeuvre to start of next, at correct height/speed.

**repressurant** Material, eg compressed air, oxygen and water vapour, stored in spacecraft outside pressurized volume and fed in to refill interior after depressurized operations.

**req. REQ** On request.

**REQMT** Requirement.

**qualification** To requalify approved system to meet more severe demand or environment.

**request for proposals** Document sent by central government to one or more industrial contractors outlining future requirement stated by armed force(s) and inviting suggestions on how this should best be met; RFP calls for analysis of problem by manufacturer and for submission of general scheme for hardware which in case of aircraft and most other equipment includes three-view drawing, basic description, estimated weights and performance, timescale and costs.

**required flightpath** That necessary to satisfy immediate task of pilot; not a recognised performance parameter but general objective weighed against projected flightpath.

**required navigation performance** Measure of accuracy of a particular segment or block of airspace.

**required track** Path aircraft commander wishes to follow; refers always to future intention. Often a ruled line joining two waypoints.

**requirement** 1 Predicted future need spelt out by armed force, usually after long process of refinement and assessment of alternatives.

2 An ingredient necessary for a successful design. See next.

**requirements capture** The rigorously structured procedure whereby, in parallel with established analytical procedures [FHA, then PSSA], all the elements required for a functioning device or system are gathered, with nothing overlooked. There are two totally dissimilar

methods. In top-down the design team start with the overall basic requirement, quantified in every detail and work downwards until they are studying cable sizes and case materials. In bottom-up the designers begin the fine detail and work their way up through sub-modules and subsystems to reach the final product.

**RER** 1 Reconnaissance exploitation report.

2 Radar electrical rack.

3 Residual error rate.

**RERA** Recent rain.

**RERP** Reliability enhancement and re-engining program.

**RERTE** Re-route.

**RES** 1 Radio emission surveillance.

2 Reserved.

3 Reservoir.

4 Radar emitter, or environment, simulator.

5 Remote, or reprogrammable, emitter simulator.

**Resa, RESA** 1 Research, evaluation and systems analysis.

2 Runway-end safety area.

3 Rotating electronically scanned array.

**Rescap** Rescue combat air patrol.

**rescue basket** Lowered from helicopter to rescue person unconscious or incapacitated.

**rescue co-ordination centre** Initiates, manages and terminates rescue efforts within particular area by all branches offering help.

**research and development** Generalized term covering process of development of specific items of hardware; research involved is usually minimal and always applied, main effort being directed at solving engineering problems which are invariably unpredicted and occasionally require new fundamental knowledge; abb. R&D, but US favours RDT&E, which is unnecessarily clumsy.

**research coupling** Disseminating research results to maximize early and widespread use.

**research octane number** Usual scale of measurement for anti-knock value of automotive fuels. On this basis unleaded gasolines are 95–97 RON, while leaded might have rich-mixture RON of 130. Aeronautical gasolines are commonly MON-rated.

**research rocket** Usually unguided ballistic rocket whose purpose is to lift scientific payload to high altitude for free-fall or parachute descent. Very occasionally purpose is to advance technology of rockets.

**research vehicle** Atmospheric or space vehicle, manned or otherwise, whose purpose is to provide answers to research problems; not normally prototype of production article but often associated with specific programme.

**reseau** 1 Group of met. stations operating under common direction; hence international \*.

2 Grid of fine parallel lines used in image analysis.

**Réseau du Sport de l'Air** Association of homebuilders (F).

**reserve aircraft** Those accumulated in excess of immediate needs for active aircraft and retained in inventory against possible future needs (DoD).

**reserve buoyancy** Additional mass or applied force needed to immerse completely floats or hull of seaplane or flying boat already at specified (usually MTO) weight.

**reserve factor** Ratio of actual strength of structure to minimum required for a specified condition.

**reserve fuel** See reserves.

## reserve parachute

## resonator

**reserve parachute** Second, standby parachute usually worn by professional parachutists and many others who make frequent deliberate descents; 7.3 m/24 ft \*\* mandatory for sport parachuting.

**reserve power** See *specific excess power*.

**reserves** Quantities of consumables, esp. fuel, planned to be unconsumed when aircraft arrives at destination and available for holding (stacking), go-arounds, diversions and other contingencies.

**reservoir** Storage (not header) tank in fluid system, eg hydraulics.

**reset** 1 To restore device, eg bistable gate, memory address or fire-warning system, to original untriggered state.

2 Process of recovering assets [notably helicopters] from scene of conflict and refurbishing them for further use (USA).

**RESH** Recent showers.

**Reshabar** Strong, dry squalls [S Kurdistan].

**residence time** 1 Time fuel droplet or gas particle remains in either gas-turbine combustor or afterburner.

2 Time, usually expressed as a halftime (not to be confused with half-life) radioactive material, eg fallout, remains in atmosphere after NW detonation.

**residual magnetism** See *remanence*.

**residual propulsive force** Net propulsive force minus total aircraft drag, F-D.

**residuals** 1 Any fluid left in spacecraft tanks after use.

2 Difference (plus/minus) between intended  $\delta V$  (velocity increment) for a burn and that achieved (NASA).

**residual stress** That in structural component in absence of applied load, due to heat treatment, fabrication or other internal source.

**residual thrust** 1 That produced by jet engine (turbojet or turbofan) at flight or ground-idle setting.

2 That produced by any other propulsion engine after deliberate shutdown, or cutoff.

**residual value** Price paid for second-hand aircraft.

**resilience** Measure of energy which must be expended in distorting material to elastic limit.

**resin** Vast profusion of natural and, increasingly, synthetic materials used as adhesives, fillers, binders and for insulation. Various types used in nearly all fibre-reinforced composites.

**resin lamp** Small lamp with filament bulb used not for illumination but to indicate position, e.g. of wingtips of aircraft in night formation.

**resistance** Opposition to flow of electric current,  $R = V/I$ , unit ohm[s], symbol  $\Omega$ .

**resistance derivatives** Quantities, generally dimensionless, which express variation in forces and moments acting on aircraft after upset. In general case there are 18 translatory and 18 rotary.

**resistance welding** Using internal resistance of metal workpiece to very large electric current to produce heating which, under pressure, forms weld (see *spot weld*, *seam weld*).

**resistivity** Specific resistance; electrical resistance of unit length of material of unit cross-section. Convenient unit ohm/cm<sup>3</sup>, though not strictly SI.

**Resistojet** Various patented (eg Avco, Marquardt) space thrusters using liquid ammonia or other working

fluid, including biowastes, accelerated by solar-powered electrothermal chamber with de Laval nozzle.

**resistor** Electrical device offering accurately specified resistance.

**reslams** Repeated throttle slams for engine test.

**RESM** Radar electronic support measures.

**RESN** Recent snow.

**resojet** Usually means resonant pulsejet.

**resolution** 1 Measure of ability of optical system, radar, video/TV or other EO system, photographic film or other scene-reproducing method to reveal two closely spaced objects as separate bodies; normally defined in terms of angle at receiver subtended by two objects which can just be distinguished as separate.

2 Ability of device, as in (1), to render barely distinguishable pattern of black/white lines; expressed in number of lines per mm which can just be distinguished from flat grey tone. Both (1) and (2) also called resolving power.

3 Measure of response of gyro to small change at input; minimum change that will cause detectable change in output for inputs greater than threshold, expressed as % of half input range.

4 Separation of vector quantity into vertical/horizontal components.

**resolution advisory** Verbal or display indication recommending increased vertical separation relative to an intruding aircraft.

**resolver** Subsystem in spacecraft INS which measures changes of attitude, esp. rotation about longitudinal axis, and informs guidance computers. In general a rotary digitiser converting small angular movements to digital signals.

**resolving power** 1 See *resolution* (1, 2).

2 Ability of radar set or camera to form distinguishable images (ASCC); term unhelpful and indistinguishable in practice from resolution (1, 2).

3 Reciprocal of unidirectional aerial beamwidth measured in degrees (not synonymous with resolution [1], which is affected by other factors).

**resonance** 1 Condition in which oscillating system such as free wave or aircraft structure oscillates under forcing input at natural frequency, such that any change in frequency of impressed excitation causes decrease in response.

2 Condition of AC circuit when, at given frequency, inductive and capacitive reactances are equal.

3 In specific case of rotary-wing aircraft, particularly helicopter, condition in which natural frequency of landing gear corresponds with main-rotor rpm.

**resonance test** Structural exploration of natural frequencies by excitation over slowly varying wide range of frequencies.

**resonant duct** See *resonant pulsejet*.

**resonant pulsejet** Pulsejet in which intermittent operation occurs at natural frequency of operating air/fuel-burning duct system, without need for one-way flap valves.

**resonating cavity** Closed hollow space of precise geometry having electrically conductive walls in which microwaves are generated when excited by EM field or electron beam; examples are magnetron, klystron, rhumbatron; also called resonant cavity.

**resonator** 1 See *resonating cavity*.

**2** Magnetostrictive ferromagnetic rod excited to respond at several distinct frequencies.

**3** Lecher wire.

**4** Piezoelectric crystal.

**5** Acoustic enclosure having single-frequency response.

**Resound** Reduction of engine source noise through understanding and novel design.

**RESP** Receiver/exciter/synchronizer processor.

**Resp** Responder; bcn adds beacon.

**responder** Receiving unit in transponder.

**response** A specialized aerospace meaning is rejection of chaff or flare decoy by a missile seeker, which re-acquires real target.

**responser** Electronic device used to receive electronic challenge and display a reply thereto (DoD).

**RESS** Radar emission, or environmental, simulator system.

**ressource** “Sudden cabrage following a dive” [i.e., pull out]; between the wars it was held there was no English equivalent.

**REST, Rest** **1** Radar electronic scan technique; spherical/planar lens array aerial, RF angle-error sampling circuits, auto search/detection/confirmation, and display/recording.

**2** Re-entry environmental and systems technology.

**rest angle** Angular position of hinged surface when not in use. May correctly incorporate slight offset, droop or other departure from housed or neutral.

**restart** Start of burn after previous cutoff.

**restart time** Time between completion of adjustment of tunnel model and taking first readings.

**rest-EVA period** Scheduled period in manned space mission when in absence of assigned duties person may rest or conduct EVA.

**restitution** Determination of true planimetric position from reconnaissance photographs (NATO).

**rest mass** Mass of body when at rest (absolute in cosmological term); other masses  $m = m_0 \sqrt{1 - (v^2/c^2)}$  where  $m_0$  is \*\*, v is velocity and c is speed of light.

**restoring couple** Couple producing restoring moment.

**restoring moment** Moment generated by upset, ie rotary excursion from original or desired condition, which tends to restore original condition.

**rest period** Time on duty on ground during which flight crew is relieved of all duties.

**REST** Radar electronic scan[ning] technique.

**RESTR** Restrict[ion].

**restrained aircraft** One undergoing dynamic structural test or analysis, eg flutter, with one or more parts anchored.

**constraint** **1** Standard series of tiedowns, webbing and nylon-cord nets to prevent movement of bulk cargo.

**2** Process of binding, lashing and wedging items into one unit on to or into transport to ensure immobility during transit (DoD), NATO.

**3** Mechanical latching of container, pallet or other ULD.

**restricted airspace** See *restricted area*.

**restricted area** **1** Airspace above surface area of published dimensions within which flight of aircraft is subject to restrictions caused, eg, by ‘unusual and often invisible hazards’ such as AAA or SAM activity; in US published in FAR 73, in UK by CAA and in all Notams, charts and commercial publications. Denoted by R

followed by an identifying number, invariably in force SL to 2743 m (9,000 ft).

**2** Area where restrictions are in force to minimise interference between friendly forces.

**restricted burning** See *restricted propellant*.

**restricted data** Those pertaining to design, manufacture or use of NW, or special nuclear material.

**restricted fire plan** Safety measure for friendly aircraft which establishes airspace ‘reasonably safe from friendly surface-delivered non-nuclear fires’ (DoD).

**restricted propellant** Solid-propellant grain whose surface is only partly available for ignition, remainder being protected by restrictor.

**restrictor** Layer of solid-propellant fuel containing no oxidant (oxidizer) or of non-combustible material bonded firmly to inner surface of grain to prevent that part being ignited except by flame travelling within propellant under \*.

**restructurable** Able to be rapidly modified [redesigned] in flight to overcome dangerous problem, such as hard-over runaway (flight-control system).

**resultant** Sum of two or more vectors. Hence \* action, \* force, \* lift, \* velocity.

**RESYNC** Resynchronize, resynchronizing.

**RET** **1** Rapid-exit taxiway.

**2** Retired.

**3** Reliability evaluation test.

**ret** NASA code for time between routine events.

**retard** **1** To cause piston engine ignition to occur later in each cycle (normally still before TDC).

**2** AT/SC mode in which throttles bleed off at programmed rate during landing flare.

**3** Displayed instruction to chop power to Flight Idle.

**4** Mechanical block on forward movement of throttle lever[s].

**retardant** Tailored additive to water dropped by fire-bomber [several trade names].

**retardation probe** Tapering rod thrust into hydraulic aperture to offer increasingly great resistance to carrier arrester-wire pull-out.

**retarded bomb** Free-fall bomb with airbrakes, drogue, parachute or other high-drag device deployed automatically on release.

**retarder parachute** Small auxiliary parachute to pull main-parachute rigging lines out in advance of canopy.

**retention** Maintenance of full design performance over long period of service.

**retention area** Highly loaded parts of turbine or compressor disc around blade roots.

**reticle** **1** Any kind of mark, such as black ring, illuminated cross or ring of bright diamonds (to give three examples) used to assist any form of optical aiming, eg aerial gunnery, spacecraft docking or airdrop on marker.

**2** In photogrammetry, cross or system of lines in image plane of viewing apparatus used singly as reference mark in monocular instruments or in pair to form floating mark in certain stereoscopes (ASCC).

**reticulated** Having form of fine network; hence \* plastic or \* foam are 3-D volumes of low-density fire-resistant foam which can be foamed in place inside or outside fuel tanks and other items to prevent build-up of fuel/air mix and, even in presence of severe combat damage or post-crash rupture, prohibit explosion or swift spread of fire.

**Retils** Rapid-exit taxiway indicator lighting system.

## Retimet

## reverberation time

**Retimet** Patented (Dunlop) reticulated metal, low-density 3-D mesh of various metal strips or filaments.

**retinal scanning display** Mounted on pilot's head and projects pixels [of flight data] into pilot's eye, focused at infinity.

**retirement** Withdrawal of serviceable aircraft on grounds of age, see next.

**retirement life** Aggregate of running time of engine or other device at which decision is taken, usually by operator but sometimes suggested by manufacturer, that further overhauls are uneconomic; main reasons are obsolescence of design or onset of fatigue problems.

**retrace** American term for flyback.

**retractable** Capable of being withdrawn into aircraft so that it no longer protrudes, or protrudes only partially; applies to many devices which are \* into all parts of aircraft, such as landing gear, inlet spikes, hooks, MAD gear, Fowler flaps, spoilers, sensor pods, radars and, formerly, gun turrets.

**retractable ejector duct** Two-position jet-engine reverser for use in flight.

**retraction lock** Mechanical device to prevent inadvertent retraction of landing gear; today is removable but backed up by second lock actuated by compression of undercarriage oleos.

**retread crew** Military flight crew returned to OCU after tour of combat duty.

**retreating blade** That on side of a lifting rotor, eg on helicopter, moving relative to aircraft in same sense as slipstream; thus its airspeed is difference between its own speed and true airspeed, which is normally positive at tip, zero at a particular part-span radius and negative near root. Inboard of zero-airspeed radius, airflow is from trailing to leading edge.

**retreating-blade stall** Stall of retreating blade at high helicopter forward speeds, when angle of attack of retreating blade is excessive, especially towards tip; exceeding flight-manual forward speed causes stall over near-rectangular area of disc whose centre is behind c.g. and thus effect is to cause nose-up roll towards retreating side.

**retrieval** Mid-air snatch of parachuted load, eg space-craft.

**retrieve** Task of following sailplane on cross-country to goal, dismantling it and bringing it back in trailer.

**retrievers** Controller workstations in Comfile ATC system which pass data and radar from Ethernet to operator consoles.

**retrimming** 1 Adjustment of flight-control trim for different flight condition [major error on takeoff can be catastrophic].

2 Adjustment of engine trim to allow for deterioration caused by deposits, erosion, birdstrikes and other factors.

**retro** Usually means retrofire or retrorocket.

**retrofire** To fire retrorocket.

**retrofit** Modification, esp. involving addition of new or improved equipment, to item already in service; hence \* action, \* mod.

**retrograde** 1 Orbit in direction different from normal; eg of a planet apparently moving westward against fixed stars.

2 Orbit in direction opposite to rotation of primary body, eg Triton around Neptune or Earth satellite

launched at inclination from 180° through 270° to 360/000°.

3 In traffic direction opposite to normal, eg cargo of military logistic type moving towards United States, or military command away from enemy.

**retroreflection** Reflection, eg of EM radiation, parallel to incident rays; hence retroreflector, device for accomplishing same, eg corner reflector, Luneberg lens.

**retrorocket** Rocket fitted to vehicle to oppose forward motion, eg to bring satellite out of orbit and back to Earth. Loosely used to mean what are more precisely called separation or staging motors or, on aircraft, braking rocket.

**retrosequence** Event sequence before, during and after retrofire.

**retrothrust** Thrust opposing motion; can be used for aircraft reverse thrust.

**Rets, RETS** 1 Remote target system, or remote-equipment target system.

2 Recent thunderstorm[s].

3 Radar extractor and tracking system.

**return** Echo (radar), esp. that due to clutter sources; often plural.

**return-flow** Combustor in which incoming air and issuing gas travel parallel in opposite directions; also called reverse-flow.

**return-flow tunnel** Wind tunnel in which air is contained in enclosed circuit.

**return grab** Returns shuttle of catapult (deck accelerator) to start position.

**return line** 1 That traced on CRT by flyback.

2 Fluid pipe bringing fluid back from device to pump.

**return load** 1 That transmitted to aircraft by stopping forward motion of action in gun, in direction opposite to recoil.

2 Personnel and/or cargo to be transported by returning carrier (DoD); 'carrier' means any vehicle, not aircraft carrier.

**return oil** Scavenge oil; hence instrument showing \* temperature.

**returns** See *return*.

**return to base** Code: proceed to point indicated by displayed information which is being used as point from which aircraft can return to place where they can land; command heading, speed and altitude may be used (DoD).

**REU** Remote electronic[s] unit.

**reusability** Extent to which space hardware can be used for repeated launches, especially if recovery is made from desert or ocean.

**REV** Revision message.

**rev. counter** Tachometer.

**Reveal** Real-time electronic video enhancement at long range.

**Reven** Reverser/variable exhaust nozzle.

**revenue** Air-carrier income from traffic sales.

**revenue yield** Rate per unit of traffic, eg cents per ton-mile.

**reverberation** Persistence of sound in enclosed space as result of continued multiple reflections, with or without continued emission by source.

**reverberation time** Time between cut-off of source and diminution of sound, measured as time-average of acoustic energy density, to fall to  $10^{-6}$  of original.

**reversal** 1 Half a cycle of oscillating applied load, ie from maximum load in one direction to maximum load in opposite direction.

2 Control reversal (see *reversed controls*).

3 Difference in direction exceeding 90° between surface wind and that in upper air.

**reversal parameter** Sign ( $\pm$ ) of partial derivative of pitch-loop bandwidth to pilot's pitch control gain, considered in design of carrier aircraft.

**reversal speed** Lowest EAS at which control reversal is manifest.

**reversal temperature** That at which characteristic spectral lines of incandescent gas disappear against black-body spectrum.

**reversal zone** Zone within ILS glideslope or course sector in which slope of sector characteristic curve is negative.

**reverse bias** That which reduces current.

**reverse blindness** Obscuration of flight-deck vision by snow or other material in reverse-thrust mode.

**reverse breakdown voltage** That at which reverse current across p/n junction increases rapidly with little increase in reverse voltage.

**reversed bootstrap** ECS in which the ram-cooled air passes through an air-cycle turbine before returning through the heat exchanger and compressor.

**reversed controls** Flight-control axis about which, in particular severe conditions, application of pilot input demand causes aircraft response in opposite sense, normally due to aeroelastic distortion of structure. Usual axis is roll, where under very high EAS (ideally not within limits of flight manual) large aileron deflection causes opposite twist of wing which more than neutralizes rolling moment due to aileron; in effect aileron acts as tab and wing as aileron.

**reverse dihedral** Destabilizing rolling moment in sideslip at high AOA when slipstream increases lift of leeward (trailing) wing. Also called negative dihedral.

**reversed lobsterback** A Phase II combustor heat shield [Rolls-Royce, superseded by Phase-V].

**reversed rolling moment** That due to reversed control in rolling plane; also called roll reversal.

**reverse engineering** Process of studying a finished product [precise geometry, materials and surface finish] so that it can be copied. Classic case is Tupolev's \* of B-29 to create Tu-4.

**reverse-flow combustor** One in which air enters at front, travels to rear-mounted fuel burners and then returns as hot gas within flame tube to leave radially inward from front; also called folded combustor, return-flow.

**reverse-flow engine** Gas turbine incorporating axial compressor which draws in air around rear end and compresses it in forwards direction, before turning flow radially outwards (often by added centrifugal stage) to flow back to rear through combustor(s).

**reverse-flow region** 1 Quasi-circular region near hub of helicopter main rotor disc, on retreating side, within which relative airflow is from trailing to leading edge, ie helicopter airspeed is greater than blade speed due to rotation.

2 Any region in turbulent boundary layer in which there is a majority-flow reversal.

**reverse idle** Power-lever setting at which engine is at idle (usually flight-idle because prior to touchdown on

committed landing) with reverser buckets in reverse-thrust mode.

**reverse launch** In direction opposing Earth's rotation.

**reverse localizer** Back course.

**reversemement** See *reverse turn*.

**reverse origami** Unfolding of spacecraft, or its aerial[s].

**reverse pitch** Special ground-only setting available on some propellers and ducted propulsors, in which blades accelerate air forwards, creating retrothrust proportional to engine power without change in direction of rotation.

**reverser** Device for deflecting some or all of efflux from jet engine to give reverse thrust (retrothrust); can take form of pivoting clamshell buckets, blocker doors and peripheral cascades, or other forms, and may include turbofan core or fan exit only. Angle through which jet is turned seldom exceeds 135°.

**reverse sweep** *Forward sweep*.

**reverse thrust** Operating mode for jet engine equipped with reverser, obtainable only by overcoming gate or detent which may be locked until weight is on oleos for specified period, eg 1.5 s; normally obtained by moving power levers past idle down to \*\* mode, further movement in this direction opening throttle to full power to give maximum retrothrust.

**reverse torque** Any situation in which the driven member [e.g., propeller] drives the prime mover. Could be dangerous, as in a Viscount which was dived at high IAS when one propeller ran away fully fine.

**reverse turn** Opposite of Immelmann: half-roll followed by half loop. Also called reversemement.

**reverse-velocity rotor** Main lifting rotor of compound or hybrid helicopter which behaves as an aeroplane in cruising flight, with a large portion in high-speed reversed relative airflow.

**reversible propeller** One in which reverse pitch may be selected.

**reversing layer** Thin lower part of Sun's atmosphere; cooler than photosphere and source of Fraunhofer lines.

**reversion** Change of operating mode (eg, but not exclusively, of flight-control system from normal powered to a degraded or manual mode).

**reversionary** Available following failure of primary system.

**reversionary facility** Facility for changing operating mode, either automatically or upon human command, esp. one following failure or degradation of existing channel or subsystem.

**reversionary lane** Back-up or standby channel.

**reversionary mode** Normally means advanced integrated flight system is available for pilot input of selected navigation mode from choice of several unrelated systems, eg INS, local R-Nav, Doppler, VOR/DME or Omega.

**reverted rubber** Rubber heated beyond critical point at which it loses basic mechanical properties, esp. elasticity, and becomes sticky and permanently deformable. In one of the three aquaplaning modes, lack of anti-skid system causes locked wheel(s), reverted rubber in contact with runway covered in standing water, rapid steam generation and aquaplaning on steam layer above water.

**revetment** Area protected on three sides by blast-resistant wall of concrete, sandbags, compacted earth or other material, either to protect occupants and parked

combat aircraft or other stores against external attack or to protect occupants, eg launch crew, against hazardous rocket or similar tests.

**Revi** Reflexvisier, reflector sight (G).

**Revise** Research vehicle for inflight submunition ejection.

**revival** Restart of spacecraft systems after period of rest or shutdown, eg after long mid-course en route to planet when \* is commanded by characteristic telecom signal.

**rev/min** SI abb. for revolutions per minute.

**revolution** 1 In engineering terms, one rotation of shaft or rotary system.

2 In spaceflight, motion of body about axis remote from itself, eg of planet around Sun.

3 One complete orbit starting and finishing at same point. In practice this is unattainable concept because of rotation of Earth, Earth's revolution (2) around Sun, Sun's motion through local galaxy, etc. Time for Earth-satellite revolution, as distinct from period (see *sidereal* and *synodic orbit*), is of meaning only in specif. case where inclination is 090° or 270° along Equator when, because of Earth rotation, time is shortened or extended by 6 min. over orbital period. At all other inclinations satellite follows fresh track on each orbit and never makes \* in this sense.

**Revolutionary Turbine Accelerator** Unconventional scheme for turbofan for flight Mach No of 4.25 (NASA).

**revolution indicator** Tachometer.

**Revolution in Military Affairs** Owning the sky and space over the battlespace; giving unchallengeable command and control.

**revolver cannon** One whose ammunition is fed to chamber via rotary cylinder driven by main action and in whose several chambers successive rounds pass through complete firing sequence, in one position being fired down a single fixed barrel. See *rotary cannon*.

**revPAR** Revenue per available room.

**revs** Revolutions, especially rpm, i.e., engine speed (colloq.).

**REVS, Revs** Radar-enhanced vision system (BAE Systems).

**REW** Radio-electronic warfare.

**Reward** Reporting working and reliability data.

**REWTS** Responsive electronic-warfare training system.

**Reynolds number** Most important dimensionless coefficient used as indication of scale of fluid flow, and fundamental to all viscous fluids;  $R = \rho V l / \mu$  where  $\rho$  is density,  $V$  velocity,  $l$  a characteristic length (eg chord of wing) and  $\mu$  viscosity =  $Vl/v$  where  $v$  is kinematic viscosity. Expression is ratio of inertia to viscous forces. It shows, eg, that for dimensional similarity model tests in tunnels should be run at pressures greater than atmospheric.

**Reynolds stress** 1 Shear stress in laminar boundary layer in viscous fluid (see *skin friction*).

2 Term(s) representing momentum transfer due to turbulence.

**RF** 1 Radio frequency, or facility.

2 Aircraft designation prefix, reconnaissance/fighter (DoD).

3 Regional forces.

4 Royal Flight; thus, issue of an \* Notam.

5 Route to a fix.

**RFA** 1 Request for alteration.

2 Royal Fleet Auxiliary; ship usually with helicopter pad.

3 Regulatory Flexibility Act [1980–] (FAA).

**RFACA** Royal Federation of Aero Clubs of Australia [office, Melbourne].

**RFAS** 1 Russian Federation and Associated States.

2 Reaction Force Air Staff (NATO).

**RF-ATE** RF (1) auto test equipment.

**RFC** 1 Reinforced fibre composite.

2 RF choke or communication[s].

3 Royal Flying Corps [13 May 1912 (until 1 July 1914 with a Naval Wing) to 1 April 1918, when renamed RAF] (UK).

4 Request for change, or comments.

5 Retirement for cause (USAF).

6 Radio facilities chart.

7 Reconstruction Finance Corporation (US 1932–56).

**RFCM** RF countermeasures.

**RFCP** RF Costs Panel (ICAO).

**RFCS** RF com. set.

**RFD** 1 Remote frequency display.

2 Regulatory flexibility determination (FAA).

**RFDIU** RF/digital interface unit.

**RFDS** Royal Flying Doctor Service of Australia [office, Sydney].

**RFDU** RF distribution unit.

**RFEG** RF environment generator, to test whole aircraft.

**RFF** 1 Research Flight Facility (NOAA).

2 Rescue and firefighting.

**RFFE** RF front end.

**RFFP** Rescue and Fire Fighting Panel (ICAO).

**RFFS** Rescue and firefighting service (CAA).

**RFGS** RF generation subsystem (ECM).

**RFI** 1 Request for information.

2 RF interference, or radar-frequency interferometer.

3 Resin-film insulation, or infusion.

**RFID, RFID** Radio-frequency identification, or RF identification device, initially of passenger or baggage, now of any item requiring maintenance.

**RFIS** Receiver fire-control computer-interface software.

**RJF, RF/J** RF jammer.

**RFL** 1 Restricted flammable liquid (cargo).

2 Rocket flare launcher.

**RFLG** Refuelling.

**RFM** RF module.

**RF-Mems** RF microelectronic/mechanical system[s].

**RFNA** Red fuming nitric acid.

**RFP** 1 Request for proposal[s].

2 Remote front panel.

**RFPB** Reserve Forces Policy Board (DoD).

**RFPI** Rapid force projection initiative.

**RFPU** Recorder/film-processor unit.

**RFQ** 1 Request for quote/quotation[s].

2 Request for qualifications [airports].

**RFR** 1 Request for revision.

2 Restriction of Flying Regulation[s].

**RFS** 1 Reserve Flying School (UK).

2 RF surveillance; /ECM adds and ECM.

3 Restricted flammable solids (cargo).

4 Regardless of feature size.

**RFSC** Rubberized friction and seal coat (runway).

**RFSP** Replacement flight-strip printer.

<b>RFSS</b>	1 RF surveillance system.	<b>rheostat</b>	Infinitely variable resistance for control of current.
	2 Remote flight-service station.	<b>RHI</b>	1 Range/height indicator (radar).
<b>RF surveillance</b>	Maintaining continuous monitor and record of all hostile RFs.		2 Relative-height indicator.
<b>RFT</b>	1 Ready for training (US).	<b>Rhino, RHINO</b>	Range/height indicator mode not operating.
	2 Request for tender.		
	3 Right first time.	<b>RHL</b>	Rudder hinge line.
<b>RFTDL</b>	Rangefinder target-designator laser.	<b>RHLP</b>	Rotatable horizontal log periodic.
<b>RFTP</b>	Request for technical proposal[s].	<b>RHO</b>	1 Density of air or other medium (EDP), from Greek.
<b>RFTR</b>	Ring-fin tail rotor.		2 Response on handoff.
<b>RFTS</b>	1 Robot flexible transfer system.	<b>rho</b>	Generalized term for radio-derived distance, usually a radial distance from fixed station.
	2 Reserve Flying Training School.	<b>rhodium</b>	Rh, hard silvery metal, one use is electrode for spark plugs, MPt 1,966°C, density 12.4.
<b>RFU</b>	Radar, or radio, frequency unit.	<b>rhombic aerial</b>	Short-wave directional aerial comprising two dipoles forming horizontal rhombus emitting travelling wave, thus having reflector at one end and non-inductive resistance at other.
<b>RFV</b>	Request for visit [by accredited foreign staff, eg attaché].	<b>rhombus wing</b>	One whose section is symmetrical double wedge, ie for supersonic flight only.
<b>RFY</b>	Reduced fission yield.	<b>rho-rho</b>	Radio navaid giving distances from two fixed stations, thus a radio fix.
<b>RG</b>	1 Retractable gear.	<b>rho-rho-rho</b>	Radio navaid, eg Omega, giving simultaneous distances from three fixed stations.
	2 Range (lights, ICAO).	<b>rho-theta</b>	Radio navaid providing fix by one distance from fixed station and also bearing from that station; not normally written $\rho\theta$ .
	3 Reconnaissance group.	<b>RHP</b>	Radar head processor.
	4 Recombinant gas (accumulator).	<b>RHS</b>	Right-hand seat, or side.
	5 Rotorcraft/gyroplane.	<b>RHSM</b>	Reduced horizontal-separation minima.
	6 Regular General Aviation use.	<b>RHTG</b>	Right-hand throttle grip.
<b>R<sub>G</sub></b>	Glide ratio.	<b>Rhubarb</b>	Small-scale attack by fighters or fighter-bombers on enemy surface targets (esp. airfield[s]), using cloud etc to achieve surprise (RAF, WW2).
<b>RGB</b>	1 Reduction-gearbox module.	<b>rhumbatron</b>	Common type of resonant cavity.
	2 Red/green/blue (systems identification and colour TV tube).	<b>rhumb line</b>	Line drawn on Earth cutting all meridians at same angle.
	3 Rail garrison basing.	<b>rhumb-line course</b>	One flown at constant heading.
<b>RGC</b>	Radar graphics computer.	<b>RHWR</b>	Radar homing and warning receiver.
<b>RGCS</b>	Review of the general concepts of separation (ATC); P adds panel.	<b>RHWS</b>	Radar homing and warning system; basic part of ECM kit of penetrating aircraft; also written RHAWS.
<b>RGD</b>	Ragged.	<b>rhythmic light</b>	See <i>code light, flashing beacon, occulting light</i> , [all now rare].
<b>RGF</b>	Range-gate filter.	<b>RI</b>	1 Radar interrogator.
<b>RGL</b>	Runway guard light[s].		2 Remote indicator.
<b>RGM</b>	US designation prefix: ship-launched surface-attack missile, also R <sub>gn</sub> (AIDU).		3 Radio-inertial (often R/I).
<b>rgn</b>	Region (ICAO), also R <sub>gn</sub> (AIDU).		4 Root insert [747 wing].
<b>RGO</b>	Royal Greenwich Observatory.		5 Risk index.
<b>RGPI/RGPO</b>	Random combination of RGPO and range-gate pull-in; ECM technique calling for predictive gate but effective against manual operator. Essentially <i>Ranrap</i> .		6 Radiation intensity.
	<b>RGPO</b>		7 Right inboard.
	Range gate pull-off.	<b>R<sub>i</sub></b>	Responce integral of structure in turbulence, i being 0, 2, 4, 6.
<b>RGPS</b>	Relative GPS.	<b>RIA</b>	1 Range instrumentation aircraft.
<b>RGS</b>	Recovery guidance system.		2 Rapid inertial alignment.
<b>RGSI</b>	Radial groundspeed indicator (DME).		3 Regulatory impact assessment (UK Cabinet Office), examines effect of new legislation.
<b>RGSN</b>	Homing radar system or beacon (R).		4 Radio interface adaptor (TRV).
<b>RGT</b>	1 Remote ground terminal.	<b>RIAP</b>	Revised instrument approach procedure (usually plural).
	2 Reliability growth test.	<b>RIB</b>	1 Rigid inflatable boat (RAF).
<b>rgt</b>	Right.		2 Right inboard.
<b>RGV</b>	Rotating guide vane.		3 Routeing information base.
<b>RGWS</b>	Radar-guided weapon system.	<b>rib</b>	1 Primary structural member running across wing or
<b>RH, rh, r.h.</b>	1 Right-hand.		
	2 Relative humidity.		
	3 Reheat.		
	4 Rotorcraft, helicopter.		
	5 Radio handler.		
	6 Rolled homogenous, see next.		
<b>RHA</b>	1 Rolled homogenous armour.		
	2 Recording-head assembly.		
<b>RHAG</b>	Rotary hydraulic arresting gear.		
<b>RHAW</b>	Radar homing and warning; S adds system.		
<b>RHC</b>	Right-hand circuit.		
<b>Rhea, RHEA</b>	Role of the human in the evolution of ATM (7) systems (Euret).		

## ribbon heater

other aerofoil essentially in chordwise direction; in highly swept wing axis may occasionally be aligned more with aircraft longitudinal axis but essential feature is that \* joins leading and trailing edges and maintains correct section profile.

**2** Light peripheral member not part of primary structure whose purpose is to maintain profile of aerofoil and support fabric or thin wood covering (see *compression* \*, *nose* \*).

**ribbon heater** Electrothermal tape coiled around pipe to prevent freezing, sections joined by approved connectors.

**ribbon microphone** Comprises thin corrugated strip of aluminium alloy suspended between poles of permanent magnet; output is signals generated by strip vibrating perpendicular to field.

**ribbon parachute** One whose canopy is formed from rings (rarely, spiral) of ribbon, giving high porosity but reduced opening shock and good stability.

**ribbons** Medals.

**ribbon spray** Water flung sideways by planing bottom at high speed; caused by first contact of hull or float with water and leaves at high speed at shallow angle; also called velocity spray.

**riblet** *1* Portion of rib, eg extending only from front spar to LE.

*2* Carefully profiled microgroove, no larger than fine scratch, which, repeated millions of times to cover entire non-laminar part of aircraft skin, can reduce drag up to c 3 per cent.

**RIBS** Readiness in base services.

**RIC** *1* Reconnaissance Intelligence Centre (RAF Marham).

*2* Reconnaissance interpretation center.

**rich** Having excess of fuel (well above stoichiometric) for given flow of air or other oxidant. Hence \* mixture.

**Richardson effect** See *thermionic emission*.

**Richardson number**  $R_i$ , non-dimensional quality in study of vertical shear in atmosphere.

**rich cut** Sudden loss of piston engine power caused by over-rich mixture, notably caused by flooding of float-chamber carburettor under negative g.

**rich extinction** Failure of combustion caused by excessively rich mixture.

**rich mixture** Piston engine fuel/air mixtures significantly above stoichiometric, among other things reducing combustion temperature and enabling higher boost pressure to be used without detonation. Thus 100-octane Avgas has an RMO rating of 130.

**RICS** Rubber-impregnated chopped strands.

**RIDE, Ride** Radio communications intercept and D/F equipment.

**ride control** Automatically commanded aerodynamic control system which reduces, and attempts to eliminate, vertical accelerations caused by flight through gusts, esp. by penetrating aircraft at high (possibly transonic) speed at lo level. Typically includes sensitive g-sensors, computer and foreplanes (possibly augmented by fore-rudder or section of main rudder) to minimize vertical acceleration of crew compartment. In B-1 called LARC, later SMCS.

**ridge** Narrow extended portion of anticyclone or other high.

**ridge girder** Structural member forming part of stiff-joined main transverse frame of airship, usually qualified

## rigging tab

as inner or outer and separated by main radial struts. Each \*\* links two longitudinals.

**ridge lift** Provided by air on upwind side of ridge.

**ridge lines** Bright lines overlaid on HUD along summits, ridges and edges.

**riding lights** Those displayed by marine aircraft moored or at anchor.

**riding the controls** Not definable, but tendency of pilot to keep making small unnecessary control movements.

**RIDR** Runway-incursion detection radar.

**RIDS, Rids** *1* Radio information distribution system (digital airborne CNI systems).

*2* Ramp-information display system.

**RIE** Rapid improvement event.

**RIF** *1* Reduction in force (military); hence, personnel can be rifled (USAF).

*2* Reclearance in flight.

**RIG, Rig** Rate integrating gyro.

**rig** *1* To adjust wing angular setting, wash-in wash-out, dihedral, control-surface neutral positions and other aerodynamic shape determinants to obtain desired flight characteristics; normally applied only to light GA aircraft, in which it is possible to \* by adjusting tensions of bracing wires and even alter shape of fuselage.

*2* To prepare a load for airdrop (NATO).

*3* Purpose-designed test installation for development of jet-lift V/SSTOL aircraft (in which case \* may fly) or complete aircraft system, eg fuel, hydraulics, environmental, landing gear or propulsion. Usually full-scale and non-flying and often incorporating flight-quality hardware; eg fuel-system \* can test entire aircraft fuel system in extreme attitudes and under abnormal environmental conditions.

**rigger** *1* Historically, ground engineer responsible for rigging (1, 2).

*2* Today, engineer responsible for fine adjustment of flight controls, flaps, airbrakes and certain operative systems.

**rigging** *1* See *rig* (1); esp. adjustment of flight control system, even in modern powered system, so that all surfaces have exactly correct rest angles and system responses.

*2* Complete system of wires, cables and cords by which aerostat (esp. kite balloon or other moored type) is secured to main cable(s) or handling guys, and by which crew operate valves etc.

*3* Equipment for dusting (dry \*) or spraying (wet \*) on ag-aircraft.

**rigging angle of incidence** See *angle of incidence*.

**rigging band** Strong tape band around kite balloon or other moored aerostat envelope to which all rigging (2) and payload are attached.

**rigging lines** Those connecting parachute canopy to load.

**rigging load** Pre-loading in tension of control cable to ensure demand P is transmitted in both legs and reduce load deformation; symbol R, thus tensions in legs are  $R \pm \frac{P}{2}$ .

**rigging patch** Patch connecting rigging (2) to aerostat, in place of rigging band.

**rigging position** Aircraft attitude in which lateral axis and an arbitrary longitudinal axis (possibly actual longitudinal axis) are both horizontal.

**rigging tab** Ground-adjustable tab.

## right ascension

## ripcord

**right ascension** Angular distance measured E from vernal equinox; arc of celestial equator, or angle at celestial pole, of given celestial body measured in hours (h) or degrees (°).

**right-hand circuit** Circuit (1) with turns to right, clockwise seen from above (unusual).

**right-hand rotation** Clockwise; in case of engine/propeller, seen from behind. No ruling exists for pusher engines, one school claiming that \*\* engine is unchanged when installed as pusher and another claiming that \*\* means seen from direction in which propeller is beyond engine.

**righting moment** Restoring moment.

**right wind** One blowing on aircraft from right, causing drift to left (suggest arch.).

**rigid airship** One having rigid framework or envelope to maintain desired shape at all times.

**rigid frame** One having fixed joints, and thus statically indeterminate.

**rigidity** Property of gyro of maintaining axis pointing in fixed direction; also called gyroscopic inertia.

**rigid rotor** 1 Rotor of helicopter (in theory also auto-gyro) whose blades have no lead/lag [drag] or flapping hinges but can rotate to change pitch.

2 Bearingless helicopter lifting rotor, in which all control input is reacted by root attachment flexible in bending and torsion.

**RIGV** Respaced inlet guide vanes.

**RII** Required inspection item [must be certified independently].

**RIIA** Royal Institute of International Affairs [London SW1Y 4LE] (UK).

**RIIS** Route integration instrumentation system (SAC 1).

**rill** Deep, narrow depression across lunar surface.

**Rilsa** Resident integrated logistic support activity.

**RIM** US guided-missile designation prefix, ship-launched for aerial interception.

**Rimcas** Runway-incursion monitoring and conflict-alert subsystem.

**rim cavities** Peripheral spaces either directly surrounding the blades of an axial turbine rotor, or connected thereto.

**rime** Icing type; rough, milky and opaque, formed by instantaneous freezing of super-cooled water droplets. Definition of BS, under heading 'frost': 'ice of feathery nature on windward side of exposed objects when frost and fog occur together'.

**Rimpatt** Read impatt diode.

**RIMS** 1 Replacement inertial measurement system [or set].

2 Ranging and integrity monitoring station [navsats].

**RIN** The Royal Institute of Navigation [1947-, office, London SW7 2AT] (UK).

**ring** 1 Common structural part of most gas turbines. Compared with a disc it has little or no inner web, and in the latest engines may include the blades in a monolithic whole.

2 Frame of fuselage of circular or oval section.

**ring and bead sight** Rudimentary gunsight in which aimers aligns target with bead foresight and correct part of ring backsight for required aim-off.

**ring around** Self-interrogation of beacon due to insufficient isolation between transmitter and receiver, or to

triggering of airborne transponders at close range by unwanted sidelobes; in either case result is disastrous ring around display origin. Suppressed by ISLS.

**ring counter** Three or more bistable devices and gates so interconnected that only one is ON at one time; input pulses advance ON around ring.

**ring cowling** Simple ring, usually with concave inner profile (in longitudinal plane) and convex outer, surrounding radial engine (see *Townend ring*, from which stemmed long-chord NACA cowl).

**Ringelman** Basic method of assessing jet smoke by subjective opinion, in use since 1896 for matching smoke plumes against grey (gray) tones; hence \* number, numbered scale from white to black. Said to be free from subjective variation but affected by angle, eg if four exhaust plumes are seen from the side.

**ring-fin tail rotor** Helicopter tail rotor mounted in profiled duct in centre of tail fin (vertical stabilizer).

**ring-frame** Main transverse structural frame(s) of rigid airship.

**ring gauge** Hand gauge for checking outside diameter of circular work, in some cases threaded; can be go/no-go type [US = gage].

**ring laser gyro** Measures rotation, and rate of rotation, by sending laser light in both directions round closed circuit [in parked aircraft, outputs rotation of Earth].

**ring main** Continuous pipe surrounding passenger cabin supplying emergency oxygen to passengers.

**ring rolling** Forming rings, eg for engine, by rolling on specially set-up machine which produces required radius.

**rings** Black/white stripes on cuffs or shoulders denoting rank (RAF).

**ring-sail parachute** One having construction based not on gores but on rings, usually arranged in form of upper disc and large skirt ring with separating gap. Unlike ribbon parachute, there is usually only one gap (sometimes two).

**ring seal** Shaft seal with small freedom to move in close-fitting static housing.

**ring-slot parachute** Family of parachutes with basic ring construction with concentric slots, merging into ribbon form.

**ring spring** Spring assembled from stack of steel rings with mating chamfered edges whose friction on compression reduces rebound.

**Ringstone** Ceramic or jewel pivot for instrument arbor (shaft).

**ring topology** Linkage of terminals by two fiberoptic rings, one sending unidirectional messages or data clockwise, the other anticlockwise. The ring continues to function following the failure of any terminal.

**ringworm** Cracked dope on fabric, especially in concentric circles, caused by local pressure or impact.

**Rint** Radiation intelligence.

**RIO** Radar intercept officer (USN aircrew).

**RIO/RIO** Remote input/output.

**riometer** Relative ionospheric opacity meter.

**RIP** 1 Resin impregnation, or resin-impregnated plastics.

2 Remote instrument package.

**ripcord** 1 Cord which deploys parachute, pulled by wearer, static line or automatic (eg barostat control) system.

**2** Cord, usually manually pulled, for tearing open aerostat rip panel.

**RIPP** Radar-information processing post.

**rip panel, ripping panel** *1* Panel or patch on aerostat envelope, usually near top, which for emergency deflation can be ripped open: parachute \*\* right round, sealable in flight; velcro \*\*  $\frac{3}{4}$  way round, not resealable in flight.

*2* Cover over item which is normally required only in emergency, e.g. first-aid box.

**ripple** *1* To fire large battery of rockets in timed sequence, interval typically 0.01 s.

*2* Residual small alternating component superimposed on DC output.

**RIPS** Rotor ice protection system.

**ripster** Carrier offering competitive fare (colloq.).

**rip-stop** Structural design technique prohibiting unchecked growth of crack, eg by making part in parallel sections. Extends throughout airframe and also systems, eg to prevent single crack from affecting two hydraulic systems.

**RIR** Range instrumentation radar.

**RIRP** Retractable inflight refuelling probe.

**RIS** *1* Range information system (ECM).

*2* Range instrumentation system.

*3* Reconnaissance interface system.

*4* Radar information service.

*5* Radar integration system.

**RISA** Reduced instruction set architecture.

**RISC** Reduced instruction-set computer (or computing), 10,000-plus active devices on single GaAs chip.

**riser** *1* Quasi-vertical channel in casting mould either for admitting poured metal or for escape of air.

*2* VTOL aircraft, esp. aerodyne (colloq.).

*3* Main duct conveying ECS fresh air to top of cabin or flight-deck.

**rise time** *1* Time taken for a pulse, waveform or other repeated phenomenon to increase from a minimum to a maximum (usually measured from 10 to 90 per cent of peak value).

*2* Time taken for flare to reach 90 per cent peak radiant power, usually measured from start of emission.

*3* Time for large abrupt demand in pitch [e.g., stick back] to reach peak rotation rate; effective \* subtracts effective time delay [intersection of maximum-slope tangent with origin].

**rising-sun magnetron** One in which resonators for two frequencies are arranged alternately for mode separation.

**RISLS** Receiver interrogation sidelobe suppression.

**RISS** Real-time IR/EO scene simulator [or simulation].

**Rista** Reconnaissance intelligence [rarely, IR] surveillance and target acquisition.

**RIT** *1* Rotor inlet temperature.

*2* Remote interactive terminal, plural RITs.

*3* Radio interface terminal.

*4* Remote image transceiver.

**RITA, Rita** *1* Rapid imagery transmission to aircraft.

*2* RF thruster assembly.

*3* Réseau intégré de transmission automatique (F).

*4* Rotorcraft Industry Technical Association (US).

**RITE** Right, direction of turn (ICAO).

**RIU** Radio, or remote, interface unit.

**RIV** *1* Rapid-intervention vehicle.

*2* Right interconnect valve.

**rivet** Essential feature is deformation of shank or surrounding collar to make permanent joint, but even this no longer true of some complex types, a few of which can be reused. Definition needed.

**rivet gun** Simple hand tool, usually pneumatic, with cup-ended striker which closes rivet by repeated blows.

**rivet hammer** Plain hand hammer with small flat steel face.

**riveting machine** Numerous forms of machine tool, most of which are fixed and through which work is fed; most close rivet between powered tool and anvil and some can drill, dimple/countersink and insert rivet, close it and then mill head.

**rivet mandrel** Rod passing through tubular rivet closed on withdrawal.

**rivet rash** Paint refuses to adhere to rivet heads because of coating of lubricant required for interference fit.

**rivet set** Hand tool having female shape which forms correct head as rivet is closed.

**rivet snap** See *rivet set*.

**rivet squeeze(r)** Hand tool which heads solid rivets by single quiet deformation, usually by mechanical leverage from operator.

**Rivnut** Patented (B.F. Goodrich) tubular blind rivet with threaded shank which, after closure, acts as nut (eg for panel fasteners).

**RIW** *1* Repairable, or required, in works.

*2* Reliability interim (or improvement) warranty.

*3* Recovery initiation window.

**RJ** *1* Ramjet.

*2* Regional jet (aircraft class).

**RJAA** Royal Jordanian Air Academy [11134 Amman] (Jordan).

**RJ-5** Conventional-type jet fuel for US expendable engines; high energy per unit volume.

**RJT** *1* Technical rejection message (ICAO).

*2* Ground Self-Defence Forces (J).

**RK** *1* Range known.

*2* Russian meanings include variable-area wing and reconnaissance/artillery correction.

*3* Runge-Kutta, a series of methods of solving non-linear state equations.

**RKA** Russian space agency Rosaviakosmos.

**RKIIGA** Riga [now Latvia] Red-banner institute of civil-aviation engineers (USSR).

**RL** *1* Rhumb line.

*2* Runway edge lights.

*3* Report when leaving.

*4* Rocket launcher.

*5* Radioluminescence.

**R/L** Redline.

**RLA** *1* Repair level analysis.

*2* Relay to.

*3* Railway (not railroad) Labor Act; formerly governed negotiations of air-carrier unions in US.

**RLB** Reversed lobsterback (Rolls-Royce).

**RLC** Request level (FL) change; E adds en-route.

**R-LCD** Reflective liquid-crystal display.

**RLD** *1* Rijksluchtaardienst (Netherlands certification authority).

*2* Reference landing distance.

**RLE** Response on link establishment.

**RLEP** Robotic Lunar Exploration Program, became LPRP.

- RLG** 1 Ring laser gyro.  
2 Relief landing ground.
- RLGM** Remote loop group multiplexer.
- RLI** Repayable launch investment [hard-to-get government funding] (UK).
- RLLS** Runway lead-in lighting system.
- RLM** Reichsluftfahrtministerium (German air ministry to 1945).
- RLNA** Requested [flight] level not available.
- RLP** Recognised land picture.
- RLPCR** Air-navigation services of the Czech Republic.
- RLS** 1 Reservoir level sensor.  
2 Raster-line structure.  
3 Radius of landing site (lunar).  
4 Reliable link source.  
5 Remote light sensor.
- RLT** Rolling liquid transporter, eg Dracone.
- RLV** Recoverable, or reusable, launch vehicle.
- RLW** 1 Regie der Luchtwege (CAA, Belgium, see *RVA*).  
2 Raising/lowering winch.
- RLY** Relay.
- RM** 1 Reference materials in calibration of R&D measures.  
2 Radio maintenance.  
3 Reflected memory.  
4 Reeling machine.  
5 Risk management.  
6 Research memorandum.  
7 Remarks.  
8 Raksha Mantralaya (MoD, India).  
9 Rescue Module.
- RMA** 1 Reliability, maintainability and availability.  
2 Royal Mail Aircraft (followed by individual name of UK airliner, now obs).  
3 Rear maintenance area.  
4 Revolution in military affairs (US).  
5 See *RMAS*.
- RMAF** 1 Royal Malaysian Air Force.  
2 Royal Moroccan Air Force.
- RM&A** Reliability, maintainability and availability.
- RM&T** Reliability, maintainability and testability.
- RMAS** Royal Military Academy Sandhurst [previously RMA] (UK).
- R<sub>max</sub>** Maximum range, especially of weapon system or radar.
- RMCB** Remote-control circuit-breaker.
- RMCC** Remote monitoring and control console.
- RMCD** Radio-message conversion and distribution equipment.
- RMCS** 1 Remote monitoring and control system (LADGPS).  
2 Royal Military College of Science [Shrivenham, SN6 8LA] (UK).
- RMD** Radar monitoring display.
- RMDI** Radio (or remote) magnetic direction indicator.
- RME** 1 Rocket Motor Executive (UK, PERME).  
2 Resonant multiphoton excitation.
- RMEF** Reconnaissance mobile exploitation facility.
- RMetS** Royal Meteorological Society [1850, Royal 1866–].
- RMF** Reconfigurable modular family.
- RMFC** Reformed-methanol fuel cell.
- RMG** Resource Management Group (USAF).
- RMHK** Re-engine modification hardware kit.
- RMI** 1 Remote, or radio, magnetic indicator.  
2 Radio magnetic interference.
- RMIT** Royal Melbourne Institute of Technology (Australia).
- RMK[s]** Remark[s].
- RML** 1 Radar microwave link.  
2 Recirculating memory loop.
- RML** Reeling machine/launcher.
- RMM** 1 Read-mostly memory.  
2 Remote maintenance monitor, or remote monitoring and maintenance.  
3 Removable, or remote, memory module.
- RMMC** 1 Remote maintenance and monitoring configuration.  
2 Remote maintenance monitoring and control.
- RMMS** 1 Remote maintenance-monitoring system, or status.  
2 Radio-magnetic management system.
- RMN** Remain.
- RMNDR** Remainder.
- RMO** Rich-mixture octane [rating].
- RMOS** Refractory MOS.
- RMP** 1 Root mean power.  
2 Range mean pairs.  
3 Reprogrammable microprocessor.  
4 Radio management panel.  
5 Remote maintenance panel.  
6 Risk miniaturization program.
- RMPA** Replacement maritime-patrol aircraft.
- RMR** Remote map-reader.
- RMS** 1 Root mean square.  
2 Route, or reconnaissance, or rocket, or radio, management system.  
3 Range measurement system.  
4 Remote manipulator system (Shuttle).  
5 Roof-mounted sight.  
6 Reusable multipurpose spacecraft.  
7 Rotary mirror scanner.  
8 Recurring manufacturing support.  
9 Remote monitoring system.  
10 Radiation meteoroid satellite.  
11 Royal Meteorological Society [Reading RG1 7LJ] (UK).  
12 Remote mine-hunting system (USN).
- RMSE** Root-mean-square error.
- RMT** Reliability, maintainability, testability.
- RMT&E** Risk mitigation test and evaluation.
- RMU** Radio management unit.
- RMV** Remotely manned (or managed, or manipulated) vehicle.
- RMVL** Removal.
- RMVP** Reliability maintenance and validation program(me).
- RMW** Reactive-material warhead, which see.
- RMWS** Ramp-mounted weapon[s] system [helicopter].
- RN** Recovery net (RPV).
- R<sub>N</sub>, R<sub>n</sub>** Reynolds number, if for any reason R is unavailable.
- RNA** Royal Naval Airship [1912–18].
- RNAC** Reinforced North Atlantic Council.
- RNARY** Royal Naval Aircraft Repair Yard.
- RNAS** 1 Royal Naval Air Station; shore airbase, also

## R-Nav, RNAV, R-nav

rocket

known by ship name (prefaced HMS), usually name of seabird.

2 Royal Naval Air Service [1 July 1914–1 April 1918, when amalgamated with RFC].

**R-Nav, RNAV, R-nav** Area navigation, can have *RNPC* added.

**RNAY** Royal Naval Aircraft Yard.

**RNDZ** Rendezvous.

**RNEFTS** Royal Navy Elementary Flying Training Squadron.

**RNEP** Robust nuclear earth penetrator (DoD).

**RNF** Radio navigation facilities.

**RNG** Radio range (ICAO, FAA).

**RNGA** Range arc.

**RNGSA** Royal Naval Gliding and Soaring Association.

**RNHF** Royal Navy Historic Flight.

**RNI** Russian research institute, IKP adds space-instrument making.

**RNII** Reaction-engine scientific research institute (USSR, R).

**RNIP** Ring-laser gyro navigation improvement programme.

**RNLAF** Royal Netherlands air force [UK usage].

**RNLN** Royal Netherlands navy [UK usage].

**RNMP** Replacement of the nautical-mile panel (ICAO).

**RNoAF** Royal Norwegian air force [UK usage].

**RNP** Required navigation performance, defined as maximum expected en-route error; /ANP adds actual navigation performance, AP adds authorisation required; C or -C adds capability, -5 means accuracy  $\leq 5$  nm (9.3 km) 95% of time; the main effort is on extending coverage of RNP-4.

**RNPU** Radar-navigation processing unit.

**RNR** Receive[r] not ready.

**RNS** 1 Radar-navigation service, or system.

2 Regular use by non-scheduled carriers.

**RNSFC** Royal Naval School of Fighter Control.

**RNTP** Radio-navigation tuning panel.

**rnwy** Runway.

**RNZAC** Royal New Zealand Aero Club [office, Wellington].

**RO** 1 Range-only memory.

2 Radio, or radar, operator.

3 Royal Ordnance (UK).

4 Rollout.

5 Report when over runway.

6 Routeing organization.

7 Receive only.

8 Rotocycle category (USN, 1954–59).

**R/O** Radio officer.

**R<sub>o</sub>** 1 Radar range at which signal/noise ratio is 1.

2 Range to a patch or mapped swath.

**ROA** 1 Return on assets.

2 Remotely-operated aircraft.

3 Radius of action.

4 Recognised operating agency.

**roach** Wake of marine aircraft when deep in water; characterized by dense, almost vertical up-flow immediately behind float or hull.

**ROAD** Retired on active duty.

**roadable aircraft** One which, usually after some alteration, can be driven on public highway as a car.

**roadmap** Graphical plot, usually with time as X-axis,

giving pictorial overview of a programme, input efforts, available technologies or other variables.

**Roadstead** Code name for attacks on enemy ships at sea (RAF, WW2).

**roaks** Cavities in steel castings caused by carbon monoxide.

**ROB** 1 Right outboard.

2 Radar order of battle.

**rob** See next entry, derived verb.

**robbery action** Procedure whereby serviceable part is taken from aircraft or assembly in order to get the latter back in service (not cannibalization because \* is temporary).

**Robe, ROBE** Roll-on beyond line-of-sight enhancement, or extension.

**Robeps** Radar is operating below performance standard[s].

**Robex** Regional Opmet bulletin exchange.

**Robin** Radar observation of bird intensity.

**Robinson anemometer** Standard three or four-cup, with worm drive.

**robot** In addition to usual meaning, guided missile (Sweden).

**robotics** Use of intelligent machines to replace human beings in routine mechanical tasks.

**robot rotary wingman** UAV helicopter able to fly fast at low level accompanying manned helicopter, see *VCAR* (Darpa).

**robustness** Unquantifiable quality of a flight-control system to continue to function in face of uncertainties or failure in actuator, airframe or sensor input, especially despite dangerous conditions such as uncommanded hardover surface deflection.

**ROC** 1 Rate of climb.

2 Required, or rate of, operational capability (pronounced rock).

3 Royal Observer Corps (UK, civilian NW/fallout monitoring organization).

4 Receiver operating characteristic (ASW).

5 Reconfigurable orbital cockpit.

**ROCC** Region(al) (or range) Operations Control Center (Norad, SSS).

**Rocets** Rocket-engine transient simulation.

**Roche's limit** Critical radius from primary within which planetary satellite cannot form; equal to 2.44 times radius of primary.

**rock** 1 Uncommanded excursion or oscillation in roll. See *SIWR*.

2 Rotary movement of wing[s] relative to fuselage, usually in plane perpendicular to longitudinal axis, caused by worn root anchor pins and various other faults (usually old GA aeroplanes) Not to be confused with wing rock.

3 To move throttle lever[s] laterally.

**rockair** Small high-altitude sounding-rocket technique involving launch from aircraft, eg jet fighter, in vertical attitude at high altitude (probably arch.).

**Rock apes** RAF Regiment (colloq.).

**Rockbestos** Synthetic fire/electricity insulator.

**rocker arm** See-saw arm pivoted to piston engine cylinder head transmitting push-rod actuation to valve(s). Hence rocker box, enclosing valve gear.

**rocket** 1 Propulsion system containing all ingredients needed to form its jet, or vehicle thus propelled. Most involve combustion, but examples which do not are

## rocket ammunition

roll

monopropellants (eg HTP) and pressurized boiling water (eg Pohwarz).

2 Verbal or written reprimand (UK, colloq.).

**rocket ammunition** Rocket-powered projectiles of relatively small size fired from aircraft or other platform, mobile or stationary (USAF). Unguided, normally finned and/or spin-stabilized.

**rocket artillery** Artillery in which projectiles are propelled by rocket power but given guidance only during launch by amount of thrust and direction of take-off (USAF). This definition is meant to cover tube-type airborne launchers.

**rocket-assisted take-off** Take-off in which horizontal acceleration, and usually vertical component of thrust, are augmented by one or more rockets which may form part of aircraft or be jettisoned when spent. Ambiguously given US term JATO.

**rocket/athodyd** See *ram rocket*.

**rocket-based combined cycle** Rocket with valve-controlled duct to scramjet.

**rocket cluster** Large group of parallel rockets normally all fired together.

**rocket engine** Term best reserved for rocket using liquid propellants, esp. with pump feed and control system.

**rocket fuel** Ambiguous; can mean fuel as distinct from oxidant, or a solid propellant.

**rocket grain** See *grain*.

**rocket igniter** Device for starting combustion in any form of rocket; usually an electrically fired pyrotechnic, but many contrasting varieties.

**rocket launcher** Anything for launching rockets, specif. aircraft pod, pylon or rail from which rocket ammunition is fired.

**rocket loop** Flight manoeuvre in which loop is made with excess initial speed, traded in loop for height.

**rocket motor** Term preferred for all solid-propellant rockets, of any size, together with hybrids of modest complexity.

**rocket on rotor** Method of temporarily greatly boosting helicopter lifting power by switching on tip-drive jets fed with HTP from tank above hub.

**rocket power** See *rocket propulsion*.

**rocket propellant** See *propellant*.

**rocket propulsion** Propulsion of vehicle by rocket, excluding rocket drive of gyro wheels, turbopumps and other shaft-output devices.

**rocketry** Technology of rockets (colloq.).

**rocket sled** Sled guided by straight track and propelled by rocket(s) to high (often supersonic) speed for use as test platform.

**rocketsonde** Launched by rocket, operates on parachute descent.

**rocket thrust** Measured either for sea-level or vacuum conditions, latter being about 26% greater.

**rocking** Uncommanded lateral and directional oscillation, chiefly in roll.

**rockoon** Sounding rocket fired from helium balloon.

**rockover** Nose-down rotation on landing, normally by tailwheel aircraft, in extreme case by 180°.

**Rockwell number** Measure of hardness, esp. of metals, derived by impressing tool (for soft metals Type B,  $\frac{1}{16}$ -in/1.5875 mm steel ball, result being  $R_B$  number; for very hard Type C, 120° diamond cone, result  $R_C$  number)

first with 10 kg load and then with 90 or 140 kg, and measuring change in indent area.

**Rococa** Rate of change of cabin altitude.

**ROD** 1 Rate of descent.

2 Repair on demand.

**rod** Photoreceptor in retina for scotopic (night) vision and detection of movement.

**rod aerial** Aerial in form of rigid tube or bar conductor.

**Rodar** Helicopter rotor-blade radar (Ferranti).

**Rodeo** Code name for sweep over enemy territory by fighters, on preplanned and opportunity targets (RAF, WW2).

**Rodnet** Reliable on-board data network.

**Rods, RODS** 1 Robust optical data system.

2 Ruggedized optical-disk system.

**ROE, RoE** 1 Rules of engagement.

2 Return on equity.

**ROEA** Read-only, electrically alterable memory.

**roentgen** Unit of exposure to ionizing radiation, quantity producing 1 e.s.u. in  $1 \text{ cm}^3$  dry air at 0°C; non-SI,  $= 2.58 \times 10^{-4} \text{ C/kg}$  (C = coulombs).

**roentgen equivalent man** See *rem*.

**ROF** 1 Royal Ordnance Factories (UK, at one time various locations).

2 Rate of fire.

3 Rollover force, imposed by aircraft wheel.

**Rofor, ROFOR** Route forecast.

**Rogallo** Originator of patented family of flexible-wing aircraft characterized by delta wing plan with three rigid members in form of arrow-head joined by flexible fabric which inflates upwards to arch under flight loads; originally paragliders with poor L/D, later developed to include powered aircraft.

**Roger** Voice code: "I have received and understood all of your last transmission".

**rogue** Aircraft which displays flight characteristics and/or performance markedly inferior to others of same type or, in particularly dangerous specimens, which is unpredictable.

**rogue state** Country considered by the USA/UK to pose a possible NW threat.

**Rohacell** Low-density cellular plastics material of thermosetting type used to stabilize sandwich structures, usually with CFRP skins.

**Rohrbond** Patented metal adhesive bonding, especially for noise-absorbent sandwich.

**ROI** Return on investment.

**Roink** See *Ronk* (USN).

**ROL** Roll-on landing.

**Rolamat** Proprietary series of floor roller panels to facilitate loading and para-dropping of cargo.

**Role, ROLE** Receive only link eleven (Link 11, US/NATO).

**role-change package** Removable equipment fit (eg flight-refuelling probe installation) stored available for use when required; does not necessarily change role.

**role equipment** Equipment attached to or carried in aircraft for particular duties or mission(s) which can be removed subsequently; eg helicopter can offload ASW gear or anti-tank weapon/sight system and take on winch, buoyancy bags and furnishing for rescues.

**roleur** Non-flying taxi trainer (F, suggest obs.).

**roll** 1 Rotation about longitudinal (OX) axis; one of the five classical modes of aeroplane motion.

## roll-angle steering

2 To move across surface on takeoff or landing.  
3 The length of \* (2).

**roll-angle steering** Autopilot mode based on CAS6 giving automatic correct bank at fixed altitude.

**rollback** 1 Pushback.

2 Engine rundown or spooldown.

**roll bar, roll cage** See *roll pylon*.

**roll cloud** See *rotor cloud*.

**roll coupling** See *inertia coupling*.

**roll damper** Flight-control damper operating on ailerons or differential spoilers, either to preclude Dutch roll or because aircraft is difficult to hold wings-level in turbulence.

**roll electrodes** Freely rotating mating discs used for resistance-welding continuous seams or evenly spaced spots.

**roller** 1 Landing by tailwheel aircraft with fuselage substantially level, eg because three-pointer is difficult or risks severe bounce, or because of gusty conditions.

2 *Touch-and-go* (RAF).

**roller/ball transfer** Movement of container[s] or pallet[s] over ballmats.

**roller bearing** Shaft bearing providing precise diametral [radial] location only.

**roller-blind instrument** Panel instrument whose display makes use, usually as backdrop, of roller blind (eg giving black/white sky/Earth indication of horizon). Not synonymous with tape instrument, which is analog linear scale.

**roller cloud** See *rotor cloud*.

**roller drive** Patented (TRW) reduction or stepup gear in which gear teeth and most bearings are eliminated, smooth preloaded rollers (Sun and two-step rings of planets) transmitting torque without lubrication.

**roller-map display** Navigation display based on moving map (usually air topographic printed on film at reduced scale) projected by optics on circular screen on which heading appears as vertical central line (usually with present position as small ring near 6 o'clock position). In advanced forms, eg Ferranti Comed, combined with electronic displays and information readouts.

**rolleron** Flight control serving as primary for pitch or pitch/yaw and roll, esp. in radial-winged missiles, which have four \* to handle all manoeuvres.

**rollgang** Any of many makes of roller system for facilitating movement of cargo, especially in removable floor panels of standard size.

**rolling** Engaged in roll (1, 2).

**rolling balance** Tunnel balance measuring forces and moments while model rolls about axis parallel to airflow.

**rolling ball** Compact two-axis human input to dynamic system, eg ATC or SSR radar, air-defence plot or computer display, in which partially recessed sphere drives two potentiometers giving rotary output proportional to rotation of ball about each of two perpendicular horizontal axes; output can be analog voltage or digital pulses. Smallest types fit on end of cockpit levers to command panel displays or HUD. In US ATC called track ball.

**rolling-element bearing** Shaft bearing in which sliding friction is eliminated, the commonest types being ball, roller, tapered-roller and needle.

**rolling engagement** Air-combat training in which one

## roll ratcheting

aircraft (eg Aggressor role) takes over when predecessor is at bingo.

**rolling instability** Lateral instability; depending whether neutral or positive instability, an upset about OX will fail to be restored or become divergent.

**rolling moment** Component about longitudinal (OX) axis of couple due to relative airflow; measured positive if rotates right-wing down, negative if vice versa.

**rolling plane** Vertical plane normal to OX axis, ie containing line through both wingtips.

**rolling radius** Effective radius of landing wheels allowing for deflection (function of aircraft weight, speed and tyre inflation pressure).

**rolling tailplane** Taileron.

**rolling take-off** Any take-off by helicopter, tiltrotor or other VTO aircraft which, for any reason, accelerates forwards before leaving ground.

**rolling vertical take-off** Take-off with vectored nozzles aft for short distance (USAF 50 ft, in practice more helps), at which point nozzles are vectored to 60° or thereabouts for near-vertical ascent. Often shortened to rolling take-off.

**roll-in point** Point in space where aircraft enters diving attack.

**roll jet** Reaction-control jet for roll.

**roll off** Uncommanded roll when at high AOA (eg due to climb at low speed) due to contamination by ice or other matter.

**roll off the top** See *Immelmann*.

**roll-on landing** Helicopter landing with substantial forward speed, eg following loss of tail rotor.

**roll on top** Half loop followed by 360° roll followed by remaining half of loop.

**rollout** 1 Ground roll after landing, esp. when continued to later turnoff to ease brake wear.

2 Emergence of new aircraft, especially first of new type, from factory, often carefully staged ceremony.

3 Termination of flight manoeuvre designed to place (normally combat-type) aircraft in optimal position for completion of intended activity (USAF).

**rollout RVR** Readout values from RVR equipment located nearest runway end (FAA).

**rollover** Apart from generalized meaning in business investment, replacement of airline line equipment by larger aircraft, in response to or anticipation of increased traffic.

**roll-over stand** Maintenance stand for engine [rarely, other items] providing hand-crank gearbox to rotate unit for all-round access.

**Rollpin** Press-fit pin made of roll of spring steel, forming self-retaining bearing pivot, axle or hinge-pin.

**roll post** Strange US term for the reaction-control jets needed for lateral control on jet STOVL aircraft, esp. the F-35B. Each comprises a downward-pointing nozzle with an electrically powered valve controlling high-power bleed air from the main engine (maximum 6% of main-engine airflow per nozzle). The previously existing terms were puffer jet and RCJ.

**roll pylon** Strong structure on ag-aircraft to give protection to pilot's head in event of aircraft becoming inverted on ground.

**roll ratcheting** Uncommanded oscillation of lateral controls, typically at 2–3 Hz, caused by human neuro-

## roll rate

muscular input [but emphatically not PIO], force-sensing stick gain and command prefiltering.

**roll rate** Measures of lateral-control power, notably instantaneous \* and sustained \*.

**roll-rate gyro** A single gyroscope used to measure rate of roll of its cage, or aircraft.

**roll reversal** Causes, apart from basic aeroelastic reversal of control, include jack stall, spoiler blowback, adverse yaw and loss of lift of accelerated wing due to increased compressibility.

**Rollspring** Patented (Lockheed Georgia) mechanical drive using belt of thin spring steel.

**roll-stabilized** Prevented, eg by autopilot or vertical gyro, from rolling; common characteristic of cruciform-winged missiles as an alternative to deliberate roll at known rate.

**roll whiskers** Short diagonal lines showing bank-angle limits (HUD symbology).

**rolometer** Extra-sensitive bolometer (ASCC).

**ROM** 1 Read-only memory.

2 Rough order of magnitude (prefix).

**Romag** Remote map generator.

**Rome Convention** International laws governing liability for, and compensation for, damage to Earth surface, especially structures, caused by aircraft (1952).

**RON** 1 Receive, receiving, only (ICAO).

2 Remain overnight (FAA).

3 Research octane number (fuel).

**Ronchi** Modification of Schlieren technique to give quantitative results, with second slit removed and grid of parallel wires added to give light/dark shadow planes.

**Roncz** Family of [originally sailplane] aerofoils, designations prefixed RQW for wing, RQHT/RQVT for horizontal or vertical tail.

**Ronk** Resident officer in charge (USN, colloq.).

**Ronly** Receiver only.

**röntgen** See *roentgen*.

**roofline** Generalized term for that level in passenger cabin at which lights, fresh-air (punkah) louvres, call buttons and drop-down oxygen are located. Hence \* locker = overhead stowage bin.

**roof rat** Carrier deck crew (USN colloq.).

**rooftop** Aerofoil profile which at typical cruise AOA generates lift more or less uniformly across large middle part of chord (chordwise plot has semi-elliptic form). Not precisely defined and generally synonymous with supercritical.

**roof watcher** Person trained in aircraft recognition stationed on roof of factory, school or similar building to give warning of imminent attack (UK, 1941–45).

**root** 1 Junction of aerofoil with fuselage or similar supporting structure, including unspecified small innermost portion of aerofoil itself.

2 Inner end of propeller or gas-turbine compressor or turbine blade [vane].

**root attachment** Method of fixing rotating blades into the disc periphery. Turbine rotor blades are invariably held by a fir-tree. Compressor rotor blades are usually retained either by being slid into axial slots across the disc periphery or retained in a slot around the disc circumference, in each case with locking devices.

**root bending moment** Bending moment at the wing root, strongly influenced by lift generated near the tip, especially by an increase in span.

## Rossby number

**root chord** Chord of a wing or tail surface at the root or [and this must be made clear] on aircraft centreline.

**root mean square** Square root of arithmetic mean of squares of all possible values of given function.

**root-mean-square error** Square root of arithmetic mean of squares of deviations from arithmetic mean of whole; standard deviation  $\sigma$ .

**Roots** One of many types of positive-displacement fluid compressors (eg superchargers, cabin blowers) in which two mating rotors are driven by external gears to revolve together inside casing; rotors in this case are identical and resemble fat figure-eights.

**root section** Profile of aerofoil at root; in both wings and propellers often significantly different from remainder of surface.

**ROP** 1 Rotor overspeed protection.

2 Runway observation post, for human guess at RVR.

3 Runway overrun protection.

**ROPA** Reserve Officers Personnel Act (ROPMA adds 'Management') (US).

**Ropar** Regional operators' program for airframe reliability; co-operative effort by US carriers.

**rope** Element of chaff consisting of long roll of metallic foil or wire designed for broad low-frequency response.

**rope chaff** Chaff which contains one or more rope elements (DoD).

**ROPW** Read-only, permanently woven memory.

**ropy** Or *ropey*, general critical/derogatory adjective and adverb (RAF WW2).

**ROR** 1 Range-only radar.

2 Rocket on rotor.

3 Red on red.

**Ro/Ro** Roll-on roll-off, ship configured for transport of vehicles driven on or off under own power. See *T-AKX*.

**Rorsat** Radar ocean-reconnaissance satellite.

**ROS** 1 Rotor outside stator (electrical machines).

2 Read-only storage.

3 Relief on station (UAVs).

4 Rosman, North Carolina.

5 Repaired, or repairable, on site.

6 Rotating oil separator.

**Rosa** 1 Runway, or road and runway, surface analyser.

2 Radar open-system architecture.

**rose** Polar plot, normally subdivided from  $000^\circ$  to  $360^\circ$  clockwise but often including only quadrantal, cardinal and possibly other points and occasionally only radial lines with variable angular intervals. Term applies to any such diagram, eg in panel instrument (ADF, RMI, HSI etc), compass or wind \*.

**rosette** 1 Standard series of patterns, generally resembling petals of flower, for applying strain gauges to signal stress in all directions, usually in sheet.

2 Similar-shaped hand weld made in hole through sheet or tube to secure second member inside.

**Rosina** Rosetta orbital spectrometer for ion and neutron analysis.

**Rosman** See *Stadan*.

**Rossby chart** Basic diagram assisting in establishing character of air masses and in met. forecasting generally; energy diagram in which specific humidity is plotted against equivalent potential temperature, result being named characteristic curve.

**Rossby number** Ratio of inertial forces to Coriolis forces in a rotating fluid.

**Rosto, ROSTO** Paramilitary sports and technical society (R).

**ROT** Reserve officer training.

**Rotachute** Patented (Hafner/ML Aviation) free-running personal rotor used WW2 instead of parachute for accurate paratroop descent.

**rotaglider** Generalized term for gliders with free-running rotary wing in place of fixed wing.

**rotaplane** Flying machine whose support in flight is derived from reaction of air on one or more rotors which normally rotate freely on substantially vertical axes (BSI); today called autogyro, making this term redundant.

**rotary atomizer** Rapidly spinning drum or disk from which fuel enters gas-turbine combustion chamber, notably on Turbomeca engines.

**rotary bomboor** Door to aircraft internal weapon bay made as single stress-bearing beam pivoted at extremities and itself loaded with ordnance or, alternatively, fuel tank or reconnaissance sensors; to drop ordnance, door is rotated 180°, thereafter normally reversing direction to close.

**rotary cannon** Gun with several (eg six) barrels which in operation rotate at high speed around the gun centreline, at any moment each barrel being in a different point in the operating cycle. In many respects similar to Gatling (1862). Not to be confused with revolver cannon.

**rotary converter** A.c. input drives generator for d.c. output.

**rotary derivatives** Stability derivatives expressing variation in forces and moments resulting from changes in aircraft rate of rotation about all axes.

**rotary distributor** See *spreader 2*.

**rotary engine** 1 Historically, piston engine (usually Otto but occasionally two-stroke) with radial cylinders which drive themselves round a fixed crankshaft; propeller is thus attached to crankcase.

2 Today, an RC (1) engine.

**rotary loads** The aerodynamic loads corresponding to rotation about the three axes, roll/pitch/yaw.

**rotary scan** See *scan*.

**rotary shears** Hand or power tool used for slitting sheet along straight lines or curves of variable radius.

**rotary variable differential transformer** Pickoff sensing the precise angular position of a shaft, giving servocontrol feedback.

**rotary-wing aircraft** See *rotorcraft*.

**rotate** 1 Voice command, usually P2 to P1, at  $V_R$ .

2 To cycle personnel, especially military, through repetitive tour of duty.

3 See *rotation*.

**rotated out** Removed from combat duty after tour.

**rotating beacon** 1 Bright aircraft-mounted light steady or flashing while rotating continuously in azimuth, usually synonymous with strobe; today tends to be illuminated whenever engine run on ground.

2 Ground transmitter having directional radiation pattern rotated continuously at predetermined rate (BSI); suggested arch. term overtaken by more precise names, eg VOR.

**rotating-combustion engine** IC engine of positive-displacement type in which main moving parts are not reciprocating but rotary; usually based on Otto cycle. According to best-known worker in this field, Felix

Wankel, 864 possible configurations divided into single-rotation machines (SIM), planetary-rotation machines (PLM), SIM-type rotating-piston machines (SROM) and PLM-type rotating-piston machines (PROM). Unfortunately acronyms confuse with equally important EDP (1) meaning of PROM etc.

**rotating-cylinder flap** High-lift wing flap in which circulation is assisted by high-speed rotary cylinder mounted along flap leading edge (Coanda and Flettner relevant), eg in NASA YOV-10A.

**rotating guide vane** Curved inner leading edge of centrifugal (rarely, other types) of compressor or impeller rotor, main purpose of which is to smooth change of direction of flow from axial to radial.

**rotating oil separator** See *centrifugal breather*.

**rotating stall** There is no brief single form describing stall in axial compressors and other rotating-blade machines.

**rotating-wing aircraft** See *rotorcraft*.

**rotation** 1 Positive, ie nose-up, rotation of aeroplane about lateral (pitch) axis immediately before becoming airborne; in transports commanded at  $V_R$ .

2 One round trip to destination, especially by scheduled transport aircraft.

**rotational speed** Number of rotations in unit time, measured as rpm (per minute) or rps (per second) or radians per second; 1 rpm = 0.104720 rad/s; 1 rad/s = 9.54927 rpm.

**rotator** Hand turning gear.

**ROTC** Reserve Officers' Training Corps (USAF).

**Rotherham pump** Windmill fuel pump (1914-c35).

**ROTHR** Relocatable over-the-horizon radar; -B adds backscatter.

**Rot Lt** Rotating light.

**rotouchute** Free-rotor airbrake fitted to certain air-dropped sonobuoys.

**rotodome** Slowly rotating radome of discus shape used to fair in antenna of AWACS-type aircraft, usually housing main and IFF/link antennas across diameter, back-to-back.

**rotor** 1 System of rotating aerofoils (ASCC); this includes propeller, so should be qualified by adding 'whose primary purpose is lift'.

2 Main rotating part of machine, eg gas-turbine engine, turbopump or alternator.

3 Local air mass rotating about substantially horizontal axis; when downstream of mountain ridge can be exceedingly dangerous.

**rotor cloud** Unusual cloud usually of Ac type and often dangerously turbulent; found in rotor flow, normally in lee of mountain range or ridge. Also called roll cloud.

**rotorcraft** Aerodyne deriving lift from rotor(s).

**rotorcraft load** See *slung load*.

**rotorcraft pilot's associate** Digital terrain map to assist plotting masked routes.

**rotor damping** Damping of blades about any pivot axis in helicopter main rotor (see *lag-plane, soft in plane*).

**rotor disc** 1 Circular area swept by blades of helicopter or autogyro rotor.

2 Structural disc holding compressor or turbine rotor blades.

**rotor flow** Large-scale rotary flow of atmosphere about substantially horizontal axis in lee of mountain or sharp ridge, which when wind very strong is turbulent to point

## rotor force

row

of being dangerous, with vertical gusts of 30 m (100 ft)/s (see *rotor streaming*).

**rotor force** Resultant imparted by lifting rotor, analysed into lift and drag, or thrust (perpendicular to disc) and in-plane (H-) force.

**rotor governing mode** Control mode in which rotor (1) speed is held constant.

**rotor head** Complete assembly of rotating components at centre of lifting rotor of helicopter or autogyro, including hub, blade attachments and pivot bearings, if any, and complete control mechanism, as well as such adjuncts as anti-icing, electrics and pressurization instrument leads rotating with hub.

**rotor hinge** In a non-rigid [articulated] rotor, the drag and flapping hinges.

**rotor hub** Primary structure connecting blades of helicopter or autogyro rotor. Some authorities define hub to mean same as head, which is unhelpful.

**rotor incidence** Angle between plane normal to axis of rotation and relative wind (BSI).

**rotor inlet temperature** Assumed equal to SOT (gas turbine).

**rotor kite** Towed engineless autogyro.

**rotor mast** Pylon carrying rotor in small rotorcraft.

**rotorplane** See *rotorcraft*.

**rotor power coefficient** Symbol  $C_p = P/pA [\Omega R^3]$ .

**rotor slap** Noise, often almost explosive, caused by interaction between each helicopter main rotor blade and the vortex from its predecessor.

**rotor streaming** Shedding of turbulent rotors (3) downstream, often near ground and very dangerous to aircraft.

**rotor tip drive, tip jet** *Tip jet*.

**rotor torque** That imparted to airframe by helicopter rotor, esp. main lifting rotor of hub-driven type, which has to be countered by tail rotor or use of two main rotors.

**ROTR** Rate of temperature rise.

**Rotte** Fighter aircraft in loose pair (G).

**rough-air speed** Recommended speed for flight in turbulence,  $V_{RA}$  (hence rough-air Mach,  $M_{RA}$ ); lies between  $V_A$  and  $V_C$  and usually near  $V_B$ .

**rough field** Defined by standard categories of surface profile, including post-attack damage repair: A, single blister up to 1.5 in H (height) over aircraft-travel distance of 80 ft; B, H up to 3 in; C/D, two 3 in blisters within 80 ft; E, two up to 4.5 in; 2E, two up to 9 in.

**roughness** Criterion affecting surface finish: irregularities that are closely spaced (see next entry).

**roughness factor** Rayleigh criterion  $\Delta_h = \lambda/8 \sin \psi$  where  $\lambda$  wavelength and  $\psi$  angle of incidence.

**roughness width cutoff** Maximum width of surface irregularities to be included in measure of surface height; in Imperial measure usually 0.03 in, but occasionally 0.003, 0.010 or 0.10.

**roulement** 1 Rotation of aircraft through front-line squadrons (RAF).

2 Short tours of duty, typically split into six four-month cycles (UK Army).

**rouleur** Ground trainer with wing too small for flight (F).

**round** 1 Single munition, missile or device to be loaded on or in delivery platform (USAF).

2 Parachute with circular canopy [smokejumper term].

**round-down** Rear terminator of aircraft carrier flight deck, usually normal to landing direction (term derives

from older ships where deck fell away over stern in large-radius curve).

**rounded trailing edge** Aerofoil designed for flow attachment by Coanda-effect blowing to give very high (10+) lift coefficients.

**roundel** National marking for military aircraft in form of concentric rings.

**round-head rivet** Usual rivet for thin sheet where countersinking is not required; head OD larger than button-head.

**round-trip time** For radar, see *ranging time*.

**route** 1 Defined path, consisting of one or more courses, which aircraft traverses in horizontal plane over surface of Earth (FAA).

2 Published route linking traffic points of air carrier and used in traffic and rights negotiations.

3 Path followed by channel of AFTN network.

**route flight** 1 One from A to B.

2 Military mission, usually transport, over established route.

**route package** Geographical division of enemy land-mass for purposes of air-strike targeting.

**router** Rhyming with doubter, machine tool having high-speed cutter, usually rotating about vertical axis, capable of being positioned anywhere over horizontal work; cutter can be side or end-cutting and in large machines may be NC.

**router** Pronounced rooter, seamlessly connects wireless networks on land/sea/air cellular [Wi Fi] satellite systems.

**route sector** Route (1) between two traffic points.

**route segment** Route (1) between two way-points or [ICAO] consecutive significant points.

**route speed** En route speed, usually synonymous with block speed.

**route stage** Stage (4).

**routine** 1 Series of step-by-step EDP (1) instructions forming part of program; hence portions of same are subroutines.

2 Complete sequence of aerobatic manoeuvres planned by competitor or airshow participant.

**routing** Itinerary followed by message in AFTN.

**routing list** That showing AFTN centre which outgoing circuit to use for each addressee.

**ROV** Remotely operated vehicle.

**Rover** 1 Armed reconnaissance, usually against shipping (RAF, WW2).

2 Remote operations, or operated, video enhanced receiver [ground-to-air].

**rover** Self-propelled explorer of planetary or lunar surface.

**roving** Traditional meaning was slightly twisted hank of textile fibre; modern meaning in aerospace is continuous fibre (eg carbon, graphite, boron, glass) for filament winding, or continuous raw material for ECM chaff to be cut to required response length in dispenser.

**roving aerodynamic test system** System for measuring flow quality and other parameters at various points (eg vane sets) in wind tunnel.

**ROW** 1 Rest of world.

2 Right of way.

**row** Group of cylinders of radial engine in one plane, all driving one crankpin (strictly, not a row but planar array); hence two-\* engine has two planes one behind the other.

**row section**

**row section** Group of consecutive seat rows called to board at the same time.

**Roydazide** Hot-isostatic-pressed sinide.

**Royal Flight** Single mission notified by Notam of flight carrying at least one of certain nominated members of the Royal Family [v. rarely, other VIP] (UK).

**Royal Naval Aircraft Yard** Major maintenance facility for RN aircraft.

**Royal Observer Corps** Civilian body established to keep watch on sky [and surface if necessary] and report occurrences [22 September 1925, prefix Royal 9 April 1941] (UK).

**ROZ** RON (G).

**RP** 1 Reporting point, or post.

2 Rocket projectile.

3 Rocket propellant (fuel designation prefix).

4 Route package.

5 Rapid prototyping.

6 Report [when you are] passing.

7 Reticulated polyurethane.

8 Routeing protocol.

9 Radar processor.

**R/P** 1 Rocket projectile (WW2 usage).

2 Receiver processor.

**R:P** Reserve to production ratio [petroleum].

**RP-1** 1 Common kerosene fuel for rockets and ramjets.

2 One-minute racetrack pattern for holding.

**RPA** 1 Remotely piloted aircraft.

2 Recreational pilot, airplane.

3 Rotorcraft pilot's associate.

**RPAR** Revenue per available room.

**RPB** Retarded practice bomb.

**RPC** 1 Recreational Pilot[s] Certificate (FAA).

2 Remote procedure call[s].

**RPCC** Rotating-parts cycle count.

**RPCM** 1 Reply processing and channel management.

2 Remote power-control module (*ISS4*).

**RPD** 1 Rapid, or rapid inertial alignment.

2 Random pulse discrimination.

**RPDE** Reliability and performance in demonstrator engine[s].

**RPDL** Receiver pilot director light.

**RPDLY** Rapidly.

**RPDU** Remote power-distribution unit.

**RPE** Rocket Propulsion Establishment (Westcott, UK).

**RPEH** Rate per engine hour.

**RPF** Reticulated-plastics foam.

**RPFS** Radio position-fixing system.

**RPFT** Rapid pucker factor take-off.

**RPG** 1 Rounds [of ammunition] per gun.

2 Regional Planning Group (ICAO).

3 Radar product generator.

4 Receiver/processor group.

5 Recreational pilot, gyroplane.

**RPGT** Radar procedure[s] ground trainer.

**RPH** 1 Remotely piloted helicopter.

2 Recreational pilot, helicopter.

**RPI** 1 Runway point of intersection.

2 Rapid process improvement.

3 Retail price index [various suffixes].

**RPK** 1 Revenue passenger-kilometres.

2 Fragmentation bomblet (as well as a series of Kalashnikov LMGs) (USSR, R).

**RPL** 1 Radiophotoluminescence.

2 Rated power level (electronic).

3 Runway planning length.

4 Repetitive flight plan; S adds system.

5 Regional Plans (ICAO Standing Group).

6 Recreational Pilot licence/license.

**RPLC** Replace[d].

**RPM** 1 Revenue passenger-mile[s].

2 Rounds per minute (often rds/min or spm).

3 Reliability prediction manual.

4 Research and program(me) management.

5 Remotely piloted munition.

6 Radar performance monitor.

7 Rendezvous pitch manoeuvre.

**rpm, r.p.m.** Revolutions per minute; SI dictates rev/min.

**RPMB** Remotely piloted mini-blimp.

**RPMD** Repeater projected map display.

**RPO** 1 Rotorcraft program office.

2 Resident project officer.

**RPOA** Recognised private-operation agency (CCITT).

**RPOADS** Remotely piloted observation aircraft designator system (USA).

**RPOW** Relative power, one-way (SSR and other radars).

**RPP** Reversible-pitch propeller.

**RPPG** Radar Planning and Policy Group (ICAO).

**RPPL** Recreational Private Pilot's Licence [likely to be valid to AUW <2,000 kg] (AOPA).

**RPRT** Report.

**RPRV** Remotely piloted research vehicle.

**RPS** 1 Radar position symbol.

2 Regional pressure setting.

3 Robot passive sonar.

4 Recording and playback system [voice/radar/LAN].

5 Radioisotope power system.

**rps** 1 Radians per second (contrary to SI and confusing, see next).

2 Revolutions per second.

**RPSTL** Repair parts and special tool list.

**RPT, Rpt** 1 Repeat, or I repeat.

2 Revenue passenger transport.

**R/Pt** Reporting point.

**RPU** 1 Receiver processor Unit.

2 Radar processing unit.

3 Remote processing unit.

**RPV** Remotely piloted vehicle, term normally confined to fixed-wing aerodynamics; US preference for UAV is making \* unfashionable.

**RPX** Radar-data processing executive.

**R/P/Y** Roll, pitch and yaw.

**RQ** Designation prefixes for Roncz aerofoil.

**RQ** 1 Preface: request (ICAO).

2 Request for quotation.

3 Role designation prefix: surveillance UAV (US).

4 Designation prefix for Roncz airfoils.

**RQD** Required.

**RQL** Rich burn, quick quench, lean burn.

**RQMNT|S|** Requirement[s].

**RQP** Request, flight plan.

**RQRD** Required.

**RQS** 1 Request, supplementary flight plan.

2 Rescue Squadron (USAF).

**RR** 1 LF or MF radio range (FAA).

2 Rendezvous radar.

- 3 Rain-repellant liquid.  
 4 Rain area.  
 5 Radiometric resolution.  
 6 Report [upon] reaching.  
 7 Rising rapidly.  
 8 Receiver ready.
- R/R** Remove and replace.
- R<sub>R</sub>** Radar power received.
- RRA** 1 Radar recording and analysis.  
 2 Radar reflective area.
- R.R.alloys** Aluminium alloys originally developed by Rolls-Royce for pistons and other engine parts, later with titanium added in gas-turbine applications, and (R.R.58) for the airframe of Concorde; trade name Hiduminium (High Duty Alloys, UK).
- RRAB** Cluster-dispersed incendiary (USSR, R).
- RRAM** Rapid-response aerospace manufacture.
- RRC** Regional radar center.
- RRCC** Rotorcraft Requirements Co-ordinating Committee (CAA).
- RRCM** Rudder-ratio control module.
- RRCS** 1 Remote radio control system [control of airfield lighting].  
 2 Remote radar control system.
- RRCSR** Rapid response to critical system requirements (USA).
- RRE** 1 Royal Radar Establishment, became RSRE.  
 2 Risk-reduction effort.
- R<sub>res</sub>** Radar range resolution.
- RRF** Ready Reserve Force[s] (US).
- R.R.58** See *R.R. alloys*.
- RRG** Roll-rate gyro.
- RRH** Remote Radar Head [station] (RAF).
- RRI** Router [pronounced rooter] reference implementation (ATN).
- RRL** Runway-remaining lights.
- RRM** Risk-reduction measures.
- RRP** 1 Runway reference point.  
 2 Risk-reduction plan.
- RRPS** Ready-reinforcement personnel section.
- RRR, R<sup>3</sup>** 1 Rapid runway repair[s].  
 2 Rapid-reinforcement plan.  
 3 Radar-data recording and replay system.
- RRS** 1 Remote receiving station (UAV).  
 2 Risk and revenue sharing; P adds partner.  
 3 Risk-reduction study.
- RRTC** Roll-response time constant; subjective assessment from 0.1–10 s of apparent lag in response to large roll demand suddenly applied.
- RRTES** Reconnaissance real-time exploitation system.
- RRTS** 1 Radar real-time simulator.  
 2 Remote radar tracking station, or system.
- RRU** Remote readout unit.
- RRW** 1 Robot rotary [-winged] wingman.  
 2 Recce [reconnaissance] report workstation, for creating and disseminating reports in various formats.  
 3 Reliability, or reliable, replacement warhead [for NW] (NNSA).
- RRWD** Radar remote weather display; S adds system.
- RRZ** Radar regulation zone.
- RS** 1 Reconnaissance/strike (USAF) or Reconnaissance Squadron.  
 2 Reserve Squadron (RFC).  
 3 Re-entry system.
- 4 Rear spar.  
 5 Rapidly solidified; MMC adds metal-matrix composite.  
 6 Regular use by scheduled carriers.  
 7 Remain well over to right side of runway.  
 8 Radio set.  
 9 Receiver segment.  
 10 Record Special, ground observation of Sigmet.  
 11 Ring-slot [parachute]; HV adds high-velocity.  
 12 Remote sensing.  
 13 Raman-shifted.  
 14 Recommended Standard [Electronic Industries Assoc.].  
 15 Readiness State.
- R<sub>s</sub>** Separation radius, of ground sheet.
- R<sub>s</sub>, r<sub>s</sub>** Specific range.
- RSA** 1 Rate sensor assembly.  
 2 Réseau du Sport de l'Air (F).  
 3 Range standardization and automation.  
 4 Runway safety area.  
 5 Reference-station antenna (GPS + datalink).  
 6 Radar service area.  
 7 Risk-sharing agreement.
- RSAF** 1 Royal Small Arms Factories (UK, defunct).  
 2 Royal Singapore Air Force.  
 3 Royal Swedish air force [UK usage].
- RSAOC** Region/sector air operations center[s].
- RSB** 1 Recovery speed brake.  
 2 Rescue/security boat.
- RSB** Vertical load on landing gear at spring-back.
- RSC** 1 Rescue sub-centre (ICAO).
- 2 Radar-scattering camouflage, or centre.  
 3 Runway surface condition.  
 4 Remote switching control.  
 5 Radar scan converter.  
 6 Reflective star copier.  
 7 Registration Standards Committee (EC, based UK).
- RSCAA, Rscal** Remote-sensing chemical-agent alarm.
- RSCD** RSC (3).
- RSCU** Ramp spill control unit.
- RSD** 1 Retinal scanning display.  
 2 Raster-scan display.  
 3 Rapid securing device (shipboard helicopter).
- RSDP** Reliable sequencing delivery [confirmation] protocol.
- RSDU** 1 Radar/sonar display unit.  
 2 Radar storm detection unit.
- RSG, rsg** Rising.
- RSH** Reservoirs souples héliportables (F).
- RSI** 1 Reusable surface insulation.  
 2 Rationalization, standardization, interoperability (NATO).  
 3 Remote status indicator.
- RSIP** Radar sensitivity [or system] improvement program[me].
- RSIS** Rotorcraft systems integration simulator (NASA).
- RSITA** Regulations, SITA.
- RSIU** Radar-set interface unit.
- RSL** 1 Range-safety launch (RAF).  
 2 Remote-source lighting.  
 3 Resource specification language.
- RSLS** Receiver side-lobe suppression.
- RSM** 1 Runway surface and markings.

2 Response surface model[s], or modelling, or methodology.

**R<sub>smc</sub>** Random-access channel for air/ground signals.

**RSMMC** Rapidly solidified metal-matrix composite.

**RSN** Regional subnetwork.

**RSO** 1 Reconnaissance Systems Officer, or operator.

- 2 Regional Safety Officer.
- 3 Runway Supervisory Officer.

**RSP** 1 Radar start point.

- 2 Responder beacon, or response (ICAO).
- 3 Radar signal processor.
- 4 Revenue-sharing participant.
- 5 Risk-sharing partner.
- 6 Reversion Select Panel.
- 7 Required surveillance performance.
- 8 Responsive space program (AFRL).
- 9 Replenishment spare parts.

**RSPD** Rapid-solidification plasma deposition.

**RSPL** Recommended spare-parts list.

**RSPT** Report [when] starting procedure turn.

**RSR** 1 En-route surveillance radar.

- 2 Radar service request.
- 3 Rapid solidification rate; P adds process.

**RSRA** Rotor-systems research aircraft.

**RS-RDX** Reduced-sensitivity RDX.

**RSRE** Royal Signals and Radar Establishment, Great Malvern.

**RSRM** 1 Reusable solid rocket motor; not multipulse, but refurbished after each mission.

- 2 Redesigned solid rocket motor [2005–] (US).

**RSRS** Radio and Space Research Station, now Appleton Laboratory.

**RSS** 1 Relaxed static stability.

- 2 Reflection suppressor system (SSR).
- 3 Radar subsystem.
- 4 Reliability and Safety Society (UK).
- 5 Remote surveillance system.
- 6 Rosette scanning seeker.
- 7 Root/sum/square.
- 8 Received signal strength; I adds indicator.
- 9 Remote Sensing Society (UK).
- 10 Responsive small spacelift (USA).
- 11 Rotating seal system.

**RSSK** Rigid seat survival kit, opened during descent.

**RSSN** Reaction-sintered silicon nitride.

**RSSP** Radar Systems Specialist Panel (ICAO).

**RST** 1 Recording storage tube.

- 2 Reheat specific thrust.
- 3 Rapidly solidified titanium.

**RSTA** Reconnaissance, surveillance and target acquisition.

**RSTD, rstd** Restricted.

**RSTE** Reynolds-stress transport equation[s].

**RSTM** Reynolds-stress transport model.

**RSTR** Restricted.

**RS232, RS422** Commercial radio standard databases used in aviation.

**RSU** 1 Runway supervisory unit.

- 2 Rate sensor unit.
- 3 Remote sampling unit.
- 4 Relay switching unit.
- 5 Repair and salvage unit.

**RSU** Vertical load on landing-gear leg during wheel spin-up.

**RSV** 1 Reserve [fuel].

- 2 Reparto Sperimentale di Volo (I).

**RSVP** 1 Restartable solid variable-pulse [rocket].

- 2 Rotating surveillance-vehicle platform.

**RT** 1 Real time, often followed by control, display, environment, interface, language, management, processor, system, etc.

- 2 Reaction time.
- 3 Remote terminal [followed by suffix letter].
- 4 Resistance training.
- 5 Replaceable tile[s], or RSI (1).
- 6 Right turn after takeoff.
- 7 Registered traveler (TSA).

**R/T** 1 Radio/telephone, or telephony, or telecommunications.

- 2 Receiver/transmitter (beacon).

**RT** Taper ratio.

**RTA** 1 Real, or required, time of arrival.

- 2 Real-time acquisition.
- 3 Rotation target altitude.
- 4 Receiver/transmitter antenna.
- 5 Research and Technology Agency, supports RTO(6) (NATO).
- 6 Revolutionary Turbine Accelerator.
- 7 Rudder-trim actuator.
- 8 Rapid-theater attack.

**RTAF** Royal Thai air force [UK usage].

**RT&BTL** Radar tracking and beacon tracking level (ARTS).

**RTAP** Rapid technology application program.

**RTB** 1 Return, or returned, to base.

- 2 Research and Technology Board, decides policy (NATO).
- 3 Rocket [ICBM] repair technical base, each numbered (R).

**RTBDA** Real-time battle-damage assessment.

**RTC** 1 Real-time control; AF adds autonomous flight.

- 2 Rotorcraft.
- 3 Resident Training Center (USAF).
- 4 Real-time clock.
- 5 Reduced temperature configuration.

**RTCA** Radio Technical Commission for Aerospace [originally, from 1935, Aeronautics, office Washington DC] (US).

**RTD** 1 Radar-target designator control.

- 2 Delayed, or routine time delayed.
- 3 Real-Time display.
- 4 Research and technology development.
- 5 Routed.
- 6 Resistance temperature detector, these have variable resistance.

**RTDC** Real-time damage computation.

**RTDF** Radial temperature distribution factor.

**RTDS** Real-time dissemination shelter.

**RTE** Route.

**RTEL** Runway threshold and end lights [co-located].

**RTES** Real-time embedded system.

**RTF** 1 Radiotelephone or radiotelephony (ICAO), also rendered rtf.

- 2 Round-trip flight.
- 3 Remote test facility.
- 4 Real-time fusion; I adds of information.
- 5 Also RT/F, revisit time/frequency (satellite).
- 6 Repair & Transport Flight (RAF).

- RTG** 1 Radiotelegraph[y].  
 2 Real target gate.  
 3 Radioisotope thermoelectric generator.
- R<sub>th</sub>** Radius of throat at inlet to gas-turbine jet engine.
- R-θ, R-theta** Radio navaid family giving distance and bearing from fixed station.
- RTHL** Runway threshold lights [normally green].
- RTI** 1 Radar-target interrogator, or indicator.  
 2 Real-time interrogate.  
 3 Run-time infrastructure.
- RTIC** 1 Real time in the cockpit.  
 2 Real-time information in the cockpit.
- RTIL** Runway-threshold identification light[s].
- RTIP, R-tip** Radar-technology insertion program.
- RTIRL** Real-time IR linescan.
- RTK** Revenue tonne-kilometres.
- RTL** Rudder-travel limiter.
- RTLS** Return to launch site.
- RTM** 1 Resin transfer moulding.  
 2 Revenue ton-mile.  
 3 Remote telemetry, or radio-transmission, module.
- RTMM** Removable transportable media module.
- RTMR** Real-time mission radius.
- RTN, RTNG** Return[ing], returned.
- RTO** 1 Rejected take-off.  
 2 Resident Technical Officer, of government in manufacturer's plant (UK).  
 3 Responsible test organization.  
 4 Range training officer (ACMI).  
 5 Runway turnoff lights.  
 6 Research and Technology Organization (NATO).
- RTOAA** Rejected take-off area available.
- RTOC** Real time out of the cockpit, often preceded by RTIC (1).
- RTOD** Real-time optical display.
- RTODA** Rejected take-off distance available; H adds helicopter.
- RTOG** Regulated take-off graph, plot on which actual weight is assessed against T°, wind etc.
- RTOL** Reduced (or, sometimes, restricted) take-off and landing, conventional transport with field length from 900 m (3,000 ft) to 1,500 m (5,000 ft).
- RTOR** Right turn on red.
- RTOS** Real-, or run-, time operating system[s].
- RTOT** Regulated take-off table.
- RTOW** Regulated takeoff weight.
- RTP** 1 Reporting and turn point.  
 2 Routine technical publication.  
 3 Radio tuning panel.  
 4 Reliability test plan.  
 5 Research and technology projects.  
 6 Receiver/transmitter/processor.  
 7 Research Technology Programme (Agard).
- RtP** Real-time perspective.
- RTPA** Room-temperature parametric amplifier.
- RTPTR** Real-time precision-targeting radar.
- RTQC** Real-time quality control.
- RTR** 1 Real-time reconnaissance.  
 2 Reserve thrust rating.  
 3 Remote transmitter/receiver site.  
 4 Radar termination range.
- RTRCDS** Real-time reconnaissance cockpit display system.
- RTRD** Retard.

- RTRN** Return.
- RTS** 1 Radar target simulator.  
 2 Replacement training squadron.  
 3 Radar test subsystem.
- R** Remote tracking station[s], AFSCF global network.
- R** Returned [or release] to service (ICAO).
- R** Request to send.
- R** Regional turbine shop.
- R** Rapid targeting system.
- RTSJ** Real-time specification for Java.
- RTSS** Red-telephone switching system.
- RTT** 1 Reserve take-off thrust.  
 2 Radio-teletypewriter, ie, teleprinter (ICAO).  
 3 Radio telephone terminal.  
 4 Radar target teacher.  
 5 Radio telemetry theodolite (US calibration).
- RTTC** Regional Technology Transfer Center (NASA).
- RTTI** Run-time type identification.
- RTTL** Range target-towing launch (RAF).
- RTTP** Real-time tracking and positioning.
- RTTS** 1 Robotic target training system.  
 2 RAF transportable telecommunications system.
- RTTY, rty** Radio-teletype.
- RTU** 1 Replacement training unit (USAF).  
 2 Radio tuning unit.  
 3 Remote terminal unit.
- RTV** 1 Rocket test vehicle (UK).  
 2 Rapid terrain visualization (JPSD).
- RTW** Return to works (UK).
- R<sup>2</sup>CSR** See *RRSCR*
- RTY** Raw total yield (megatons).
- RTZ** 1 Runway touchdown zone; L adds lights.  
 2 Return to zero.
- RU** 1 Range unknown.  
 2 Rack unit.
- R<sub>u</sub>** Maximum unambiguous radar range.
- RUA** Release unit adapter (torpedo).
- rubber aircraft** Aircraft in early project stage when gross variation in design is still possible (colloq.).
- rubber at the ramp** Airpower (US, colloq.).
- rubber-base propellant** Solid rocket propellant in which fuel is related to synthetic-rubber latex (wide range of resins, plasticizers and other additives) mixed with oxidant often of AP or other perchlorate type, finally cured into rubber-like grain. Examples include PBAA, PBAN.
- rubber boot** See *pneumatic deicing*.
- rubberdraulics** Rubber presswork technology, especially when flexible medium flows like liquid.
- rubber fuel** Colloquial term for HTPB, PBAN and similar propellants.
- rubber powered** Model aircraft whose energy is derived from twisted loops of rubber elastic.
- rubber press** Press for forming sheet-metal parts by forcing thick pad of rubber down under high pressure on to cut-out flat parts (or, if blanking strips added, uncut sheet) arranged above male dies against which parts are forced with minimal wrinkling, rubber acting sideways as well as downwards.
- rubber slick** Stripe of rubber melted off tyre at touchdown and adhering to runway. Resulting blackened region shows touchdown zone preferred by actual traffic.
- rubbing seal** Gastight seal between fixed and moving

## rubbing strip

members actually in contact; usually at least one mating face is carbon.

**rubbing strip** Numerous non-structural parts whose purpose is to accept impact from doors, ground equipment (eg steps and vehicles) and abrasion by inlet blanking plates or rescue winch cable.

**rub indicator** Sensor giving cockpit indication of eccentric running of rotating assembly, eg engine shaft.

**rub rail** Mount and launch rail for missile shipped and launched from canister; sometimes four, each locating a wingtip.

**RUC** Rapid update cycle (weather).

**rudder** Primary control surface in yaw; when nose-mounted, prefaced by nose- or fore-. Term also includes fixed fin of kite balloon, usually ventral, providing weathercock stability.

**rudder bar** Centre-pivoted bar providing pilot rudder input in simplest ultralights and historic aircraft. Traditional term for rudder input even when linear pedals are fitted.

**rudder-bias strut** Simple engine-out device comprising piston in rudder circuit with engine-bleed air piped to each side; failure of either engine causes immediate application of rudder.

**rudder lock** Potentially dangerous flight condition with rudder locked at maximum deflection. Caused by reversal of aerodynamic moment at large sideslip angle [suggest simple manual rudder only].

**rudder pedal** Left/right pedals for pilot's feet acting as manual input to rudder, and in modern aircraft to wheel-brakes.

**rudder post** Traditional (suggested arch.) term for leading-edge member of rudder carrying hinges; with modern inset hinges place taken by internal spar.

**rudder reversal** Roll reversal using rudder only, usually in maximum-performance high-alpha air-combat manoeuvres.

**rudder roll** Unwanted roll produced solely by coarse use of rudder.

**rudder torque** Twisting moment exerted by rudder on rear fuselage.

**ruddervator** Movable flight-control surface of butterfly tail, combining duties of rudder and elevator. It may or may not be downstream of a fixed surface. Sometimes 'ruddevator'.

**ruddervon** Control surface, usually of traditional trailing-edge form, able to serve as rudder, aileron or elevator on so-called tailless aircraft. In most applications, outboard of elevon[s].

**RUF** Rough.

**ruling dimension** Basic measure, almost impossible to alter, e.g. diameter of fuselage.

**ruling material** That used for most of airframe structure.

**RUM** Ship-launched anti-submarine missile (USN code).

**rumble** 1 Rocket combustion instability audibly obvious from low growl or \*.

2 Unstable pulsing at low frequency [300–700 Hz] in jet engine or afterburner.

3 Prolonged flat landing approach under power, to \* in.

**rumble seat** Occasional seat, eg for flight-deck observer or for stewardess on landing/take-off.

**run** 1 Ground or distance traversed by wheels, or water by floats/hull, on takeoff and landing.

## run-out

2 Number of production articles built to common type, or elapsed time to produce same.

3 Single flight over target (also called pass) for assessment, release of ordnance or operation of reconnaissance sensors.

4 Single flight past designated point(s), eg in attempt on speed record.

**runaway** Undesired operation of device, eg PFCU, when not commanded; in dangerous extreme case continuing to limit of travel, giving hard-over condition.

**runback ice** Very dangerous accretion of ice which forms on LE, is melted by deicing system or kinetic [ram-energy] heating, and refreezes further back.

**Run black** Order to extinguish all externally visible lighting [interceptor squadrons] (US).

**rundown** 1 Fall off to zero rpm after normal closure of shut-off valve or HP cocks, or flameout or engine failure (also called spool-down).

2 Decay in production rate due to falling demand or imminent termination.

**rundown time** Time for engine to come to rest, giving rough indication of internal rubbing.

**run-flat tyre** Various aircraft tyres, pioneered by Goodrich, designed for high-speed landings after deflation caused by take-off blowout, fire or combat damage.

**Runge-Kutta** Possibly the most widely used integration routine in digital flight control.

**running fit** Slight clearance between mating parts allowing rotation or other relative motion.

**running fix** Approximate fix obtained by taking a bearing of fixed station, or in any other way obtaining PL, then obtaining second PL and adjusting to common time.

**running in** Act of running newly built or completely overhauled engine or other machine to ensure parts run together under controlled gentle operating conditions.

**running landing** 1 Helicopter landing made into wind with groundspeed and/or translational lift at touchdown; with skid gear demands careful collective after touchdown to avoid abrupt stop.

2 Jet V/STOL landing with significant forward speed.

**running mate** New transport aircraft type, usually smaller, to accompany trunk-route type already in service and offering same advanced-technology appeal.

**running order** Traditional condition for measuring mass of piston engine: including radiator, coolant, internal oil, external pipes and controls, but excluding fuel, oil, tanks, reserve coolant, exhaust tailpipes and instruments.

**running rigging** Rigging for kite balloon or other aerial object which by system of vee-lines and pulleys automatically adjusts to direction of pull.

**running take-off** 1 Started without lineup and hold, speed never slackening on arrival at runway in use.

2 By helicopter or other VTO aircraft making preliminary ground run.

**runoff area** Strip or pad beside runway where arrivals can clear quickly for following traffic (also run-off, run off).

**run-on landing** Roll-on landing.

**run-out** 1 Distance travelled by carrier aircraft between engaging hook and coming to stop, also called pull-out.

2 Distance travelled by aircraft after encountering runway barrier, drag wire, decelerating bed [such as EMAS] or other arresting system.

3 Distance travelled by gun or barrel, on recoil stroke.

**run-up**

**4** A composite tolerance specified for a part of basically circular form; circular \* detects variations in circulatory and coaxial misregistration, total \* adds [e.g.] straightness, taper and position.

**run-up** **1** To accelerate engine under own power.

**2** Portion of flight immediately preceding target run.

**3** To test piston engine, briefly at high power and to check dual ignition, before takeoff.

**run-up area** Portion of airfield near taxiway designated for run-up (3).

**run-up drag** **1** Drag caused by windmilling propeller in air-start.

**2** Drag caused by need to accelerate landing wheels on touchdown.

**runway** Paved surface, usually rectangular and of defined extent, available and suitable for aeroplane take-off and landing. Equipped \* includes stopway, clearway, surface markings and designators. All-weather \* includes lighting. Instrument \* adds electronic aid, eg ILS, MLS. Unpaved \* = airstrip.

**runway alignment** Direction of runway centreline, published as first two digits, in both directions, eg 13/31; also called direction number. See *runway designator*.

**runway alert system** Passively monitors ASDE and other sources to detect potential RWI.

**runway alignment factor** Maximum angular departure from alignment admissible for straight-in approach, normally 30°.

**runway alignment indicator** Group of flush lights offering directional guidance on takeoff (to some degree on landing) in bad visibility.

**runway basic length** That length selected for aerodrome planning purposes required for takeoff or landing in ISA for zero wind, elevation and slope.

**runway capacity** Frequency of landings and/or takeoffs, or mixture, possible or permissible with minimal approach spacing, published for IFR and VFR. In complete airport varies greatly with number and arrangement of runways, and conflicts of crossing traffic.

**runway condition** Numerical output from braking [decelerometer] tests.

**runway controller** ATC controller stationed, usually in caravan with checkerboard markings, close beside downwind end of runway in use; equipped with signal pistol, Aldis and telephone to tower (rare since WW2).

**runway designator** Numerical alignment plus qualifier left/right if necessary; thus New York JFK offers 4R/22L, 4L/22R, 13R/31L and 13L/31R.

**runway direction numbers** Numerical values of alignment.

**runway-edge lights** White lights grouped according to intensity: fixed-intensity LIRL (low-intensity runway lights) and variable MIRL and HIRL. Designed to withstand flying stones.

**runway end** End of runway in use, identified by markings; beyond may be similar-surfaced blast pad, overrun (RESA) or stopway and (unpaved) clearway.

**runway-end lights, REIL** Often pair of flashing white lights, at major airport continuous transverse row of bi-directional lights showing green towards approach and red towards runway.

**runway-end safety area** UK term for overrun area; area adjoining runway in use, symmetrical about extended

centreline, intended to minimize damage to undershoot or overrun aircraft.

**runway floodlight** Appears incorrectly in some dictionaries; does not exist.

**runway gradient** Not used; correct word is slope.

**runway guard** Flashing yellow lights where taxiway meets runway.

**runway incursion** Crossing runway in use, or taxiing beyond takeoff holding point, without ATC clearance. Abb. RWI.

**runway localizer** See *localizer*.

**runway markings** Basic, 2-digit direction number and centreline; Instrument adds threshold; All-weather (precision) adds side strips and zones.

**runway occupancy** Elapsed time particular aircraft is on runway, on arrival or departure.

**runway profile descent** Published procedure for complete IFR controlled arrival from en-route to glide-path.

**runway separation** Time and distance intervals between arrivals and/or departures on one runway. Distance between parallel runways is spacing.

**runway spacing** Perpendicular distance between centre-lines of parallel runways at same airport.

**runway strip** Defined area including runway and stopway intended to reduce risk of damage to aircraft that run off runway in any direction and to protect aircraft flying over it during takeoff or landing.

**runway threshold** Threshold (1).

**runway turnoff lights** Fixed wide-beam white lights on each side of the forward fuselage giving lateral illumination.

**runway visibility value, RVV** Determined for particular runway by transmissometer with readout in tower; generally being replaced by RVR.

**runway visual range, RVR** Value representing horizontal distance pilot will see centreline or edge lights or runway markings down runway from approach end. Once recorded by an observer 76 m from centreline, now by RVR system.

**RUR** Ship-launched anti-submarine rocket (USN code).

**RUSA** Roll-up solar array.

**RUSI** Royal United Services Institute for Defence Studies [London SW1A 2ET] (UK).

**Ruslick** Anti-corrosive coating for bright metal in saline (ocean) environment.

**Rustilo** Proprietary anti-corrosive inhibiting oil.

**RUT** Standard regional route transmitting frequencies (ICAO).

**Ruticon** Family of photoconductive/liquid-crystal devices used in large-screen projection, typically with potential across photoconductor and elastomer with mirror surface for readout, scanned on opposite face by CRT input.

**RV** **1** Radar vector.

**2** Re-entry vehicle.

**3** Residual value.

**4** Rescue vessel (RAF, ICAO).

**5** Rescue vehicle.

**6** Rendezvous.

**Rv** Vertical load reaction on landing gear.

**r<sub>v</sub>** Radius of vortex-release point along helicopter rotor blade.

<b>RVA</b>	<i>1</i> Radar vectoring area.	<i>4</i> Reconnaissance wing.
	<i>2</i> Régie des Voies Aériennes (Belgium, see <i>RLW</i> ).	<i>5</i> Rain shower.
<b>RvA</b>	National accreditation body (Netherlands).	<i>6</i> Runway.
<b>RVC</b>	Radar video corridor.	<b>R/W</b> <i>1</i> Marine aircraft on water total resistance divided by weight, equivalent to an L/D ratio.
<b>RVD</b>	<i>1</i> Radar video.	<i>2</i> Runway.
	<i>2</i> Rear-view display.	<i>3</i> Read/write.
	<i>3</i> See next.	<b>RWA</b> <i>1</i> Reaction wheel assembly.
<b>RVD/B</b>	Rendezvous and docking/berthing of space-craft.	<i>2</i> Rhomboid-wing aircraft.
<b>RVDP</b>	Radar video data processor.	<i>3</i> Rotating-Wing Aviation, RU adds Research Unit (USA).
<b>RVDT</b>	<i>1</i> Rotary, or rotating, variable, or voltage, differential transformer, or transducer.	<b>RWB</b> Rotating warning beacon.
	<i>2</i> Rotating voltage-displacement transformer.	<b>RWD</b> Rigged wet and dry, ie for both spraying and dusting (ag-aircraft).
<b>R/VGPO</b>	Synchronized range and velocity deception, see <i>RGPO</i> , <i>VGPO</i> .	<b>RWE</b> Radar warning equipment.
<b>RVL</b>	Rolling vertical landing.	<b>RWG</b> Rotorcraft Working Group (UK/US).
<b>RVO</b>	Runway visibility by observer.	<b>RWI</b> Runway incursion.
<b>RVP</b>	<i>1</i> Reid vapour pressure.	<b>RWIS</b> Runway weather information system.
	<i>2</i> Ramp void pressure.	<b>RWM</b> <i>1</i> Code for SAR helicopter (ICAO).
<b>RV-PVO</b>	Radioteknicheski-Voiska PVO, radio-technical air-defence troops (R).	<i>2</i> Read-only wire (or composite-wire) memory.
<b>RVR</b>	<i>1</i> Runway visual range; C adds centre, R rollout, T touchdown area.	<i>3</i> Read/write memory.
	<i>2</i> Rear-view radar.	<b>RWR</b> <i>1</i> Rear-warning radar.
	<i>3</i> Reverse-velocity rotor.	<i>2</i> Radar warning receiver.
<b>RVR system</b>	Various electro-optical instruments for measuring RVR without subjective interpretation, usually by calibrated light source and transmissometer receiver separated by distance great enough to avoid too much error from local smoke.	<b>RWRT</b> Real world, real time.
<b>RVS</b>	Reduced vertical separation[s]; M adds minima [US often minimums], MK minima kit.	<b>RWS</b> <i>1</i> Radar warning system.
<b>RVSD</b>	Revised.	<i>2</i> Range while search.
<b>RVSM</b>	Reduced vertical-separation minima, or minimum.	<i>3</i> Remote workstation.
<b>RVSN</b>	Strategic rocket forces (USSR).	<b>RW+S</b> Rigged wet plus spreader (ag-aircraft).
<b>RVSP</b>	Radar video signal processor.	<b>RWT</b> Radar warning trainer.
<b>RVT</b>	Remote video terminal.	<b>RWTS</b> Rotary-Wing Training School (RAF, WW2).
<b>RVV</b>	Runway visibility value.	<b>RWU</b> Rain shower, intensity unknown.
<b>RV/WH</b>	Re-entry vehicle/warhead.	<b>RWY, rwy</b> Runway (ICAO); -TDZ adds touchdown zone.
<b>RW</b>	<i>1</i> Radiological weapon(s).	<b>RX</b> <i>1</i> Report [when you are] crossing [specified point].
	<i>2</i> Retractable wheel (sailplanes).	<i>2</i> Receive.
	<i>3</i> Rigged wet, ie for spraying (ag-aircraft).	<b>Rx</b> Receiver, or reception only.
		<b>R/X</b> Range extension.
		<b>R(X)</b> Correlation function.
		<b>Ryton</b> A trade-name for PPS (4), with high opacity to EMI(1) (Phillips Petroleum).
		<b>RZ</b> <i>1</i> Recovery zone.
		<i>2</i> Reconnaissance zone.
		<i>3</i> Return to zero.
		<b>RZI</b> Real-zero interpolation.

# S

**S** 1 Generalized symbol for area, eg gross wing area or reference area [also  $S_W$ ].

2 Entropy (not UK and some other countries).

3 US piston engines, supercharged (hence, TS = turbocharged).

4 Aircraft category, scout (USN 1922-46), sonic test (USAAF 1946-47), ASW (USN from 1946).

5 Aircraft modified mission, ASW (USN pre-1962 suffix, post-1962 prefix).

6 Aircraft category, strike (RAF, RN).

7 Siemens, normally written siemens.

8 JETDS code, special, or detection / range-bearing / search.

9 South, south pole, southern latitudes (ICAO).

10 Section modulus (alternatively Z).

11 Surface, common missile code for both launch location and target.

12 Single [especially single wheel on each landing-gear leg, and runway bearing capacity for such wheel].

13 Distance between contact areas of dual wheels.

14 Serviceable (CAA).

15 Secondary [and secondary airport].

16 Saturated [especially traffic between city pair].

17 VLA (BCAR section).

18 Supplementary [frequency].

19 Snow, or squalls.

20 Stoke[s].

21 Signal or radar power, or energy.

22 Scheduled flight.

23 Superior (warm air mass).

24 Suffix, light-alloys = wrought.

25 Strouhal number [St is preferred].

26 Reluctance.

27 Apparent power (electrical).

28 Sulphur.

29 Now used, with several suffixes, as take-off distances (US).

30 Landing-gear side load.

31 FAI category: space model.

32 Sears' function, referred to mid-chord.

33 Slave [Loran station].

34 Strobes.

**s** 1 Second[s] (time).

2 Stress.

3 Generalized symbol for linear measure, length, distance; esp. used for aerofoil semi-span ( $b/2$ ). Also, with suffixes, various take-off and landing distances, and penetration distance into a gust.

4 Starboard.

5 Square (eg in rms).

6 Spherical (eg in scp).

7 Static [not total] pressure.

8 Laplace variable.

9 Specific entropy.

**S'** Sears' function, referred to leading edge.

**S̄** Vector: integrated signal energy, =  $\vec{E} \cdot \vec{H}$ , unit  $\text{Wm}^{-1}$ .

**S<sub>0</sub>**, **S<sub>0</sub>** Segment zero.

**S<sub>1</sub>** Segment 1.

**S<sub>2S</sub>** Sensor-to-shooter.

**S<sup>3</sup>** 1 S-cubed, stick-shaker speed.

2 Step stress screening.

**S<sub>4</sub>** Special-services switching system.

**S-band** Former common-use radar band originally 19.33-5.77 cm, 1.55-5.2 GHz, later rationalized to 15-7.5 cm, 2-4 GHz; now occupied by E and F.

**S-code** IFR flightplan code aircraft has 64-code transponder and approved R-Nav.

**S-duct** Curved duct supplying air to centre engine in trijets, and to turboprops with offset gearbox.

**S-gear** Full supercharge.

**S-ing** Series of S-turns, especially in taxiing.

**S-maneuvre** To weave in horizontal plane.

**S-mode** Aircraft transponder provides data-link capability, e.g. altitude, bearing, range.

**S-pattern** Wavy track resulting from S-ing.

**S-Stoff** Rocket fuel: 90-97% RFNA, 10-3% sulphuric acid (G).

**S-turn** To describe S in horizontal plane.

**SA** 1 Situational awareness.

2 Sand or dust storm (ICAO).

3 Standby altimeter.

4 Shaft angle.

5 Surface-to-air.

6 Submerged-arc (weld).

7 Spin axis.

8 Single-aisle (passenger transport aircraft internal layout).

9 Structural audit.

10 Structured analysis (software).

11 Stand-alone.

12 Safety altitude.

13 Standard Atmosphere.

14 Safety action (FAA).

**SAA** 1 Société Anonyme (F), and Sociedad Anónimo (Spain).

16 Special access [black].

17 Selective availability, of GPS.

18 Simple approach [runway lighting].

19 Arsine, CW agent.

20 Scientific Advisor (UK).

21 Ship's Airplane (USN 1917-19).

22 Surface aviation scheduled weather report.

23 Search/attack (USN).

24 Sensitivity analysis.

25 Synthetic aperture.

**SAA** 1 Society of Airline Analysts (US).

2 Safety and arming.

3 Swiss Aerobatic Association.

4 Systems application architecture.

5 Service access area.

6 Supersonic adversary aircraft [also SSA] (USN).

7 Cargo container for main deck (code).

8 Sulphuric-acid anodized [surface finish].

9 School of Army Aviation (UK).

10 South Atlantic anomaly.

**SAA** Seaplane Association of Australia [office, Greenwich, NSW].

**12** Swiss Astronautics Association [CH-4702 Oensingen] (Switzerland).

**SAAA** Sport Aircraft Association of Australia [office, Clifton Hill, Vic.]

**SAAAA** South African Aerial Applicators Association.

**SAAFE** South Atlantic, Africa, Asia and Far East (ICAO).

**SAAAR** Special aircrew and aircraft authorisation required [RNP] (FAA).

**SAAATS, SA3TS** South African advanced ATC system.

**SAAC** *1* Simulator for air-to-air combat.

*2* Society of Amateur Aircraft Constructors (Ireland, 1978–).

**SAAF** *1* Small austere airfield.

*2* South African Air Force; A adds Association [office, Johannesburg].

**SAAFI** South African Association of Flying Instructors [office, Rand Airport].

**SAAHS** Stability-augmentation/attitude-hold system.

**SAALC** San Antonio Air Logistics Center (Kelly AFB).

**SAAM** *1* Special-assignment airlift mission.

*2* Surface [or sol (F)] -air anti-missile.

**SAAPA** South African Airways Pilots' Association [office, Jan Smuts Airport].

**SAARU** Secondary attitude and air-data reference unit.

**SA/AS, SAAS** Selectively available [or selective-availability] anti-spoofing; M adds module (GPS).

**Saaty** Versatile methodology for blending multiple source or data elements into hierarchical ranking [Dr Thomas L Saaty].

**SAB** *1* Scientific Advisory Board (USAF).

*2* Self-aligning bearing.

**SABA, Saba** Often pronounced 'Sabre', small agile battlefield aircraft.

**SABAR** Satellites, balloons and rockets.

**Sabatier** *1* Reversal phenomenon in photo processing occurring when developed image is exposed to diffuse light and redeveloped (not encountered with X-rays).

*2* Fully developed reaction process for recovery of pure oxygen from human exhalation/excretion with by-products such as methane and carbon dioxide.

**Saber** Simplified acquisition of base engineering requirements.

**SABH** NDB providing automatic weather broadcasts.

**Sabin** Unit of acoustic absorption equal to 1 ft<sup>2</sup> of surface absorbing all sound energy falling on it. Appears to be no SI unit available.

**Sabmis** Surface-to-air ballistic-missile interception system.

**sabot** Annular driving mechanism to enable subcalibre projectile to be fired at very high muzzle velocity from gun; usually has form of drum open at one end to receive projectile and divided radially to separate into sections beyond muzzle.

**SABR** Support, amphibious and battlefield rotorcraft (RAF/RN).

**Sabrs** Space atmospheric burst reporting system (MDA).

**SAC** *1* Strategic Air Command, formed 1946 by USAAF, principal 'deterrence' of USAF until formation of Air Combat Command in 1992.

*2* Space Applications Centre (India).

*3* Space Activities Commission (Japan).

**4** Soaring Association of Canada [Ottawa, not normally abb.]

**5** Supplemental air carrier.

**6** Subsecretaría de Aviación Civil (Spain).

**7** Standing advisory committee.

**8** Standard arbitration clause.

**9** Sectional aeronautical chart.

**10** Single annular combustor.

**11** Stealthy affordable capsule.

**12** Surface-analysis chart (weather).

**13** Scene-of-action commander.

**14** Senate Appropriations Committee (US).

**15** Space Analysis Center (AFSPC).

**16** Strategic airlift capability.

**SACA** Service Administrative de la Commissariat de l'Air (F).

**SACC** Society of Air Cargo Correspondents [1979– office, Ewell] (UK).

**SACCA** Scottish Advisory Council for Civil Aviation.

**SACCS** SAC (1) automated command and control system.

**Sacdin** SAC digital information network (USAF).

**Saceur** Supreme Allied Commander, Europe.

**Sacintnet** SAC intelligence network (from 1990).

**SACL** Strobe anti-collision light.

**Sacleme** Standing Advisory Committee for Licensed Aircraft Mechanical Engineers (UK CAA).

**Saclant** Supreme Allied Commander, Atlantic.

**Saclos** Semi-automatic command to line of sight.

**SaCo** Samarium cobalt (magnet material).

**SACP** *1* Surface/air courte portée; short-range SAM (F).

*2* Standing Advisory Committee on Pilot licensing (CAA, UK).

**sacrificial corrosion** Metal is protected against corrosion by being coated with metal less noble than itself, which is attacked preferentially.

**Sacru** Semi-automatic cargo release unit.

**SACS** *1* Speed/attitude control system (takeoff).

*2* Secondary attitude and compass system.

*3* Small air-capable ship.

*4* Secure-access control system.

**SACT** *1* Signal acquisition conditioning team, or terminal.

*2* Supreme Allied Command Transformation (NATO, Norfolk Va).

**SACU** Stand-alone communications unit.

**SAD** *1* Submarine anomaly detector.

*2* Spares advanced data.

*3* Self-adhesive decal.

*4* Solar-array drive.

*5* Situational-awareness display.

*6* Surface-to-air defence.

*7* Standard advanced Dewar [A adds assembly, D display].

**SADA** Semi-automatic air-defence system (Spain).

**Sadarm** Sense (or search) and destroy armour (USA/Aerojet).

**SADC** Secondary air-data computer.

**saddle** Shaped wooden former on which keel of marine aircraft rests during manufacture.

**Sadis** Satellite distribution system.

**SADL** Situation[al] awareness data-link.

**SADM** Special atomic demolition munition.

- SAdO** Station Administration Officer (RAF).
- Sadral** Système autodéfense rapproche anti-aérien légèr (F).
- Sadram** Seek and destroy radar-assisted mission; locks on for long period after hostile emitter silent.
- SADRG** Semi-active Doppler radar guidance (SADRH substitutes ‘homing’).
- SADS** Satellite distribution service.
- SADT** Structured analysis and design techniques.
- SAE** 1 Society of Automotive Engineers. The Society publishes thousands of internationally accepted specifications and manuals of design practice, many of which [such as numerous ARP documents] are aeronautical. Office Warrendale, PA15096. (US).  
2 Servicing Appraisal Executive (RAF).
- SAE-A** Society of Automotive Engineers-Australia [office, Melbourne].
- SAEP** Society of Aerospace Engineers of the Philippines Inc. [office, Manila].
- SAE ratings** Lube-oil ratings (10 to 70) based on Saybolt viscosity.
- SAF** 1 Specified approach funnel.  
2 Secretary of the Air Force (US).  
3 Simulation and analysis facility (USAF).  
4 Spanish air force [UK usage].  
5 Satellite application facilities.  
6 Sallskapet for Astronautisk Forskning [astronautical soc.] (Finland).
- SAFA** Safety assessment of foreign aircraft (ECAC, USAF).
- SAFCS** Standard automatic flight-control system.
- SAFE** 1 Formerly Survival & Flight Equipment Association, now simply SAFE Association [Canoga Park, CA] (US).  
2 Soil airfield fighter environment (DoD).  
3 Simple architecture for full electrical.  
4 System for aircrew fatigue evaluation [QinetiQ] (UK).
- Safe-bar** Safeland barrier.
- safe burst height** That above which damage/fallout is locally acceptable.
- Safecon** Safety and Flight Evaluation Conference (NIFA).
- SAFEE** Security of aircraft in the future European environment.
- Safe Flight kit** AOA-sensitive stall-warning system normally displaying green arrows on glareshield of GA aircraft.
- Safegrip** Proprietary anti-icing/deicing fluid, based on potassium acetate.
- safe life** Basic design and certification philosophy for primary structure; whether or not there are redundant load paths or fail-safe provisions, a total acceptable life (flight time) is published in flight manual and relevant structure must then be replaced, even if no crack is visible.
- safe line** Boundary of airspace within which unarmed [surveillance or tanker] aircraft can operate.
- Safer** 1 System for aircrew flight extension and return; lifting/propelled ejection capsule.  
2 Special aviation fire and explosion reduction (FAA panel, US, from 1977).
- safety** As verb, see *safetying*.

- safety advisory** Issued by ATC to aircraft under its control to warn of (1) terrain obstruction and (2) aircraft conflict, in the judgement of the controller (FAA).
- safety altitude** Loosely, one at which collision with surface is unlikely at approximate location; not accepted term (see *DH*, *MDA*, etc.).
- safety analysis** Investigation of likely consequences of all failures [of an item] likely to occur.
- safety area** Designated area around helicopter, ICAO = 0.25 overall length [minimum 3 m] and must be load bearing, FAA = 0.33 main-rotor diameter [minimum 6 m], need not be load bearing (downwash only).
- safety barrier** Emergency arresting barrier across carrier flight deck (US often barricade net).
- safety belt** For passenger, normally called seat belt or lap strap; for flight (occasional cabin) crew, seat harness.
- Safetycom** Radio frequency [135.475 MHz] where no specific v.h.f. frequency is notified [CAA, from Nov. 2004] (UK).
- safety disc** Disc of accurately known strength sealing fluid system, eg cartridge-operated, serving as safety valve.
- safety equipment** Vast range of personal items, of which the most obvious is a parachute, others being helmet, goggles, armour, whistle, dinghy (with fluorescein dye), Sarbe (or similar) beacon, torch, mirror, pocket GPS, Very pistol and in some circumstances anti-NW flash protection or a handgun. Does not include normal flying clothing, oxygen mask or microphone, but does also include aircraft equipment, such as seat harness, axe, fire extinguisher and escape slide.
- safety equippers** Specialized ground staff charged with maintenance of safety equipment.
- safety factor** See *factor of safety*.
- safety harness** Ambiguous, see *safety belt*, *seat harness*.
- safety height** Not accepted term (see *DH*, *MDA*, etc.). One authority: lowest at which safe to fly on instruments.
- safety imagination** Ability to extrapolate from a real near-accident to hypothetical accident.
- safetying** 1 Rendering explosive or pyrotechnic device safe by positive means. See *safing*.  
2 Installing locking wire or other device which prevents an attachment from becoming loose.
- safety net** One designed to catch flying object with minimal damage, eg ejection seat on test model in tunnel (esp. spinning tunnel) or flying rotor blade in rotor test rig.
- safety pilot** One present in cockpit to prevent accident, eg to radio-controlled aircraft or RPV, or with pupil on instrument practice.
- safety pins** Those inserted to disarm ejection seat except in flight.
- safety plug** Blow-out plug serving as safety valve in case of excess pressure (eg JATO bottle) or excess temperature (eg tyre after prolonged braking).
- safety speed** That above which aircraft is safe to fly with given load and configuration; formerly several, eg FUSS, but most important today is  $V_2$ .
- safety thread** That connecting D-ring (ripcord) to parachute pack.
- safety wire** Locking wire passed through holes in nuts, turnbuckle barrels and other fasteners in such a way that they cannot loosen subsequently.
- safety zone** Area reserved for non-combat operations by friendly forces (DoD).

## Safeway

**Safeway** Proprietary deicers: \* SD is a solid, \* KA liquid.

**Safeway Pneutronic** Guidance installation for nose-in parking; pavement pressure pads sense nosewheel(s) and illuminate progress lights facing flight deck while arrows, lights and other displays give guidance.

**Saffire** Synthetic-aperture fully focused imaging radar equipment.

**SAFI** Semi-automatic flight inspection (FAA, from 1962); S adds system, = Safis.

**safing** Process of rendering potentially dangerous device or system inoperative; eg complex procedure in Space Shuttle Orbiter post-landing.

**Safire** Scanning airborne filter radiometer.

**SAFO** Safety alert for operators (FAA).

**Safoc** Semi-automatic flight operations centre.

**SAF/OI** Secretary of the Air Force/Office of Information (USAF).

**SAFP** Slotted-array flat plate; A adds antenna.

**SAF/PA** As above, Public Affairs.

**SAFR** Schweizerische Arbeitsgemeinschaft für Raumfahrt (previously Raketentechnik) (Switzerland).

**SAFU** Safety, arming and fuzing (sometimes functioning) unit.

**SAG** 1 Support air group (Royal Navy).

2 Scientific advisory group (US).

3 Surface action group (USN, concerned with ship targets).

4 Survivability analysis group (DoD).

5 Semi-active guidance.

**sag** See *sagging*.

**SAGA** 1 Studies Analysis and Gaming Agency (DoD).

2 System of azimuth guidance for approach; simple optical ILS.

3 Statistics of accidents in General Aviation.

**SAGE, Sage** 1 Semi-Automatic Ground Environment; pioneer computer-controlled radar and communications system for defence of large airspace and management of interceptors and SAMs. [1953–63] (US).

2 Stratospheric aerosol and gas experiment.

3 System for assessing aviation's global emissions (FAA).

**sagging** 1 Distortion of airship (any kind) caused by upward loads near ends or lack of lift at centre.

2 Bending stress on seaplane float or flying-boat hull caused by water support concentrated near ends due to swell or waves.

**SAGr** Maritime reconnaissance group (G. WW2).

**Sags** Semi-active gravity-gradient stabilization.

**SAGW** Surface-to-air guided weapon (UK usage).

**SAH** 1 Semi-active homing.

2 Sample and hold (EDP [1]).

3 Select and hold.

4 School of Aircraft Handling.

**SAHA** Shoreham Airport Historical Association (UK).

**SAHIS, Sahis** Standby attitude, heading and rate of turn indicating system.

**SAHR** Semi-active homing radar (SAHRG adds 'guidance').

**SAHRS** Standby, or standard, or secondary, or supplementary, attitude/heading reference system.

**SAI** 1 Standby airspeed indicator.

2 Spherical attitude indicator.

3 Single-aperture interferometer [or interferometry].

## Salisbury screen

4 System architecture and interface.

**SAIA** Swedish Aerospace Industries Association.

**SAIAE** South African Institute of Aeronautical Engineers [office, Johannesburg].

**SAIF** Standard avionics integrated fuzing (sets dispenser payload fuzes milliseconds before release).

**SAIG** 1 Single-axis integrated gyro.

2 Swiss Aeronautical Industries Group [22 companies] (January 2005–).

**SAIL** Shuttle-Avionics Integration Laboratories.

**sail** 1 Flat surface pointed towards Sun or other celestial object and attached to spacecraft, eg carrying solar cells.

2 Very large lightweight reflective surface proposed for space propulsion by pressure of sunlight. Potential for  $6 \times 10^5$  km/h (380,000 mph).

3 To navigate seaplane (see *sailing* [2]).

4 Projecting structure above hull of submarine; also called fin, bridgefin or, formerly, conning tower.

5 (Usually plural) Small winglets arranged at different angles around wingtip, typically four disposed from front to rear.

6 Loosely and ambiguously, any winglet.

7 Recent usage, upper or lower surface of fabric-covered rigid wing, thus upper-\*, lower-\*.

**sailing** 1 Undesired rotation of helicopter rotors or aeroplane propeller in high wind.

2 Navigation of seaplane on water, esp. in conditions of wind and current.

**sailplane** Glider designed for soaring.

**sails** See *sail* (5).

**sailwing** Aerodyne whose wing assumes lifting (near-aerofoil) profile only in presence of suitable relative wind; class includes parawings but normally has flexible surface(s) restrained by rigid periphery.

**Saint** 1 Surveillance, acquisition, identification, notification and tracking.

2 Satellite inspection technique.

3 Satellite active imagery [or imaging] national testbed.

**Saint Elmo's fire** Brush discharge caused by build-up of electrostatic potential, notably on propeller blades; luminous and often audible.

**Saint-Venant's principle** In any two-dimensional region the stresses and strains produced at a point remote from a series of applied loads do not differ significantly from those resulting from any other set of loads having the same resultant force and moment.

**SAIP** Semi-automated imagery [or Imint] processing [or processor].

**SAIRS, Sairs** Standardized advanced IR sender [or system] [Martin Marietta].

**SAIRST** Situational awareness IR search and track.

**SAKh** Written CAX, mean aerodynamic chord (R).

**SAL** 1 Strategic arms limitation.

2 Security access level.

3 Selected altitude layer decoder.

4 Semi-active laser.

**Salbei** See *SV-stoff*.

**SALC** Sacramento Air Logistics Center (McLellan AFB).

**Salis** Strategic airpower interim solution.

**Salisbury screen** Oldest and simplest RAM (2), comprising resonant absorber created by placing resistive sheet on spacer of low dielectric constant in front of metal plate (eg aircraft skin).

## Salkit

## SANDF

**Salkit** Supplemental airfield lighting kit.

**salmon** 1 Streamlined bulge forming tip to wing of aircraft having centreline gear and no outrigger (eg sailplane); designed to withstand rubbing on ground.

2 Streamlined fairing on wingtip for purpose other than housing fuel (applied to Su-25 where \* incorporates airbrakes; not used for EW tip pods so far).

**Salomon damper** Dynamic damper for crankshaft balance weights to remove oscillatory loads.

**SALR** Saturated adiabatic lapse-rate.

**SALS** 1 Short approach-light system; F adds with flashing lights, R with runway alignment indicator lights (FAA).

2 Separate-access landing system.

3 Shipborne aircraft landing system.

4 Service de l'Aviation Légère et Sportive (F).

**SALT** Strategic Arms Limitation Treaty (\* I 26 May 1972, \* II 18 June 1979).

**salted weapon** NW which has, in addition to normal components, extra elements or isotopes which capture neutrons at time of explosion and produce additional radioactive products; generally, opposite to clean NW.

**Salthorse** Commander of a carrier despite being a non-aviator (RN, colloq.).

**Salти** Synthetic-aperture lidar for tactical imaging.

**Salto di Quirra** NATO air firing range, including AAA and SAMs, in Sardinia.

**salvage** 1 To scrap complete aircraft or other equipment but recover parts or material.

2 To retrieve aircraft after landing away from any airfield.

3 To retrieve potentially dangerous flight situation, eg high rate of sink.

**salvo** 1 Simultaneous group of ECM bursts, esp. from dispensed payloads; not necessarily all of same species, eg could be two chaff, one IR, one jammer.

2 In close air support/interdiction, method of delivery in which all weapons of specific type are released or fired simultaneously (DoD).

3 See *salvos*.

**salvos** Air-intercept code: "I am about to open fire"; can add further word specifying weapon(s), eg \* mushroom = "I am about to fire special weapon", ie Genie (DoD).

**SAM** 1 Surface-to-air missile.

2 School of Aerospace Medicine (USAF).

3 Sound-absorbing material(s).

4 Standard (or standardized) assembly module.

5 Société Aérostatische et Météorologique, 1865 (F).

6 Special Air Missions squadron (USAF).

7 Standard avionic module.

8 Structural analysis and maintenance.

9 South American region, /SAT adds South Atlantic (ICAO).

10 Situational-awareness mode.

11 Structural-anomaly mapping.

**SAMA** 1 Small Aircraft Manufacturers' Association (US).

2 Systema aeronautico modulare anti-cendio (I).

3 Semi-automated manoeuvre analysis.

**Samar, SAMAR** Search and maritime rescue.

**samarium** Sm, rare-earth metal, density 7.52, MPt 1,077°C, alloying element in magnets.

**SAMD** Stratospheric aerosol measurement device.

**SAMF** Société Aérostatische et Météorologique de

France [1852, in 1863 merged with SdA to form SFNA] (F).

**SAMI** System-acquisition management inspection.

**Samir** Système d'alerte missile IR (F).

**SAMM** 1 English form of VSMI, SSCM.

2 Surface-area movement management (TCAS).

**Samoa** Système aérotransportable mobile pour les opérations aériennes (F).

**Samoc** SAM operations center.

**Samos, SAMOS** 1 Stacked-gate avalanche-injection MOS.

2 Satellite and missile observation system.

**SAMP** Sol-air [or système d'autodéfense] moyenne portée [short-range SAM]; / N adds navale, T terrestre [land] (F).

**Sampe, SAMPE** Originally Society of Aerospace Material and Process Engineers, now Society for the Advancement of Material and Process Engineering [office, Covina, CA91724-3751] (US).

**sampled recording** Automatic switching so that many ( $<10^6$ ) parameters can be measured each second.

**sample length** Length of specimen studied in examination of variable, eg surface finish.

**sample rate** Rate per unit time for flight-test programme or other variable.

**Sampras** SAM position ranking and analysis system.

**Sams, SAMS** 1 Six-axis motion system (simulator).

2 Software automated management support.

3 Spare assembly, maintenance and servicing (spacecraft).

**SAMSO** Space and Missile Systems Organization, Air Force Systems Command (USAF).

**Samson** 1 Strategic automatic message-switching operational network (Burroughs).

2 Special avionics mission strap-on, now a self-powered FLIR pod (Lockheed).

**SAMT** 1 Simulated aircraft maintenance trainer.

2 State-of-the-art medium terminal (Satcom).

**SAMTEC** Space and Missile Test Center (DoD).

**SAN** 1 Satellite access node[s]; / AP adds air-portable.

2 Sanitary.

3 Storage area network.

**SAND** Simultaneous analysis and design.

**S&A** Safety and arming.

**sand and spinach** Green/brown camouflage (colloq.).

**sandbag** Passenger carried free by airline to make up necessary ballast.

**sandbag bumping** American term for hand-shaping sheet metal by hammering against tough sandbag.

**sandbag line** Rope joining sandbag loops to prevent wear.

**sandbag loops** Cord loops over aerostat (esp. kite balloon) envelope carrying sandbag at each end; also called sandbag bridle.

**sandbag ring** Cable or rope round balloon basket from which sandbags are (suggest were) hung, forming easily jettisoned load.

**sandblasting** Scouring material surface with high-velocity jet of sand or other abrasive for various purposes; not common in modern aerospace, replaced by tailored steel shot or glass beads.

**sand casting** Casting metal parts in sand mould.

**S&E** Scientists and engineers.

**SANDF** South African National Defence Force.

**S&I** Safety and initiating.

**sanding coat** Heavy-bodied paint or dope coat which fills irregularities in surface, leaving smooth base for top coats.

**S&M** Supply and movements (RAF).

**Sandow cord** See *bungee*.

**sand pillar** *Dust devil*.

**S&S** Sensors and shooters.

**sandstorm** Wind densely laden with sand and dust, bringing surface visibility close to zero.

**SANDT** School of Applied Non-Destructive Testing.

**S&R** Search and rescue.

**S&TI** Scientific and technical intelligence.

**sandwich aircraft** Positioned horizontally or vertically between two enemy aircraft.

**sandwich construction** Large family of constructional methods, most of them patented, in which two load-bearing skins are joined to stabilizing low-density core. In most types both skins are locally flat and parallel, but most can be shaped to single or compound curvature before or after bonding three components together, and a few are tailored so that \* thickness varies to meet requirement of part. Cores can be metal or paper/plastics honeycombs, foamed plastics, balsa or many other choices, including dimpled or corrugated sheet.

**sandwich manoeuvre** One fighter, usually DA partner, turns away and accelerates while other falls in behind enemy.

**sandwich moulding** Polymer A injected inside polymer B in mould.

**sandwich plate** Plate, part of primary structure, located between two other members, eg on centreline between left/right keel girders.

**Sandy** Search and rescue aircraft (colloq.).

**San Marco** Italian-operated space launch platform on island off Kenya.

**SANS** Small-angle neutron scattering.

**Santal** Système anti-aérien léger (F).

**SAO** 1 Special access only (high security classification, also called black).

2 Special Activities Office (DoD).

3 Surface aviation observation.

**SAOCS** Submarine/aircraft optical communication system.

**SAOEU** Strike/Attack Operational Evaluation Unit.

**SAOWP** Structural analysis and optimization working party.

**SAP** 1 Seaborne air platform, eg for jet V/STOL.

2 Semi-armour piercing [many possible suffixes, such as, HE, high-explosive, API; armour-piercing incendiary].

3 Silicon avalanche photodiode.

4 Simulated attack profile.

5 Special-access programme [OC adds oversight committee] (DoD).

6 Survivable adaptive planning [E adds experiment].

7 Soon as possible.

8 Sensing and processing.

9 Service access point[s].

10 Sensitivity analysis program.

**SAPC** South African Parachute Club.

**Sapco, SAPCO** Special-access program co-ordination office.

**SAPE** Survivable adaptive planning experiment.

**Saphyre** Swerve aero-propulsion hypersonic research experiment (NASA).

**SAPM** Synchronized air-power management (USAF).

**SAPO** Standby arrangement for peacekeeper operations (UN).

**Sapoc, SAPOC** Special-access program oversight committee.

**SAR** 1 Search and rescue.

2 Synthetic-aperture [or array] radar; FTI adds fixed-target indication.

3 Selected acquisition report (US one each FY).

4 Stand-alone radar.

5 Semi-active radar.

6 Signal-acquisition remote.

7 Special access required.

8 Starter-assisted relight.

**Sara** 1 Selective-adhesion release agent.

2 Ship approach recovery aid[s].

**Sarah** Search and rescue and homing; personal radio beacon (Ultra).

**Sarbe** Search and rescue beacon equipment; military/civil (Burndepot).

**SARC** Systems Acquisition Review Council (USA).

**Sarcap, SarCAP** SAR (1) combat air patrol.

**Sarda** State and regional defense airlift (US).

**Sardam** Sonar-array remote detection of aircraft and management, enables submerged submarine to detect and track distant aircraft.

**SARG** Semi-active radar guidance.

**Sarge** Surveillance and reconnaissance ground equipment.

**SARH** 1 Semi-active radar homing.

2 Society of Air Racing Historians [Berea, OH44017, US] (Int.).

**Sarie** Semi-automatic radar identification equipment; part of Abbey Hill (UK).

**Sarin** Toxic nerve gas.

**Saris** 1 Synthetic-aperture radar interpretation system.

2 Semi-active radar imaging seeker.

**SARJ** Solar alpha rotary joint.

**SARLupe** Radar surveillance satellites (G).

**SARO** Supply aero-engine record office (UK).

**Sarops** Search and rescue operations.

**Saros** Search and rescue for Open Skies.

**SARP, sarp** 1 Semi-automatic radar plotting.

2 Signal auto radar-processing system.

3 See Sarps.

**Sarpal, SAPpal** Search and rescue portable air-launchable.

**Sarps, SARPS** Standards and recommended practices (ICAO).

**SARS** 1 Support and restraint system.

**Sarpal, SARpal** Search and rescue portable air-launchable.

2 Static automatic reporting system.

3 Severe acute respiratory syndrome.

**Sarsat** 1 Search and rescue satellite.

2 Search and rescue satellite-aided tracking.

**SART, Sart** 1 Semi-active [artificial] radar target.

2 Search and rescue transponder.

3 Structural airframe repair technician.

4 Self-activating reactive target.

**Sartaf** SAR (1) task force.

**Sartor, SARTOR** Standards and routes to registration (EC<sup>UK</sup>).

**Sartu** Search and Rescue Training Unit (RAF Valley).

**SAS** 1 Stability-augmentation system.

2 Satellite Applications Section (NOAA).

3 Small-angle scattering.

4 Stall-avoidance subsystem.

5 Staring-array seeker.

6 Single audio system.

7 Special Air Service (UK).

8 Survival avionics system.

9 Sensors and Avionic Systems (UK Qinetiq).

10 Signature augmentation subsystem.

11 Support analysis software.

12 Société par Actions Simplifiée (F, joint stock co).

13 Station address set.

14 School of Aviation Safety (USN, USMC).

15 Small Astronomy Satellite[s].

16 Standard altimeter setting [1,013.2 mb].

**SASC** Senate Armed Services Committee (US).

**SAS/CSS** SAS (1) plus control-stick steering.

**SASE** Semi-automatic support equipment.

**Sashlite** Illuminated under bomber at instant of bomb release and plotted on camera obscura (RAF training, 1930-45).

**SASI** The Society of Air Safety Investigators [offices at Camp Springs, MD, and Toronto, Canada].

**SASIG** Strategic Aviation Special Interest Group (UK, airport location).

**SASO** 1 Pronounced sasso, Senior Air Staff Officer (RAF).

2 Stability and support operations.

**SASP** Single advanced signal processor.

**SASRS** Satellite-aided search and rescue system.

**SASS** Strategic airborne, or small aerostat, surveillance system.

**SASSA, Sassa** Self-awareness space situational awareness (USAF).

**SASSR** Small-aperture SSR.

**SAST** 1 Strategic analyses in science and technology.

2 Shanghai Academy of Spaceflight Technology.

**SAT** 1 Software audit team.

2 Static air temperature.

3 Situational-awareness technology.

4 Strategic action team (FAA).

5 System acceptance test.

**SATA, Sata** Small-aperture telescope augmentation.

**Sataf** Site-activation task force.

**Satair** Sea acceptance trials, air.

**Satca** Swedish Air Traffic Controllers Association [office, Angelholm].

**SATCC** Southern African Transportation Co-ordinating Commission.

**Satco, SATCO** Senior air traffic control officer.

**satcom[s]** Generalized term for satellite communications.

**Satcoma** Satellite Communications Agency (US).

**SATCP** Sol-air très courte portée (F).

**satellite** 1 Body revolving in equilibrium orbit around primary, natural or man-made.

2 Man-made device intended to become \* (1).

3 Military airfield auxiliary to nearby main airfield and relying on latter for admin. and most services.

4 Sub-terminal at airport to disperse processing and bring passengers nearer relevant gates.

**satellite landing system** Based on a DGPS ground station, currently provides Cat.1 to equipped aircraft [DGNSSU plus interfaces] to all runways within 30 nm [56 km]; later growth to Cat.III.

**satellite/pier layout** Airport terminal is connected to some satellites (4) and some piers.

**satellite telephone intermediate unit** Cabin interface between satcom and terrestrial telephone [or telecommunications] avionics with CTU (2).

**satelloid** Satellite whose orbit is within planetary atmosphere and thus requires continuous or intermittent thrust.

**SATF** 1 Strike and terrain-following (radar).

2 Shuttle activation task force (also rendered Sataf).

**Satin** 1 SAC automated total-information network (USAF).

2 Survivability augmentation for transport installation-now (Lockheed-Georgia ECM).

**Satka** Surveillance, acquisition, tracking and kill assessment.

**Satnav** Satellite navigation, ie satellite-assisted.

**Satnet** Satellite network.

**SATO** Scheduled airlines ticket office.

**satphone** Satellite telephone, especially in aircraft.

**Satrack** Satellite tracking, first GPS system.

**SATS** 1 Small airfield for tactical support (USMC).

2 Small-arms target system.

3 Shuttle avionics test set.

4 Small-aircraft technology [changed from transportation] system, to relieve pressure on hubs (NASA).

**SATSAR** Satellite-aided SAR study group (ICAO).

**Satsim** Saturation countermeasures simulator (USAF).

**SATT** Small-aircraft training target.

**saturable reactor** Soft-core inductor control for pulsed radars and magnetic amplifiers.

**saturated adiabatic lapse-rate** Rate of decrease of temperature with height for parcel of saturated air.

**saturated air** Air containing greatest possible density of water vapour, such that in any given period number of molecular break-ups equals number of recombinations; RH (2) = 100%.

**saturated beacon** Ground transponder beacon, eg DME, interrogated by so many aircraft (usually 100 simultaneously is limit) that its AGC cuts out replies except to 100 strongest interrogators.

**saturation** Measure of airport traffic: current movements [usually per hour] ÷ maximum allowable.

**saturation diving** Undersea submergence at depths in order of 300 m for prolonged period when blood is saturated with chosen breathing mixture.

**saturation vapour pressure** Vapour pressure of particular substance, variable with temperature, which at given temperature is in equilibrium with plane surface of same substance in liquid or solid phase.

**Saturn** 1 Second-generation anti-jam tactical uhf radios for NATO.

2 The interoperable waveform for (1).

**SAU** 1 Safety/arming unit.

2 Signal acquisition unit.

3 Surface-attack unit.

4 Splitter amplifier unit.

**saucépan** Circular remote dispersal for single heavy bomber (colloq. WW2).

**saunter** Air-intercept code: "Fly for best endurance".  
**sausage** 1 Kite balloon (colloq., arch.).

2 According to one authority, a windsock.

**saumon** Salmon (F).

**Sauter mean diameter** Diameter of droplet having same surface : volume ratio as an entire liquid spray, measured in  $\mu$ .

**SAVA** Society of Aviation Artists (UK, 1953–).

**SAVAC** Simulates, analyses, visualizes activated circuitry (Chrysler/USAF).

**Savasi** Simplified abbreviated Vasi.

**save** 1 Rescue of a downed pilot, esp. behind hostile lines.

2 A landing made at the scheduled destination in conditions that threatened a diversion.

**save-list item** Item of equipment to be salvaged from aircraft at 'boneyard' site.

**SAVR** Strapdown attitude/velocity reference.

**SAW** 1 Surface acoustic wave; / CAD adds chemical-agent detection.

2 Society of Aviation Writers (several countries).

3 Submerged-arc welding.

4 Special Air Warfare (USAF).

**sawcut** Chordwise slot in leading edge of aerofoil to promote chordwise flow, energize boundary layer or serve other aerodynamic function.

**SAWE** 1 Society of Allied [previously Aeronautical] Weight Engineers [office, Los Angeles, CA90060] (US).

2 Simulated area-weapons effects; can have suffixes NBC or RF.

**SAWHQ** Shape alternative war HQ.

**SAWOS** Semi-automatic weather observation system.

**SAWRS** Supplementary, or supplemental, aviation weather-reporting station (NOAA).

**SAWS** Satellite, or silent, attack warning system.

**SAWSS** Shipboard aircraft weight subsystem.

**sawtooth** 1 Voltage or timebase which when plotted has appearance of saw edge with series of linear-rate climbs and near-vertical descents.

2 See *dogtooth*.

3 Flight profile of motor-glider.

**sawtooth nozzle** Propulsive nozzle of jet engine, especially turbofan fan duct and/or core, terminating in a zig-zag edge. This typically gives c3 dB reduction in takeoff noise. Also called sawtooth mixer.

**say again** Please repeat last bit of message.

**Saybolt** Standard tests for viscosity of liquid, esp. lubricating oil, in which sample heated to known temperature is poured through calibrated orifice and time in seconds recorded for 60 ml ( $\text{cm}^3$ ); hence *SUS*.

**SB** 1 Service bulletin.

2 Sideband.

3 Scrieve board.

4 Sonic boom.

5 Speedbrake(s).

6 Scout Bomber (USN aircraft category 1934-46).

7 Snow began, followed by time.

8 Southbound.

9 Spot beam.

10 Side of body (casting).

**sb** Stilb[s].

**s/b** Stand-by.

**SBA** 1 Standard beam approach, pioneer electronic

landing aid providing lateral (azimuth) and distance (marker-beacon) guidance; led to ILS.

2 Small Business Administration (US, from 1953).

3 Smaller Businesses Association (US, from 1953).

4 Spot-beam antenna.

5 Serial-bus analyser.

6 Space-based assets.

7 Strategic brigade airdrop.

**SBAC** The Society of British Aerospace Companies [previously, 1916-70, The Society of British Aircraft Constructors; office, London SE1 7SP] (UK).

**SBAMS** Sea-based air master study.

**SBB** Single-beam blanking.

**SBC** 1 Senate Budget Committee (US).

2 Single-board computer.

3 Sonic-Boom Committee (ICAO).

4 Small bayonet cap.

**SB-comp** Service-bulletin computerization.

**SBD** 1 Schematic block diagram.

2 Short-burst data.

**SBE** Single-bit error.

**SBF** Svenska Ballong Federationen (Sweden).

**SBG** Stand-by gyro.

**SBGS** Sonic-boom ground signature.

**SBH** Support by the hour.

**SBHN** Solar-blade heliogyro nanosat.

**SBI** Space-based interceptor, for disabling hostile BV, PBV, RV, Asat, etc (SDI).

**SBIR** Small-business innovation, or innovative, research.

**SBIRS** Space-based IR system; HP adds Hi-Program, L adds Low [replaced by STSS].

**SBJ** Supersonic business jet.

**SBKEWS** Space-based kinetic-energy weapon system.

**SBKKV** Space-based kinetic-kill vehicle.

**SBL** 1 Space-based laser; BMD adds ballistic-missile defense.

2 Scanned-beam laminography.

**SBM** 1 Space battle management.

2 Sinter-bonded mesh.

3 Scheduled base maintenance (DARA).

**SBMC3, SBMC**<sup>3</sup> SBM(1) Command, control and communications.

**SBMCS** Sea-based mid-course system [ballistic-missile defence].

**SBN** Strontium barium niobate.

**SBNPB** Space-based neutral-particle beam.

**SBO** 1 Sideband[s] only.

2 Specific behavioural objective.

3 Split-based operation[s].

**SBR** 1 Space-based radar.

2 Signal-to-background ratio.

**SBRA** Smart bomb release assembly.

**SBS** 1 Smart/small/space-based bomb system.

2 Satellite business systems.

3 Self-contained booster stage.

**SBSS** 1 Standard-base supply system (USAF).

2 Space-based soldier system (USA).

3 Space-based surveillance system, or space-based space surveillance [of satellites and debris] (USAF).

**SBT** Self-briefing terminal.

**SBTC** Sino-British Trade Council.

**SBTDS** Sea-based terminal-defence system (USN).

**SBTT** Single-belly twin-tandem.

**SBU** Sensitive but unclassified.

**SBUV** Solar backscatter UV.

**SBW** 1 Steer [nosewheel] by wire.

2 Search bubble window, giving view vertically downwards.

**SBX** Sea-based X-band radar, crucial element in BMD system testbed.

**SBY, sby** Standby.

**SC** 1 Single-crystal.

2 Speed-control (system).

3 Short circuit (also s.c.).

4 Subgrade code (ICAO).

5 Service ceiling.

6 Stratified [or shaped] charge.

7 Statement of capability.

8 Structured coupling.

9 Single-card.

10 Special committee, or category.

11 Surface combatant, = warship.

12 Supercritical.

**Sc** 1 Stratocumulus.

2 Schmidt number.

**S/C, S/c** 1 Spacecraft.

2 Step[ped] climb.

3 Supercharged.

**S<sub>c</sub>** Unit compressive stress.

**SC-1** One engine inoperative.

**SC-2** All engines operating.

**SCA** 1 Single-crystal alloy.

2 Services de la Circulation Aérienne = ATC (F).

3 Simulation control area.

4 Supercritical compound aerofoil [or airfoil].

5 Short-circuit analysis.

6 Self-contained approach [blind landing aid].

7 Software communications architecture.

8 Strategic-capabilities assessment.

**scab** External payload carried flush against pylon or aircraft skin; hence to \*-on, scabbed.

**SCAD, Scad** 1 Subsonic-cruise armed decoy.

2 Often ScAd, Scientific Advisor (NATO).

3 Single-channel amplifier/detector.

4 Stock control and distribution.

**Scada** Supervisory control and data acquisition.

**SCADC** Standard control (or, USAF, central) air-data computer.

**Seade, SCADE** Safety-critical application development environment.

**Scads** 1 Shipboard containerized air-defence system (BAe).

2 Simultaneous calibration of air-data systems.

**SCAF** Supply, control and accounts flight (RAF).

**scalar** Quantity having magnitude only, as distinct from vector.

**scale** To reproduce on different scale of size, esp. to produce gas-turbine engine larger or smaller than original but broadly similar aerodynamically.

**scale altitude effect** Compressibility error, so called because at high speeds ASIR over-reads as if it were at lower altitude.

**scaled** Basically unchanged in design but smaller or larger than original.

**scale effect** Sum of all effects of change in size of body in fluid flow, keeping shape same; more specifically, effect of alteration in Reynolds number.

**scale factor** Output for given input; eg for accelerometer\*\* is output current in mA per unit of applied acceleration g.

**scale model** Model forming exact miniature of original.

**scaler** Electronic counter producing one output pulse for given number of inputs; thus binary \* has scaling factor of 2 and decade \* has SF of 10.

**scale strength** Relationship between actual structural strength of model and its size and same relationship for full-scale aircraft or other item; hence scale stiffness.

**scaling factor** Number of input pulses for one scaler output pulse.

**scaling law** Mathematical equations permitting effects of NW explosion of given yield to be determined as function of distance from GZ provided that corresponding effect is known for reference explosion, eg 1 kt.

**scalloping** VOR bearing error due to distortion of propagation over uneven terrain; also called bends.

**Scalp** Système de croisière conventionnel autonome à longue portée (F).

**scalping** Rough-machining surface layers off ingot.

**SCAM, Scam** Strike camera.

**SCAMA, Scama** Switching, conferencing and monitoring arrangement (NASA).

**SCAN, Scan** 1 Surface-condition analyser.

2 Simulated comprehensive air navigation.

3 Self-correcting automatic navigator.

**scan** 1 Motion of electronic beam through space searching for target (see \* types).

2 In EM or acoustics search, one rotation of sensor; this may determine a timebase (NATO).

3 Air intercept code: "Search sector indicated and report any contacts".

4 In TV and other video systems, process of continuously translating scene into picture elements and thus varying electrical signal(s).

5 To make one complete cycle or sweep of eyes across either selected flight instruments or external scene ahead.

**SC&D** Stock control and distribution.

**scandium** Sc, silvery metal, density 3.0, MPt 1,541°C, could become important in aerospace.

**scanner** 1 Device which scans (usually 1 or 4), including electron beams in image tubes and CRTs, TV cameras and many electronic display systems, but esp. including radar transmitter/receiver aerials (antennas) which are scanned mechanically or electronically.

2 Radio receiver add-on which trawls the airband.

**scanner column** Vertical member carrying two or more superimposed radar aerials, eg in nose of C-5B.

**scanning** 1 Process by which radar aerial scans, either by physical rotary movement (usually driven hydraulically) or by electronic scanning.

2 Process by which electron beam scans, accomplished by electrostatic or electromagnetic plates or coils.

3 Action of keeping eyes sweeping over external scene and/or flight instruments and other internals.

4 In particular, searching sky ahead visually, either front-to-side or side-to-side, to avoid a mid-air.

5 Use of scanner (2).

**scanning-beam MLS** See *MLS*.

**scanning DME** DME that scans stations and locks on to strongest signal without pilot action.

**scanning field** Area, usually rectangular, scanned by

## scanning generator

electron beam in TV camera, image tube, CRT or electronic display.

**scanning generator** Timebase controlling scanning (2).

**scanning sonobuoy** One whose acoustic sensors (either passive or active) scan to give directional information and/or to filter out noise from sources other than target.

**scanning spot** Point of light where electron beam strikes face of CRT or other scanning field.

**scan period** Time period of basic scan types other than conical and lobe-switching, or period of lowest repetitive cycle in more complex combinations; basic units in US are  $\frac{1}{s}$ , mils/s or s/cycle.

**scan stealing** Appropriating a main scan for writing symbols and alphanumerics when interscan period is too brief; term not recommended.

**scan transfer** Sudden switching of scanning (3) from external to internal scene or vice versa, esp. immediately before bad-visibility touchdown.

**scan types** There are many varieties of radar scan (1) patterns. What follows is descriptive of motions of centre-line axis (boresight line) of main lobe only. Each \* is associated with particular type(s) of display, to which aerial (antenna) az/el information is supplied by potentiometer or other servo system. Fixed-scan radar points in one direction only. Manually controlled, points where directed. Conical, traces out circular path forming small-angle cone with radar at apex; a variation, spiral, traces spiral path beginning and ending at centre of circle. Sector, scans through limited az angle (unidirectional, from L to R or R to L only, snapping back to start after each scan; bidirectional, L-R-L-R). Circular, rotates continuously in horizontal plane (common AWACS mode). Sector display is circular scan with long-persistence phosphor in one [important] sector. Helical, scans continuously in az while winding up and down elevation from  $0^\circ$  to  $90^\circ$  and back. Palmer is conical scan superimposed on another, eg Palmer-circular or Palmer-sector covers  $360^\circ$  periphery or arc respectively with conical scans. Raster is TV method of horizontal lines, usually interlaced; eg an air-intercept 6-bar raster might scan to R along line 1 (top), to L along 4, to R along 3, to L along 6, to R along 2, to L along 5 and back to start. Palmer-raster is another air-intercept scan with conical scan along two or more horizontal bars; thus 3-bar PR makes quick rings along top bar, next along middle and back along bottom, then back via middle to top. Track while scan (TWS) uses an az radar and an el radar simultaneously scanning in both planes.

**SCAR, Scar** 1 Strike control and reconnaissance, co-in mission (USAF).

2 Strike co-ordinating armed reconnaissance.

3 Sistemi de Control de Armamento (I).

**scarf** 1 Inclination in vertical plane of cutoff from rod, tube or other section.

2 Inclination in vertical plane of engine inlet or nozzle, thus zero-\* = vertical.

**scarf cloud** Thin cirrus draping summit or anvil of Cb.

**scarfed** Cut off at an oblique angle; hence \* joint, inlet, nozzle etc.

**Scarf ring** Standard British cockpit mount for hand-aimed machine gun 1917-40 with ring-mounted elevating U-frame.

**scarf joint** Structural joint, invariably in wood, in which

## scatter weapon

mating members are given flat taper to give large glued/pinned area.

**scarifying** Increasing coefficient of friction of airfield surface by cutting shallow grooves, simultaneously removing rubber and other unwanted residues.

**Scarlet** Solar concentrator array with refractive linear element technology.

**Scart** Syndicat des Constructeurs d'Appareils Radio-récepteurs et Télésieurs (F).

**scar weight** Weight penalty remaining [from brackets, cables etc] when mission-specific features are removed.

**SCAS** Stability and control augmentation system.

**Scat, SCAT** 1 Supersonic civil air transport.

2 Space communications and tracking.

3 Scout/attack helicopter.

4 Speed command of attitude and thrust.

5 Special-category [or single-contractor] aviation training.

6 Security control of air traffic; ANA adds and air navigation plan, ER adds and EM radiation (US DoD, 1952).

7 Satellite control of air traffic [oil rigs].

**Scatana** Security control of air traffic and air-navigation aids; special provisions and instructions in time of defence emergency (FAA).

**ScATCC** Scottish and Oceanic ATC Centre (Prestwick).

**Scatha, SCATHA** Spacecraft charging at high altitude[s].

**Scat-I** Special-category I, capability for Cat.I landings provided by SLS to all runways within radius of [usually] 30 nm, 56 km.

**scatter** 1 Distribution, either ordered or, more usually, random of measured values about mean point (eg of 1,000 measures of wing span of similar type aircraft).

2 Distribution of impact points of projectiles aimed at same target.

3 See *scattering*.

**scattered cloud** Seldom used; cloud amount reported only in octas, see *SCT* (1).

**scattering** 1 Diffusion of radiation in all directions caused by small particulate matter in atmosphere; effect varies according to ratio between wavelength and particle size; when this exceeds about 10 Rayleigh scattering occurs (see *back-\**, *tropospheric*\*).

2 Trajectory changes of sub-atomic particles caused by collisions of various interactions; can be elastic or (if there is energy transfer) inelastic.

**scattering loss** That part of transmission loss due to scattering (1) or to target's rough surface.

**scattering power** Ratio of total radar power scattered by target to total power received at target; also called scattering cross-section.

**scatterometer** Carried by satellite or aircraft to measure light reflected from ocean surface to give information on local wind.

**scatter point** Geographic point where race competitors cease to be constrained to narrow take-off corridor.

**scatter propagation** See *back-scatter*, *tropospheric scatter*.

**scatter tolerance** That allowed on dimensions of die forging, often measured at random locations.

**scatter weapon** One releasing or dispensing many bomblets or mines.

## scavenge filter

## Schwarm

**scavenge filter** Principal filter in a lubricating oil circuit, between the scavenge pump and tank.

**scavenge oil** Lubricating oil on its way back from the lubricated part, also called return oil.

**scavenge pipe** Carries lube oil from machine, eg engine, to tank. In US, often scavenger.

**scavenge pump** Pumps lube oil out of machine, in case of engine fitted with wet sump, from base of sump. Gas turbines generally have several scavenge (return) gears on same shaft as pressure gears. In US, often scavenger.

**scavenger(r) system** Exit ducting from wind tunnel for removal of contaminants, eg from smoke apparatus, combustion products from burning tests or exhaust from combustion devices.

**SCC** 1 Standing Consultative Commission (arms control, ABM treaty).

2 Security consultative committee.

3 Sector control, or command, centre.

**SCCAM** Military coordination and control service for complementary route[s] clearances.

**SCCI** System controllers and cockpit indicators.

**SCCOA** Système de commandement et de conduite des opérations aériennes (F).

**SCCS** Source-code control system (software).

**SCD** 1 Speed computing display; airspeed (often TAS) needle plus Mach counter.

2 Signal command decoder.

3 Specification control drawing.

4 System category diagram.

5 Side cargo door.

**SCDA** Software cost-driver attribute.

**SCDDS** Sensor control-data display set.

**SCDL** Surveillance and control data-link.

**SCDU** 1 Selective control decode unit (IFF).

2 Satellite control data unit.

**SCE** 1 Signal conditioning equipment.

2 Single corporate entity.

3 Spacecraft command encoder.

**scenario computer** One able to assemble visual scenes, eg in Tepigen.

**scene-matching** Guidance or navigation by comparing terrain below with stored information; generally synonymous with image-based navigation.

**SCEPS** Stored chemical energy propulsion system.

**Sceptr** Suitcase emergency procedures trainer (cheap erasable ROM).

**SCF** 1 Satellite control facility.

2 Single-configuration fleet.

3 Stress-concentration factor.

**SCFN** Spherical convergent flap nozzle.

**SCG** Speed-control governor.

**SCH** 1 Sonobuoy cable hold (autopilot selector).

2 Simplified combined harness.

**sched** Schedule[d].

**schedule** 1 Precisely controlled mechanical movements to meet system demands, carried out automatically by system usually provided with feedback; eg variable inlets and nozzles in supersonic airbreathing engine installation.

2 Preplanned sequence of time events, eg aircraft inspections and overhauls or timetabled civil flights.

**scheduled service** Air-carrier service for any kind of payload run to timetable.

**scheduled speed** Any of type-specific speeds published in

flight manual, eg  $V_S$ ,  $V_{AT}$ ; in no way connected with speed in commercial use, which is defined as block speed.

**scheduling** Numerical, analog or graphical description of sequence of scheduled (1) movements, eg of turbojet inlet spike.

**schedule inventory** List of all safety equipment and other removable items carried on board.

**schematic diagram** Drawing which explains functions and general spatial relationships but which uses standard symbols and makes no attempt to portray visual appearance. Often includes only one subsystem, rest of machine, aircraft or other device being in outline or phantom line only. Alternatives are exploded drawing, block diagram.

**Schlichting** Original (1936) theory treating of flat plate in supersonic flow.

**schlieren** German word (nearest English equivalent is ‘striations’) for various shadowgraph-like techniques for optical investigations based on 1859 method of Foucault. Basic feature is small light source, parallel rays of light through region under investigation and opaque cut-off at focus of second lens projecting image on screen or photographic film (either point source and pinhole cut-off or line source and line cut-off). Variations in density, eg in flow through shock-waves, Prandtl-Meyer expansions and supersonic flow generally, are sharply visible as tonal gradations.

**Schmidt camera** Elegant astronomical camera/telescope with objective in form of thin plate of glass and rear concave spherical mirror focusing on curved film. Objective plate has one surface figured (thicker and convex at centre, thin and concave around periphery) to correct mirror’s aberration, its own chromatic aberration being slight because of small thickness.

**Schmidt duct** Pioneer flap-valve pulsejet.

**Schmidt number**  $Sc = \mu/\rho D_{12}$  where  $\mu$  is viscosity,  $\rho$  is density and  $D_{12}$  diffusion coefficient; ratio of viscous and mass diffusivity, or kinematic viscosity divided by mass diffusivity.

**Schottky defect** Atom missing from crystal lattice.

**Schottky diode** Barrier-layer device based on rectification properties of contact between metal and semiconductor due to formation of barrier layer at point of contact.

**Schottky effect** Small variation in electron current of thermionic valve caused by variation in anode voltage affecting work done by electrons in escaping.

**schräge Musik** Oblique music = jazz, code name for night-fighter armament of upward-firing cannon (G, WW2).

**Schuler pendulum** One whose length equals radius of Earth, and thus when carried in vehicle moving near Earth’s surface always indicates local vertical. In practice any pendulum having same period of approximately 84 min., achieved at particular relationship between c.g. and pivot, such that centre of rotation of pendulum is always at centre of Earth. Used in stable platforms of INS.

**Schuler tuning** Adjusting period of Schuler pendulum so that its centre of rotation exactly corresponds with centre of Earth.

**Schultz-Grunow** Standard treatment for turbulent flow in viscid fluid at  $R$  from  $10^6$  to  $10^{10}$ .

**Schwarm** Two Rottes, fighters in two loose pairs (G) arguably = finger four.

**SCI** 1 Smoke curtain installation, for laying smoke-screen.

2 Switched collector impedance.

3 Secure [or sensitive] compartmented information (DoD).

4 Scalable coherent interface.

5 Serial communication interface.

**SCIA** Spacecraft checkout and integration area.

**SCID** Software configuration index drawing.

**SCIDA** System co-ordinating installation design authority.

**SCIDM** Single-cord improved data modem.

**science pilot** Experienced researcher in a scientific discipline subsequently qualified as pilot, eg of Space Shuttle (NASA).

**Scimitar** System for countering interdiction missiles and target-acquisition radar[s].

**scimitar wing** One whose planform is curved; usually means same as crescent wing but has been applied to early wings curved across whole span with 'sweep' at tips and zero sweep at root.

**Scinda** Scintillation network decision aid (USAF space command).

**scintillation** 1 See *glint* (radar).

2 Rapid and random variation in appearance of small light source viewed through atmosphere, esp. variation in luminance.

3 Brief light emission by single event (eg impingement on phosphor) (see \* *counter*).

**scintillation counter** Instrument for measuring alpha, beta or gamma radiation by counting scintillations (3); also called scintillator or scintillating counter.

**scintillation spectrometer** Scintillation counter plus pulse-height analyser for radiation energy distribution.

**scintillometer** Photoelectric photometer for measurement of wind speed near tropopause by various Schlieren-type measures of stellar scintillation. Also called scintillation meter.

**SCIP** Secure communications interoperability protocol.

**SCIRP** Semiconductor IR photography.

**SCISE** Self-contained in-seat entertainment.

**scissor** Any flight manoeuvre made by coarse rudder at low airspeed. See *scissors*.

**scissor lift** Platform mounted on two pairs of pivoted arms giving true vertical motion without any tilt. Hence, scissor jack, scissor drive.

**scissors** Flight manoeuvre performed by two or more pairs of aircraft crossing at angle like two halves of \*; basically a series of turn reversals intended to make following enemy overshoot.

**scissor wing** Wing made as single plane from tip to tip pivoted to fuselage at mid-point; usually synonymous with slew wing.

**SCIU** Code for radio-altitude indicator or reading.

**SCJ** Shaped-charge jet.

**SCL** Space-charge limited (C adds 'current').

**sclerometer** Hand instrument measuring hardness by load needed to make scratch of standard depth with diamond point rotated along arc.

**scleroscope** Hand instrument measuring hardness by rebound height of hard-tipped (steel or diamond depending on pattern) rod-hammer dropped inside tube

from standard height on to surface. Common commercial model is Shore \*.

**SCM** 1 Single-crystal material (or metal).

2 Single-chip microprocessor.

3 Software configuration management.

4 Spoiler control module.

5 Surface contamination module.

6 Silicon carbide monofilament.

7 Self-contained munition.

8 Supply-chain management.

9 Subsidies and countervailing measures.

**SCMR** 1 Surface-composition mapping radiometer.

2 Surface-combatant maritime rotocraft (UK RN).

**SCN** 1 Specification change notice.

2 Satellite control network.

3 Self-contained navigation [S adds system, U adds unit].

**SCNS** See above.

**SCO** 1 Sub-carrier oscillator.

2 Scramble Cancellation Order.

3 Slow cook-off [ammunition].

**SCOB** Scattered clouds or better.

**Scoff** Society for Conquest of the Fear of Flying (US).

**SCOMP, Scomp** Secure communications processor.

**scooter bogie** One with two wheels only, in tandem.

**SCOPE** Simple checkout program (language).

**Scope** Spacecraft operational-performance evaluation.

**scope** 1 Electronic display, esp. one supplying output of radar (colloq.).

2 Generalized term for optical viewing instrument, eg microscope, CRT, etc (colloq., vague).

3 According to Webster, distance within which missile carries; unknown in aerospace.

**Scope Command** From 2002 the replacement for all previous h.f. ground communications (USAF).

**scopodromic** Headed in direction of target.

**Score** 1 Signal communications by orbital relay experiment, or equipment.

2 Stratified-charge omnivorous [ie, multifuel] rotary engine.

3 Supplier cost-reduction effort.

**Score defect** Damage caused by movement of penetrative item across softer surface.

**scoring** Apart from normal use (eg in military exercises), the process by which a customer numerically evaluates bidders' proposals.

**SCORM** Shareable content object reference model.

**Scot** Satellite-communications on-board (ship) terminal.

**scotopic** Vision with retinal rods associated with extremely low light intensity and detection of gross movement.

**Scott** Single-channel objective tactical terminal.

**scout** Single-seat aircraft, armed for air combat, operating in patrol or reconnaissance role (WW1).

**SCP, scp** 1 Spherical candlepower.

2 System-concept paper.

3 Single-card processing.

4 Spacecraft control processor.

5 Supersonic camera pod (RAAF).

6 Security Co-operation Participant.

**SCPC** Single channel per carrier [or single carrier per channel] alternative to TDMA; mobile ISDN.

**SCPI** Supersonic-cruise propulsion integration.

**SCPL** Senior commercial pilot's licence (no longer issued).

**SCPS** Space communications protocol standard[s] (DoD, NASA).

**SCPU** Suite central processing unit.

**SCR** 1 Silicon-controlled rectifier.

2 Signal/clutter ratio.

3 Stratified-charge rotary (engine).

4 Single-channel radio.

5 Selective chopper radiometer.

**SCRA** 1 Single-channel radio access.

2 See *SCRIA*.

**Scramble** 1 Take off as quickly as possible (usually followed by course and altitude instructions) (DoD). Any urgent call for military (usually combat) aircraft to take off and leave vicinity of base, either as training manoeuvre or for sudden operational reason.

2 To attempt to provide telecom security by rendering transmission unintelligible to third parties (ie by scrambling), eg by speech inversion.

**Scramble Cancellation Order** Vital order countermanding an attack with NW.

**scrambled egg** Gilt rim round peak of Service-dress cap of group captain and Air Ranks (RAF, colloq.).

**scramble pan** Dispersal from which fighter can make immediate takeoff.

**scramjet** Supersonic-combustion ramjet; one in which flow through combustor itself is still supersonic.

**Scram/Lace** Supersonic combustion ramjet, liquid air cycle engine (NASA).

**scrap** 1 Workpiece containing defect, even trivial, sufficient to cause it to fail an inspection.

2 To break up old unwanted aircraft or one beyond economic repair.

3 Residue of (2) other than produce or salvaged items.

**scraper ring** 1 Spring piston-ring with sharp-angled lower periphery for removing oil from cylinder wall.

2 Middle ring on squadron-leader badge of rank (RAF, colloq.).

**scrap view** Small inset showing detail (eg item from different viewpoint or in different configuration) added where room permits on main drawing.

**scratchbuilt** Replica of historic aircraft containing no authentic parts.

**SC/RC** Stratified-charge rotating-combustion engine.

**SCRE** Syndicat des Constructeurs de Relais Electriques (F).

**screaming** Undefined term descriptive of high-frequency combustion instability in rocket characterized by high-pitched noise (see *screeching*).

**screeching** Undefined term describing high-frequency combustion instability in rocket or afterburner characterized by harsh, shrill noise more irregular than screaming.

**screening** Levelling and smoothing resin adhesive in bonding operation; hence \* tool.

**screen** 1 Imaginary obstruction having form of level-top wall normal to flightpath which aeroplane would just clear on takeoff or landing with landing gear extended and wings level.

2 Arrangement of ships, submarines and aircraft for protection of ship(s) against attack (DoD).

3 Wire-mesh gauze or sieve (ASCC).

4 Electrically conducting or magnetically permeable

enclosure which shields either contents or exterior against unwanted magnetic/electrical fields.

5 Face of electronic display, eg CRT, TV, projection system, etc.

**screen burn** See *ion burn*.

**screen captain** Senior training or supervisory pilot in role of examiner. May be employee of certification authority.

**screened** Provided with screen (4), thus \* ignition has enveloping earthed conductive covering to prevent escape of R/F interference.

**screened horn** Balance surface entirely downstream of fixed surface.

**screened pair** Twin electric cable incorporating earthed screen (4).

**screener** Airport X-ray machine, or person assigned to probe baggage.

**screen filter** Fluid filter whose element is a fine metal mesh screen.

**screen grid** Screen (3) between anode and control grid in thermionic valve to reduce electrostatic influence of anode.

**screen height** Height above ground of top of screen (1), normally 35 ft (10.67 m), occasionally 10 m and rarely 50 ft, on takeoff; on landing usually 30 ft (often interpreted as 10 m). Depends upon aircraft performance group and particular case considered.

**screening** Meanings include: 1 Examining candidate as fit to handle classified information. 2 Airport security examination of passengers and baggage. 3 *Screen* (4).

**screen navigator** Carried in navigator training aircraft to ensure safe return despite pupil errors.

**screen speed** Speed at moment aeroplane passes over screen (see *screen height*), either assumed or as target value, on takeoff or landing. Does not have V-suffix abbreviation.

**screw** Generalized term for threaded connector rotated into workpiece and not held by nut; many quick-fasteners have \*-thread and no sharp dividing line is possible.

**screw gauge** Hand instrument for measuring major diameter of screw, typically by graduated line scales forming small-angle notch.

**screwjack** Actuator having rotary input and linear output obtained by screwthread, often with interposed recirculating balls.

**screw pitch gauge** Hand instrument for checking thread on metalworking screw or bolt, usually with selection of blades each having one 'threaded' edge.

**SCRIA** Supply-chain relationships in aerospace.

**scribe board** Portable board on which lofting lines are recorded either by scribing or some other undeformable method. Often used with locating blocks for actually assembling flight hardware, eg frames, thus becoming a jig. Becoming obsolete.

**SCRJ** Supersonic combustion ramjet.

**scroll** Any curved duct or guidance channel, especially leading air out of centrifugal compressor or cooling air across face of turbine disc.

**SCRT** Single-channel receiver/transponder.

**scrub** 1 To abandon project, esp. a planned flight or military mission.

2 To eliminate a pupil from course of instruction, following failure of \* check.

**scrubbing**

**scrubbing** 1 Lateral sliding of landing-gear tyre on hard pavement, eg of inner bogie wheels in sharp turn.

2 Significant contact between tips of rotating members, esp. blades, in gas turbine and casing; also called rubbing.

3 Rapid wear in piston engine caused by detonation.

**scrubbing torque limit** Maximum permitted torque imposed on landing-gear leg by scrubbing (1), which usually determines limit of steering angle of nose gear, and hence minimum turn radius.

**scrub check** Last-chance assessment of pupil pilot by senior instructor (usually CFI).

**SCS** 1 Stabilization control system.

2 Speed control system.

3 Sea control ship.

4 Survivable control system.

5 Single-crystal sapphire (IR domes).

6 Society for Computer Simulation [office, San Diego, CA] (US).

7 Signal Corps Set (USA, WW2).

8 Satellite communication system.

9 Single-channel simplex.

10 Slaved compass system.

11 Space Control Squadron.

12 Software configuration set.

**SCSC** Strategic conventional standoff capability.

**SCS-51** Signal Corps Set 51, original form of ILS.

**SCSI** 1 Small computer system[s] interface.

2 Simulation Computer Society International [AC adds Advisory Council].

3 Single-card serial interface.

**SCT** 1 Scattered cloud, also **SCTD**, CAA = 3 to 4 oktas, ICAO =  $\frac{1}{8}$ - $\frac{1}{4}$ , FAA = 0.1-0.5.

2 Scanning telescope (NASA).

3 Surface-charge transistor.

4 Single-channel transponder.

5 Staff continuation training (CAA).

6 Seat and canopy trainer.

**SCTF** Standing Contingency Task Force (Canada 2006-).

**SCTI** Service Centrale des Télécommunications et de l'Informatique (F).

**SCTR** Sector.

**SCTV/GDHS** Spacecraft TV ground data-handling system.

**SC21** 21st-century supply chain [numerous members] (UK).

**SCU** 1 Signal conditioning unit.

2 Signal convertor unit (satcoms).

3 System[s], switching, stores, sensor, station, supplemental, or secondary control unit.

4 Satellite communications unit.

**SCUC** Satellite Communications Users Conference (Int.).

**Scud** Subsonic-cruise unarmed decoy.

**scud** Shredded or fragmentary cloud, typically Fs, moving with apparent greater speed below solid layer of higher cloud.

**scuff plate** Protects airframe against impacts from GSE.

**scupper** Fuel-tight recess around gravity filler, usually with its own drain.

**scuttle** 1 Hatch in top of fuselage (US usage).

2 According to Webster: 'An airport. *Brit.*; unknown to author.'

**SCV** 1 Sub-clutter visibility.

2 Standardized cross-validated; R adds residual.

**scuzzy** Small computer system[s] interface [colloq.].

**SCWA** Single-channel wire access.

**SCWG** Satellite communications working group.

**SD** 1 Shaft delivery, ie rotary output.

2 Shipping document.

3 Structured design (software).

4 Service dress (RAF).

5 Specification detail.

6 System, or situation, display, or device.

7 Storm detection (NWS, ARTCC).

8 Side display.

9 Service deviation, or Standard deviation.

10 Self-destruct, or destroying.

11 Radar weather report (ICAO).

12 Surveillance drone.

13 Sympathetic detonation.

**S/D** Synchro to digital.

**Sd** 1 Distance between centres of ground-contact areas of diagonally-opposite wheels of a bogie.

2 Propeller [usually not helicopter rotor] disc area.

**Sd** Sodium [lighting].

**SDA** 1 System, or sister, design authority.

2 Strategic-defense architecture.

**SdA** Société d'Aviation [1863, became SFNAJ] (F).

**SDAC** System-data analog converter.

**SDACS** Solid-fuel divert and attitude-control system.

**SD&D** System development and demonstration (USAF).

**SDAS** 1 Source-data automation system[s].

2 Satellite-data acquisition subsystem.

**SDAT** 1 Sector design and analysis tool (ATC).

2 Silicon-diode array target.

**SDAU** Safety Data and Analysis Unit (CAA, UK).

**SDB** 1 Small-diameter bomb.

2 Small disadvantaged business.

**SDBY** Standby (ICAO).

**SDC** 1 Synchro-to-digital converter.

2 Signal data converter, or computer.

3 Space Defense Center (Colorado Springs, USAF).

4 System data capture.

5 Shuttle Data Center.

6 Satellite data communications; S adds system.

7 Shaft-driven compressor.

8 Supersonic-dash capability.

9 Strategic Defense Command (USAF).

10 Situation-display console.

**SDD** 1 Standard disk drive.

2 System design and development.

3 System development and demonstration [now SD&D].

4 Synthetic dynamic display.

5 Sensor data degradation.

6 Situation data display; -T adds Tower-Brite.

7 System description document.

**SDDM** SecDef decision memorandum (US).

**SDE** 1 Spatial-database engine.

2 Software development environment[s].

3 Scatter detection enhancement.

**SDF** 1 Single degree of freedom.

2 Simplified directional facility (FAA).

3 Self-destruct fuze.

4 Stepdown fix.

5 Strategic deterrent forces [previously RVSN] (R).

<b>6</b> Special Duties Flight [unit] (RAF).	<b>4</b> Special drawing rights; assist airlines in inter-line fare transactions.
<b>SDFOV</b> Simultaneous dual field of view.	<b>5</b> System development requirement.
<b>SDG</b> Speed-decreasing gearbox.	<b>6</b> Strategic Defence Review (UK).
<b>SDI</b> <b>1</b> Strategic (sometimes rendered as Space) Defense Initiative (US); O adds Organization, P Program, PO Participation Office.	<b>7</b> Supplier data requirements [L adds list].
<b>2</b> System discharge indicator.	<b>8</b> Software-defined radio.
<b>3</b> Selective dissemination of information (telecommunications).	<b>9</b> Signal-to-distortion ratio.
<b>4</b> Source destination identifier.	<b>SDRAM</b> Synchronous dynamic RAM.
<b>5</b> Strength deployment inventory.	<b>SDRL</b> Subcontract, or supplier, data requirements list.
<b>S-D&amp;IF</b> System development and integration facilities.	<b>SDRS</b> Splash-detection radar system.
<b>SDIO</b> SDI Organization, or Office (US).	<b>SDS</b> <b>1</b> Software development system.
<b>SDIP</b> SDI Program.	<b>2</b> Satellite, or secondary, data system.
<b>SDIPO</b> SDIP Office (UK).	<b>3</b> Strategic defense system (US, SDI).
<b>SDIS</b> Small-diameter imaging seeker.	<b>4</b> Small digital switch.
<b>SDL</b> Software design laboratory.	<b>5</b> Short-distance sensor.
<b>SDLC</b> Synchronous datalink controller.	<b>SD-S</b> Situation display, secondary.
<b>SDLF</b> Shaft-driven lift fan.	<b>SDSAWG</b> Software Development Standards and Ada Working Group.
<b>SDLM</b> Standard depot-level maintenance.	<b>SDSMS</b> Self-defense surface missile system.
<b>SDL-PE</b> Software design laboratory – protocol emulator.	<b>SDT</b> <b>1</b> System development tool.
<b>SDLV</b> Shuttle-derivation launch vehicle.	<b>2</b> Shock/detonation transition.
<b>SDM</b> <b>1</b> Scatter-drop mine (or munition); helicopter weapon.	<b>SDTI</b> Système de drones tactiques intérimaire (F).
<b>2</b> Site-defense of Minuteman; anti-intruder system.	<b>SDU</b> <b>1</b> Selective decode unit (SSR).
<b>3</b> System definition manual.	<b>2</b> Safety data unit (CAA).
<b>4</b> Speaker drive module.	<b>3</b> System design utility.
<b>5</b> Ship-defense missile.	<b>4</b> Satellite, or satcom, or Service, data unit.
<b>6</b> Sum in depth of modulation.	<b>5</b> Smart, or sensor, display unit.
<b>7</b> Space division multiplex[ing].	<b>6</b> Signal [ATC] distribution unit.
<b>8</b> Structural dynamics model.	<b>7</b> Secure-data unit (JTIDS).
<b>9</b> Security duty manager [airport].	<b>SDVP</b> System demonstration validation program(me).
<b>10</b> Service data management.	<b>SDW</b> Symmetrical double-wedge aerofoil.
<b>SDMA</b> Space-division multiple-access.	<b>SE</b> <b>1</b> Support equipment.
<b>SDME</b> Software development and maintenance environment.	<b>2</b> Systems, or safety, or sustaining, engineering.
<b>SDMI</b> Strategic distribution management initiative (USTC/DLA).	<b>3</b> Servicing echelon.
<b>SDMS</b> <b>1</b> Software development maintenance system.	<b>4</b> Snow ended.
<b>2</b> Shipboard data-multiplex system.	<b>5</b> Storage element.
<b>3</b> Support defense missile system.	<b>6</b> Synthetic environment.
<b>4</b> Sensor to decision-maker to shooter.	<b>7</b> Synthetic[ally] enhanced.
<b>SDN</b> System descriptive note.	<b>8</b> Strip examination.
<b>Sdn Bhd</b> Sendirian Berhad (company constitution, Malaysia).	<b>S/E</b> Single-engine[d].
<b>SDNRIU</b> Secure digital net radio interface unit.	<b>Se</b> Selenium.
<b>SDO</b> <b>1</b> Serial digital output.	<b>SE<sup>2</sup></b> Software engineering environment.
<b>2</b> Standards Development Organization (SAE).	<b>SEA</b> <b>1</b> Single-engine asymmetry.
<b>SDOF</b> Single degree of freedom.	<b>2</b> Stored-energy actuator.
<b>SDOM</b> Six degrees of motion (simulator).	<b>3</b> Software engineering architecture.
<b>SDP</b> <b>1</b> System-definition phase.	<b>4</b> South-East Asia region (ICAO).
<b>2</b> Signal-data processor.	<b>5</b> Statistical energy analysis.
<b>3</b> Standard datum plane.	<b>sea/air/land team</b> Group trained and equipped for unconventional and paramilitary operations including surveillance/reconnaissance in and from restricted waters, rivers and coastal areas (DoD).
<b>4</b> Surveillance data processing.	<b>Sea ALL</b> Sea airborne lead line, UAVs for naval perimeter defence (USN).
<b>SDPDS</b> Surveillance data-processing and distribution system[s].	<b>sea anchor</b> Anchor for marine aircraft in deep water, typically canvas or rubberized-fabric bucket or drogue trailed from stern.
<b>SDPR</b> Federal directorate of supply and procurement (Jugoslavia).	<b>Seabed Treaty</b> Prohibition of NW, 11 February 1971.
<b>SDPU</b> Sensor-data processor unit.	<b>Seabee</b> Construction Battalion (USN).
<b>SDR</b> <b>1</b> System design report, or review, or responsibility.	<b>sea bias</b> See <i>water bias</i> .
<b>2</b> Service difficulty report, or reporting.	<b>sea breeze</b> Onshore wind during day.
<b>3</b> Signal data recorder.	<b>SEAC</b> <b>1</b> Support-Equipment Advisory Committee (inter-airline).
	<b>2</b> South-East Asia Command (WW2).
	<b>SEAD</b> Suppression of enemy air defence(s).

**sea disturbance**

**sea disturbance** See *sea state*.

**seadrome** Floating aerodrome for refuelling transoceanic aeroplanes [unrealised idea 1931–39].

**Seafac** Systems engineering avionics facility.

**sea fog** Fog over sea usually caused by moist air over cold water.

**SEAGA** Selective employment of ground and air alert (SAC).

**Seagull** EDP for flight simulators using distributed computers linked by reflective-memory bus (Rediffusion/Gould).

**SEAL** Sea/air/land.

**sea lane** Area of water with fixed markers showing its use by marine aircraft.

**sealant** Material tailored to particular duty of ensuring fluid-tight [liquid or gas] seal between mating materials; often applied as continuous layer, eg inside integral tank.

**Sealdrum** Portable, collapsible rubber container for POL, water and other liquids (US Royal).

**sealed** Officially closed, eg by lock wire with lead seal, until completion of particular flight or test programme.

**sealed-balance control** Flight-control surface whose gap between the leading edge [ahead of the hinge] and the fixed surface is made airtight by flexible strip.

**sea level** 1 Actual height of sea surface, used as local height reference.

2 More often, height corresponding to pressure of 1,013.25 mb.

3 In UK, referred to mean high-water at Newlyn, Cornwall.

**sea-level corrections** See *STP (1)*.

**seam** 1 Joint in fabric, eg overlap or three fell-types.

2 Unwanted flaw in deep-drawn metal tubing.

**sea marker** Anything dropped on sea to provide visible indication of drift.

**sea-motion corrector** See *sea-surface correction*.

**seam weld** Continuous, hopefully pressure-tight, weld made by roll electrodes; in theory can be accomplished by close repeated spot welding or by hand process, but unusual.

**SEANC** South-East Asia Notam centre.

**SE&I** Systems engineering and integration.

**Seapac** Sea-activated parachute automatic crew release.

**seaplane** 1 Float seaplane, marine aircraft having one, two or [rarely] more separate floats and conventional fuselage (UK).

2 Marine aircraft of any fixed-wing powered type (US).

**seaplane basin** 1 See *towing tank*.

2 Some dictionaries define this as a place having sheltered water for seaplanes.

**seaplane marker** Buoyant or bottom-fixed marker at marine aerodrome, also called taxi-channel marker.

**seaplane rating** Endorsement on licence qualifying holder to fly or maintain seaplanes.

**seaplane tank** See *pitching tank, towing tank*.

**seaplane trim** Angle between mean water surface and aircraft longitudinal axis or other reference when parked on water.

**sear** Generalized term for catch, pawl or other latching device which holds breechblock or bolt of gun at open position.

**sea rating** See *sea state*.

**search** 1 Systematic reconnaissance of defined area such that all parts pass within visibility.

2 DME mode: emit interrogation pulse pair and scans whole operating area for reply.

**search and rescue facility** One responsible for maintaining search and rescue service for persons and property in distress.

**search jammer** Automatic jammer.

**searchlight** Any powerful directional surface light for illumination of cloudbase or other aerial objects.

**searchlight scanning** Sector scanning (see *scan types*).

**search mission** Air reconnaissance to search for specific surface object(s).

**search radar** Vague; generally means surveillance radar operating in search mode, and often applied to weather radar.

**search rate** Reciprocal of average time to search one PN chip-width, ie chips/s (ECM).

**sea return** See *clutter*.

**Sears' function**  $S(k_g)$ , deals with a helicopter rotor traversing a sinusoidal gust field, encounter frequency  $k_g = \pi V/\lambda_g$  where  $\lambda_g$  is gust wavelength.

**Sears-Haack** Profile of body having minimum supersonic drag, normally body of revolution having pointed ends and fineness ratio appropriate to Mach number; complicated by addition of aerofoils.

**SEARW** Single-engine advanced rotary wing.

**seasat** Generalized name for oceanographic satellite.

**sea smoke** See *steaming fog*.

**sea state** Condition of sea surface as related to standard list of reference conditions, invariably Beaufort scale.

**sea-surface correction** Electronically applied correction to Doppler output to remove false velocities due to motions of waves.

**SEAT** 1 Site-equipment acceptance test.

2 Status evaluation and test.

**Seat** Single-engine air tanker (USFS).

**seat belt** Single quick-release belt across bottom of torso for passenger.

**seat harness** Arrangement of four or five adjustable straps keeping occupant in place in violent manoeuvres [military or aerobatic aircraft].

**SEATO** Pronounced Seato, SE Asia Treaty Organization, 1954–76.

**seat pack** Parachute pack worn in such a way that it forms seat cushion.

**seat selection** Offering customer for particular commercial flight right to select seat from those remaining, subsequently shown on boarding pass.

**seat-type parachute** One with seat pack.

**SEB** 1 Staphylococcus enterotoxin B, BW agent.

2 System[s] electronics box.

**Sebass** Spatially enhanced broadband Army spectrographic system (USA).

**SEBRW** Single-engine basic rotary wing.

**SEC** 1 Secondary emission cathode.

2 Secondary-electron conduction.

3 Securities and Exchange Commission (US).

4 Secondary (NASA).

5 Spoiler and elevator computer.

6 Security [problems] working group (ECAC).

7 Special-event charter.

8 Section, or sectional aeronautical chart.

9 Sector.

10 Survivable engine control.

11 Software-enabled control (AFRL-Darpa).

## Sec[s]

**Sec[s]** 1 Second[s] (contrary to SI but still ICAO).

2 Secondary.

**Secad** SEC (10) algorithm development (NAWC).

**Secam** Safety, efficiency and capacity of ATM (7) methodologies (Euret).

**Secant** Separation and control of aircraft, non-synchronous techniques.

**secant modulus** E, slope of stress/strain curve to any point; thus equal to modulus of elasticity up to limit of proportionality, thereafter varying with applied stress to point of rupture.

**SECBM** Seventeen-sixty [MIL-Std 1760] enhanced conventional bomb-module (USAF).

**SecDef** Secretary of State for Defense (US).

**SECL** Symmetrical emitter-coupled logic.

**Seco, SECO** S-IVB engine cut-off (Apollo).

**second** 1 SI unit of time, symbol s, = 9,192,631,770 transitions between two ground states of Cs-133 atom.

2 Unit of plane angular measure, symbol " =  $4.848 \times 10^{-6}$ .rad.

**secondary** Small area of low pressure on periphery of large cyclone.

**secondary airflow** That used to dilute and cool flame in gas-turbine combustor.

**secondary airport** Smaller airport at city possessing hub airport.

**secondary battery** Electric battery rechargeable by reverse DC current.

**secondary bending** In a beam or column whose chief applied stress is transverse, that bending moment due to axial load.

**secondary controls** See *secondary flight controls*.

**secondary depression** See *secondary*.

**secondary display** Simplified display of flight instruments enabling aircraft to be safely flown following failure of primary.

**secondary electron emission** Flow of electrons from metal surface under bombardment by high-energy electrons or protons.

**secondary emission** Ejection of subatomic particles and/or photons from atoms or particles subjected to primary radiation, eg cosmic rays.

**secondary explosion** Explosion at surface target caused by air attack but additional to explosions of air-dropped ordnance.

**secondary fan airflow** Airflow through fan which does not pass through engine core.

**secondary flight controls** Those used intermittently to change lift or speed but not trajectory; eg flaps, slats, Krügers, airbrakes, droops and, except in DLC, spoilers.

**secondary frequency** Assigned to an aircraft as standby in air/ground.

**secondary front** One formed within an air mass.

**secondary glider** Not defined, but training glider more advanced than primary and with enclosed cockpit. Generally any glider intermediate between primary and Standard Class sailplane.

**secondary great circle** See *meridian*.

**secondary heat-exchanger** That which rejects heat to atmosphere from secondary circuit heated by primary heat-exchanger.

**secondary holes** Those admitting secondary air to combustor.

**secondary instruments** 1 Those giving information

## second segment

unconnected with gross flight trajectory, ie not a primary flight instrument.

2 Those whose calibration is determined by comparison with an absolute instrument.

**secondary members** See *secondary structure*.

**secondary modulus** Modulus of elasticity for composite of other two-component material (esp. two-metal components) beyond point at which weaker material yields.

**secondary nozzle** Annular nozzle surrounding primary nozzle of jet engine through which may pass cooling airflow, inlet excess and various other flows around engine.

**secondary power system** Mechanical power system on board aircraft other than main engines, eg shaft-driven accessories, gearboxes, gas-turbine starter, APU, EPU or MEPU, inter-engine cross-shafting and major bleed ducting with air-turbine drives if fitted.

**secondary radar** Radar in which interrogatory pulse is sent to distant transponder which is triggered to send back a different pulse code to originator. Examples are airborne DME triggering ground DME facility and ground SSR triggering airborne transponder.

**secondary radiation** Usually synonymous with secondary emission.

**secondary stall** Rotating stall [engine].

**secondary stress** That resulting from deflection under load, eg of end-loaded column in bending.

**secondary structure** Structural parts of airframe whose failure does not immediately imperil continued safe flight.

**secondary surveillance radar** Ground radar which interrogates air traffic with identifiable codes of pulses, triggers distinctive response from each target, extracts plots and assigns identity to each, normally presented as flight number, altitude and other information beside target on radar display [Mode A provides coded target identiy, C altitude and S selective interrogation]. Aerial normally slaved in azimuth to main surveillance (primary) radar and may be on-mounted.

**secondary winding** That of transformer, magneto or other electrical device from which output is supplied.

**second buy** See *option (1)*; originally Lockheed term for option with paid deposit.

**second day** In all-out war, assumption that enemy's long-range air defences are destroyed.

**second dicky** Co-pilot (UK, colloq.).

**second-line servicing** That carried out over planned period when aircraft is out of line service, sometimes at special off-base facility.

**second moment of area** Moment of inertia of a structural section whose mass is unity; SI  $m^4 = 115.86183 \text{ ft}^4$ ,  $\text{cm}^4 = 0.024025 \text{ in}^4$ .

**second pilot** 1 Person designated as second pilot in flight crew to assist PIC; in commercial crew usually has rank of First Officer. In ASCC definition: 'not necessarily qualified on type'.

2 Unofficial term for passenger who has completed short [usually 8–10h] flying course to enable him or her to land light [ $\leq 12,500\text{lb}$ ] aircraft following incapacitation of pilot.

**second segment** Second segment of normal takeoff for large or advanced aerooplanes beginning at gear retraction at  $V_2$  and maintaining this speed in climb to top of climb at end of segment when aircraft is levelled out, or

climbed less steeply, to accelerate to FUSS or for power cutback in noise-abatement procedure, which see.

**second source** Manufacturer assigned by government to augment output of major hardware item, eg aircraft or missile, with assistance of original design company, which remains in production as first source; no royalty is normally payable, and \*\* has no commercial rights to design, nor permission to sell to third party.

**second strike** Strategic attack with NW mounted after enemy's nuclear attack has taken place; objective of hardening is to confer a \*\* capability. DoD: 'The first counterblow of a war; generally associated with nuclear operations'.

**second throat** That downstream of working section and upstream of exhaust diffuser in simple blow-down supersonic tunnel. In operation traversed by weak normal shock.

**second-trace return** Caused by large echoing target outside range scale.

**second-user aircraft** Also called pre-owned or second-hand.

**Secop** Single-engine climb-out procedure.

**Secor** Sequential collation of range. Usually \* /DME, which collates range with distance derived from DME. A basic technique in global mapping with geodesic satellites.

**secretress** GA stewardess also serving as office secretary in flight.

**SECS** Sequential-events control system.

**SECT, Sect** Simulator for electronic-combat training.

**Sect** Sector.

**section** 1 Cross-section.

2 Major portion of airframe, eg nose\*, tail\*, but becomes dangerously ambiguous with wing\*, body\* when meaning normally (1).

3 Small subdivision of military air unit, normally (DoD) two combat aircraft; in 1915–18 four or five; US in Korea, four.

4 Raw material rolled or extruded to standard (often complex) cross-section, as distinct from sheet, billets or strip.

5 Major subdivision of missile or rocket vehicle, eg guidance\*.

6 Subdivision into similar parts, eg six sections of slat.

**sectional** Noun, VFR navigation chart, equivalent to ICAO 'half-million' (US).

**section modulus** Moment of inertia of structural member cross-section divided by perpendicular distance from neutral axis to outermost surface of section, ie most highly stressed fibre.

**sector** 1 Subdivision of air-defence frontier.

2 Limited range of azimuth, eg through which radar may scan (see \* under *scan types*).

3 Subdivision of airspace by radio range characterized by letter A or N, also called quadrant.

4 Portion of commercial route between two traffic points.

**sector controller** Air-defence controller in charge of sector (1).

**sector display** See *scan types*.

**sector distance** Length of air route sector (4).

**sector fuel** That allowed for in flightplan for one sector (4).

**sector management tool** Software providing a traffic-

management unit with ability to maintain sector integrity through use of ground delays.

**sector scan** See *scan types*.

**sector temperature/wind** Those met values assumed in flight-planning one sector (4).

**sector time** In commercial operation, scheduled or actual time for sector (4).

**sector visibility** Within particular sector (2) of horizon seen from tower.

**SECU** Spoiler[s] electronic control unit.

**secular** Having a very long time period, eg a century or more.

**secure** Proof against interference by enemy and esp. against information content of signals being deciphered by enemy. Various shades of meaning, eg \* air refuelling is one beyond enemy radar range in which all communication is by lamp.

**Secure Flight** Computerised passenger pre-screening system, replacing Capps II (TSA).

**Security** Over 20 terms relating this topic to aerospace all appear to be self-explanatory.

**SED** 1 Safe escape distance; minimum radius from airbase at which aircraft tail-on is assumed safe against hostile NW with GZ at airbase.

2 Scanning electron diffraction.

3 Sensor evolutionary development.

4 Systems engineering documentation.

5 Secondary Eicas display.

6 Society of Engineering Designers (UK).

7 Scramjet engine demonstrator.

8 Strategic economic development (US).

**SEDF** Surface-emitting distributed feedback.

**SEDIS, Sedis** Surface-emitter detection identification system (ESM).

**Sedris** Synthetic-environment data representation [and] interchange specification.

**Seds** Students for the Exploitation and Development of Space (Int.).

**SEE** 1 Society of Environmental Engineers (UK).

2 Secondary electron emission.

3 Single-event effect.

4 Software engineering environment.

**see and avoid** Basic onus on pilots in VMC to maintain lookout.

**Seebeck effect** Generation of EMF or current by dissimilar metals in circuit with junctions at different temperatures (see *Peltier*).

**seeding** 1 Aerial dispensing, at controlled rate per unit time or unit distance, of ECM payload such as chaff, flare pellets or other dispersed medium including aerosols. Hence \* rate, \* distance.

2 Aerial dispensing, at controlled rate per unit time, of condensation nuclei such as crystals of silver iodide or dry ice (solid CO<sub>2</sub>) to trigger precipitation in rainmaking.

**seeing** 1 Colloq.ually used to mean ability of radar to reach highly reflective part[s] of target.

2 Quality of observability (astronomy).

**seeker** Device able to sense radiation from target, lock-on and steer towards it, using radar (active or semi-active), optics (usually passive), laser or IR; rarely other methods. Normal sensor for terminal guidance of missiles and other guided ordnance.

**Seem** Side-emitting electronic manifold [radar].

**Seenot** Air/sea rescue, prefix to longer words (G).

**see-saw rotor** See *teetering*.

**S<sub>ef</sub>, S<sub>EF</sub>** Takeoff distance from brake-release to [not yet recognised] engine failure

**S<sub>efg</sub>** Ground roll to liftoff with one engine inoperative.

**SEF** Stability enhancement functions.

**Sefis, SEFIS** Simulated electronic flight-instruments system.

**SEFT** Section d'Etudes et Fabrications des Télécommunications (F).

**SEG** 1 Signaller, engineer, gunner (RAF aircrew grade, WW2).

2 Sharp-edged gust; F adds function.

**segment** 1 One of six standard subdivisions of take-off flightpath: 1, screen to gear-up at V<sub>2</sub>; 2, gear-up to top of initial climb at V<sub>3</sub>; 3, level acceleration to FUSS; 4, flaps-up to 5-min. power point at FUSS; 5, level acceleration to en route climb speed; 6, climb to 1,500 ft at ERCS; rest is en route climb.

2 A second definition is: one of two subdivisions of climbout, first-\* from lift-off to location of noise listening post or airport boundary, second-\* from that point with power cut back in drift-climb until sensitive area has been overflowed or a declared height is reached. See *noise-abatement climb*.

3 Portion of en route flight between two waypoints.

4 Portion of missile flight, eg boost, cruise (or midcourse) and terminal.

5 See *SE&I*.

**SEGS** 1 Selective (inclination) glideslope.

2 Standard-entry guidance system.

**SEI** 1 Small-engine instruction.

2 Standby engine indicator (or instrument) (CAA). In other usage E is engineer.

3 Specific emitter identification.

4 Software Engineering Institute [Carnegie Mellon University] (DoD, US).

5 See *SE&I*.

**SEID** Système d'écartometrie IR différentielle (F missile guidance).

**SEIFR** Pronounced safer, single-engine IFR.

**SE-IMC** Single-engine instrument meteorological conditions.

**SEIRS** Small-engine IR suppressor.

**seizing up** Sudden and total arrest of operation of mechanical device, for whatever reason.

**SEKPY** Association of defence companies [GR-11252] (Greece).

**SEL** 1 Selcal (ICAO).

2 Space Environment Laboratory (NOAA).

3 Single-engine licence.

4 Single-engine, landplane.

5 Select, selector identifier.

6 Switchable eyesafe laser.

7 Sound exposure level, see *noise*.

8 Surface-emitting laser.

9 Sun/Earth Lagrange point; 1, 2, respectively denote near or dark side.

**Selcal** *Selective calling*.

**Selecta-vision** Registered name for holographic video recording.

**select code** That code displayed when ground interrogator (SSR, or in US ATCRBS) and airborne transponder are operating on same mode and code simultaneously.

**selected track** In traditional US-style airways structure, link route off-airways authorized to particular flight equipped with R-nav. Where R-nav systems (eg Decca) in use for decades term has little meaning because commercial and IFR pilots are not confined to airways and VOR radials.

**selective address** See *selective interrogation*.

**selective availability** Management of the GPS by the US DoD so that civilian receivers cannot have access to the [22-m, 72-ft] accuracy of P(Y).

**selective calling** System enabling ground controller to call a single aircraft, usually long-haul oceanic airline or bizjet, without the crew having to listen out on that frequency or any other aircraft being bothered. Selcal code for each aircraft is four-letter code using letters A through M, triggering light or loudspeaker. Airborne decoder usually accepts inputs from VHF or HF. See *Adsel, DABS*.

**selective fading** Distortion of signal caused by variation in ionospheric density which causes fading that varies with frequency.

**selective feathering** Manual feathering using selector to pick out correct propeller.

**selective fit** Non-standard and rare engineering fit selected by hand to achieve desired mating of parts.

**selective identification facility (or feature), SIF** Airborne pulse-type transponder which provides automatic selective identification of aircraft in which installed (NATO); early form of selective interrogation used with Mk X ATCRBS.

**selective interrogation** With automated ATC systems, once aircraft acquired by computer, interrogation necessary only as radar scans exact sector containing that aircraft; if each transponder has its own (discrete) address code, computer can order interrogation on that code in particular sector, so transponders reply only when selected, number of replies cut by perhaps 99% and interference negligible (saturation avoided); two current systems are Adsel (UK) and Dabs (US).

**selective jamming** Jamming on single frequencies; often synonymous with spot jamming but can cover several specific frequencies.

**selective loading** Arranging cargo load to facilitate unloading in desired sequence.

**selective pitch** Early term for variable pitch.

**selectivity** Measure of ability of radio receiver to discriminate between wanted signal and interference signals on adjacent frequencies.

**selector** Manual demand input offering choice, eg \* valve may have four or more fluid-flow positions, flap \* may offer four or more settings, while landing-gear \* normally offers only two.

**selenium** Se, non-metallic crystalline element, density 4.8, MPT 217°C, high electrical resistance except when illuminated, thus used in photocells, resistance bridges and, with semiconductor properties, in rectifiers.

**seleno-** Prefix, of the Moon: hence \*-centric orbit, \*-id (lunar satellite), \*-logy (study of Moon).

**Self** Entry in a personal flying log book meaning the book's owner; can be written in capitals.

**self-aligning bearing** Ball (occasionally other forms) bearing with outer race having part-spheroidal track allowing variation in shaft attitude.

**self-bias** See *automatic grid bias*.

**self-contained night attack** Capability of single aircraft navigating by night to acquire and strike designated point target and return to base (USAF omits word 'point').

**self-destructing fuze** One designed to explode projectile before end of its flight.

**self-destruct** Ability of missile, RPV or similar air vehicle to explode into harmless fragments at particular time or geographical location.

**self-erecting** Of gyro, capable of erecting automatically after being toppled or started from rest.

**self-exciting** Generator's own current supplies magnet coils.

**self-FAC** To carry out entire surface-attack-mission without help of FAC or other aircraft giving aiming directions.

**self-forging fragment** Warhead which punches through thin top armour of AFVs: transverse disc of explosive converts disc of dense metal ahead of it into streamlined globule moving at over 9,000 ft (2,750 m)/s, its impact energy exceeding shear strength of armour.

**self-generated multipath effect** Multipath radio/radar problems caused by change in aircraft configuration, eg carriage of large stores.

**self-guided missile** One guided by means other than command.

**self-indexing** Automatically moving to the next operating position; thus a \* cartridge starter automatically readies the next cartridge.

**self-induced vibration** Caused by internal conversion of non-oscillatory to oscillatory excitation; also called self-excited vibration.

**self-induced wing rock** Sustained roll, with little or no yaw, in flight at high AOA by slender delta or aircraft with wing of low aspect ratio, caused by asymmetric shedding of LE vortices.

**self-inductance** Ratio of magnetic flux linking circuit to flux-producing current, ie e.m.f induced per unit rate of change of current; symbol L, unit henry, also webers per ampere; analogous to inertia in mechanical system.

**self-maneuvring stand** Airport apron arranged so that gate parking and departure are accomplished by aircraft taxiing under own power. Normally nose-in parking avoided, and gate parking is accomplished with fuselage approximately parallel to adjacent wall of finger or terminal.

**self-noise** Internally generated noise within system, esp. within sonar.

**Selfoc** Sheet electric-light focusing; patented (Nippon) two-component optical-fibre system.

**self-repairing** Having inbuilt ability automatically to adjust itself to best possible condition (eg operative channels, gain, feedback, power management) following any malfunction or damage.

**self-rescue system** Patented (Bell Aerospace) jet-propelled foldable parawing to enable combat aircraf to eject and fly to friendly area.

**self-sealing tank** Fluid, esp. hydrocarbon fuel, tank constructed with layer of soft unvulcanized synthetic rubber sandwiched between main structural layers so that combat damage causes leak, bringing fuel into contact with rubber, which swells swiftly to block hole.

**self stall** Self-induced stall brought about by inherent tendency when near stalling AOA to pitch-up, eg by stall

well outboard on swept wing with root still lifting strongly, thus progressively increasing nose-up tendency.

**self-sustaining speed** Gas-turbine rpm [typically 35% maximum] at which, during start cycle, external cranking is no longer needed.

**self-test** Sequential test program performed by equipment (usually electronic) upon itself to determine whether it is operating correctly and which subsystems or circuits are faulty. In advanced form pinpoints each fault to particular device or PCB and stops.

**selint** Selective interrogation; not a particular system but technique.

**SELR** Switchable eyesafe laser ranger [or rangefinder]; D adds designator.

**SELS** 1 Severe local storm[s].

2 Single-engine land and sea.

**selscan** Selective-call scanning.

**selyn** From self-synchronous, patented (US General Electric) synchronization system for transmitting remote compass indication to cockpit; fluxvalve current fed to three 120° coils driving central coil carrying indicator needle.

**selvedge** Woven edge of fabric from mill, does not unravel (US = selvage).

**SEM** 1 Scanning electron microscope, microscopy.

2 Space environment monitoring (or monitor).

3 Service engineered [in UK, engineering] modification.

4 Standard electronic [or system equipment] module.

5 Superconducting electrical machine (or machinery).

6 Society for Experimental Mechanics (US).

7 System engineering management.

8 Simple evaluation model.

**SEMA** 1 Special electronics mission aircraft (USAF).

2 Station engineering management aid (RAF, computerized maintenance management).

3 Smart electro-mechanical actuator.

4 Syndicat des Equipements et Matériels Aéronautiques (Paris).

**semaphore TVC** Thrust-vector control using oscillating blades pivoted to move across propulsive jet transversely and by partial blocking of flow path cause angular deflection.

**SEMC** Standard electronic-memory cartridge.

**SEM-E** Standard electronic module Format E.

**semi-active homing** Homing on to radiation reflected or scattered by target illuminated by radar forming part of system but mounted on fighter or surface platform, ie, not carried by the homing vehicle.

**semi-active landing gear** One in which the damping forces are controlled in response to the aircraft motion.

**semi-active missile** Missile whose guidance system includes a receiver only, to home on a target illuminated by a radar, laser, or other emitter located elsewhere.

**semi-angled deck** Carrier deck whose axis is at maximum diagonal angle permitted by original hull and deck without addition of large overhanging portion.

**semi-annular wing** Wing whose front elevation forms lower half of circle centred on fuselage or on each of two engine nacelles.

**semi-armour-piercing** Important category of gun-launched projectiles with AP properties conferred by high muzzle velocity and choice of materials but not relying entirely upon KE for penetration and with internal explosive charge. Some have added incendiary or tracer.

## semi-automatic gun

Sentai

**semi-automatic gun** One which ejects spent case and reloads but fires only upon command; same as repetition of single-shot.

**semi-automatic machine tool** Usually, one that must be commanded to begin cycle of operations but thereafter runs through that cycle to completion, thereupon awaiting next start order.

**semi-cantilever** Not defined; loose term often meaning a braced cantilever, as in many light-plane wings.

**semicircular separation** System of allocating cruise height in Airways and  $\geq 24,500$  ft (7468 m) amsl outside controlled airspace in IFR (outside UK, in most European countries VFR also). Typically magnetic tracks  $000^\circ$ – $179^\circ$  have one set of assigned FLs [such as odd 10s + 5] while  $180^\circ$ – $359^\circ$  have those in between. An exception is Italy, which divides  $090^\circ$ – $269^\circ$ / $270^\circ$ – $089^\circ$ .

**semiconductor** Electronic conductor whose room-temperature resistivity lies between that of metals and insulators (say, in range  $10^{-2}$ – $10^9$  ohm/cm) and which compared with metals has very few charge carriers, energy bands being full or empty (except for a few electrons or holes excited by heat in intrinsic \* or provided by impurity doped in extrinsic \*); n-type \* has free-electron (negative) charge carriers and p-type has free-hole (positive) charge carriers.

**semi-controlled mosaic** One made up of photographs on approximately same scale so arranged that major ground features match geographical co-ordinates.

**semi-hardened** Given some protection against nuclear attack, eg buried in ground but without concrete, or enclosed in concrete but not buried; aircraft shelters in NATO are an example at bottom end of hardening scale.

**semi-levered bogie** One whose rear bogie beam can be locked to the front half before takeoff to increase tail clearance on rotation.

**semiotics** Imparting information by signs and symbols.

**semi-monocoque** Structure in which loads are carried part by frame/stringer combination and part by skin. Almost all modern fuselages are of this type.

**semi-ogive** Sliced in half longitudinally [see ogive].

**semi-permanent runway** One paved with prefabricated metal by any of several standard methods.

**semi-rigid airship** Non-rigid with a single longitudinal member to assist in maintaining shape of envelope and distribute loads.

**semi-rigid rotor** Main lifting rotor of helicopter in which there are no hinges but flexible root behaves as leaf spring in vertical and horizontal planes to allow some freedom in flapping and lag modes.

**semi-rigid theory** Approximate treatment for elastic structure in which only finite number of degrees of freedom are allowed, each with one fixed mode.

**semi-sonic blading** Rotor blading (normally of axial compressor or fan) in which tips are just supersonic.

**semi-span** Half wingspan, theoretically measured from centreline but occasionally measured from side of fuselage, esp. in calculating wing bending modes. Symbol b/2.

**semi-stalled** Stalled over portion of total aerofoil while remainder continues with attached lifting flow.

**semi-transparent photocathode** Radiation, eg light, on one side produces photoelectric emission on other.

**SEMMS** Solar electric multimission spacecraft.

**SEMP** System(s) engineering management plan.

**Semtex** Plastic explosive, PETN plus syrene-butadiene copolymer.

**Senama** Société d'Encouragement pour la Navigation Aérienne au Moyens d'Appareils plus lourds que l'Air [1863, became SFNA] (F).

**Senap** Signal emulation of navigation and landing [translation from Czech].

**Sender** Self-navigating drone, expendable/recoverable (USN).

**SENEAM** CAA (1) Mexico.

**Senel** Single-event noise exposure level (see *noise*).

**Sengap** Small [jet] engine advanced program (Darpa).

**Sengo, SENGO** Senior Engineering Officer (RAF).

**senior pilot** Second-in-command of RN air squadron (UK).

**sense aerial** Fixed vertical receiver aerial with output same as maximum obtained from D/F or ADF loop and in phase with loop only over  $180^\circ$  to resolve  $180^\circ$  ambiguity of basic radio D/F method.

**sense indicator** Direct-reading to/from readout on VOR/ILS and similar panel instruments.

**sensible atmosphere** That part offering measurable aerodynamic resistance.

**sensible horizon** Circle of celestial sphere formed by its intersection with plane through eye of observer and perpendicular to local vertical.

**sensing** Removing ambiguity by sense aerial.

**sensitive altimeter** Pressure (aneroid) instrument more accurate than simple altimeter with aneroid stack, corrective adjustments and three-needle or counter-pointer readout; not as accurate as servo-assisted.

**sensitivity** Generalized term for output divided by input, eg instrument or system response per unit stimulus.

**sensitivity-level command** Instruction to TCAS [any type] to control threat volume.

**sensitivity time control, STC** Automatically reduces gain of weather radar as aircraft approaches cloud to avoid near clouds appearing brilliant and distant clouds faint; normally operates within radius of 45 km/25 nm.

**Senso** Sensor operator aboard ASW aircraft.

**sensor** According to DoD: 'A technical means to extend man's senses; equipment which detects and indicates terrain configuration, presence of military targets, and other man-made and natural objects and activities by means of energy emitted or reflected by such objects; energy may be nuclear, EM (visible and invisible portions of spectrum), chemical, biological, thermal or mechanical, including sound, blast and vibration'. Definition could be even broader; any transducer converting an input stimulus into a usable output. It is suggested there are three classes:

1 Input device for detecting and measuring vehicle motion and air data.

2 Device for graphically illustrating a remote object.

3 Device for detecting and precisely locating a target.

**SensorCraft** Concepts for high-altitude unmanned sensor platforms (USAF).

**sensor-enabled seat** Passenger seat sensitive to occupant behaviour and seat-belt status.

**sensor fusion** Automatic combination of outputs from different types of sensor into a single display.

**Sentac** Senso (tactical).

**Sentai** 1 Division or flotilla comprising aircraft of one or (usually) two carriers (Japanese Navy, WW2).

## sentence

2 Basic combat unit equivalent to UK wing or US group (Japan).

**sentence** In a repair and overhaul cycle, the crucial decision on each part: serviceable; repair and pool; or scrap and replace.

**SEO** Station Engineering Officer (RAF).

**SEOS** Stabilized electro-optical system.

**SEP** 1 Specific excess power.

2 Single-engine performance, or piston.

3 Separate, separation.

4 Safety and emergency procedures.

5 Strategic equity partner.

6 Single-event phenomenon.

7 Spherical-error probability.

8 Secondary electric power.

9 Solar-electric propulsion.

**Sepak** Suspension of expendable penails by kite.

**separated flow** Flow no longer attached to surface of immersed body.

**separated lift** Vortex lift.

**separation** 1 Breakdown of attached fluid flow round body into gross turbulence, occurring at particular time (stall) or place (\* point); possible to have sustained equilibrium with attached (laminar or turbulent) flow upstream and complete \* downstream.

2 Authorized lateral, longitudinal and vertical clearances (distances) between aircraft under positive control.

3 Severing of links between rocket stages or other fall-away sections, also called staging.

4 Time when (3) occurs.

5 Discharge, release from active duty (USAF).

6 Distance, along any axis or direction, between interceptor and target.

7 Periphery of ground sheet, where it lifts from the surface.

**separation distance** A particular meaning is straight-line distance from aircraft to detonation of its free-fall NW.

**separation manoeuvre** Energy-gaining manoeuvre at low-alpha, high thrust, to close (reduce) or extend (increase) separation in air combat.

**separation minima** Minimum longitudinal, lateral or vertical distances by which aircraft are spaced through application of ATC (1) procedures (FAA).

**separation motor** Thruster to assist separation (3).

**separation point** In 2-D flow, point at which velocity of boundary layer relative to body becomes zero and flow separates from surface.

**separation standards** ICAO term for separation (2) minima.

**separation test vehicle, STV** Air vehicle for assisting development of separation (3), esp. of tandem or wrap-round boost motors.

**separator** See *breather*.

**SEPC** Secondary electric-power contactor.

**SEPD** 1 Standard for the exchange of product data.

2 Secondary electric power distribution ; b adds box, c center, s system.

**Sepla, SEPLA** Sindicato Español Pilotos Lineas Aéreas [office, Madrid] (Spain).

**SEPM** Scanning electric-potential microscope [differs from SEM].

**SEPP** Stress evaluation prediction program.

**SEPS** 1 Solar electric propulsion system (or stage).

2 Supplemental electric power system.

## series

**SEPSTO** Single-engine protected short takeoff.

**SEPT** Synthetic environmental procedures [or procedural] trainer.

**SEQ** Sequence.

**sequenced doors** Landing-gear doors close after gear has been extended.

**sequenced ejection** 1 Automatic small delays are built in between events, eg canopy, stick, calf garters, seat, drogue, harness release etc.

2 Ejection from multiseat aircraft in which crew members are fired in close-spaced series, captain or aircraft commander last.

**sequence valve** Fluid-flow controller scheduled to perform series of actions in sequence, each completion starting that following. Common US term: sequencer.

**sequencing** Assignment by ATC or radar controllers of strict order in which aircraft under control are to proceed, eg by selecting arrivals from holding points and, with path-stretching if necessary, achieving correct time/distance separation as they join localizer.

**sequential collation of range, Secor** Long-base-line system for determining vehicle trajectory by phase-comparison of responses of vehicle transponder to interrogation by three ground stations.

**sequential computer** Connected in series with other equipment, eg SSR or air-defence radars, eg to predict conflicts and advise on courses of action.

**SER** 1 Service, served, serving.

2 Stop [at] end of runway.

3 Serial number, or series.

4 Snap experimental reactor.

**SERB** 1 Selective Early-Retirement Board.

2 Space-Experiments Review Board.

**SERC** Science and Engineering Research Council (UK).

**SERD** Support-equipment recommended data.

**SERE** Survival, evasion, resistance [or rescue] and escape (US joint services).

**SEREB, Sereb** Société pour l'Etude et la Réalisation d'Engins Balistiques (F).

**Serf** Studies of the economics of route facilities (ICAO).

**serial** 1 Element or group of elements within series given numerical or alphabetical designation; also that designation (DoD, NATO).

2 Numerical identity of particular hardware item, eg aircraft. Usually displayed on item concerned and recorded in all events concerning item (eg entered in pilot's log book, used as radio callsign in US and many other air forces).

3 In sequence as distinct from parallel; hence \* data, \* wiring.

**serial data** Successive signals passed over single wire or channel.

**serial number** See *serial* (2).

**serial rudders** Rudder made in front and rear portions, latter hinged to former and deflecting through greater angle (eg on Dash 7). Also called serially hinged.

**series** 1 General term for subdivision or group within a larger related group, eg aircraft type Halifax II Series 1A, in this case corresponding to block number, modification state and other national terms.

2 In routine sequence as in manufacture of successive identical articles, eg \* production, \* aircraft; in this context often redundant word.

## **series burn**

**3** Mathematical expression with sequence of terms having form  $a_1 + a_2 + \dots + a_n$ .

**4** Connected in succession on same line, wire or channel and thus all carrying same signal, current or flow. Thus a turbine bearing, rotor disc and OGV may be cooled by a single airflow in \*.

**series burn** Consecutive burns of single or multiple rocket motors, eg on Space Shuttle Orbiter.

**series loading** Addition of inductance in series to increase electrical length of aerial and reduce natural frequency of system.

**series modulation** Connection of modulator in series with amplifier.

**series/parallel redundancy** Connection of fluid pipes or other lines to give particular item (eg control valves of LMAE) choice of series or parallel redundancy, either on command or automatic and switched by sensed failure.

**series production** Manufacture of successive identical (or near-identical) articles.

**series redundancy** Connection of two or more similar items, eg control valves, in series so that failure of one does not imperil functioning system.

**series resonant circuit** One in which inductances and capacitances are connected in series.

**series servo** Servo located in control system so that its output adds to that of a major input. Commonly used with SAS actuators to superimpose controls on primary commands without motion at major input.

**series yaw damper** One connected into rudder circuit at PFCU, driving surface only but having no effect upstream and thus not felt at pedals; may be operative at all times, including takeoff and landing.

**SERL** Services Electronics Research Laboratory (UK, MoD PE, Baldock).

**SermeTel** Coating systems [notably Process 2000] comprising aluminium-filled ceramic basecoat [sacrificial] and inert glossy-ceramic top-coat.

**SERN, Sern** Single-expansion ramp nozzle.

**Serno** Serial number.

**serpentine inlet** Shaped to prevent hostile radars from 'seeing' the engine.

**Serrate** Family of similar passive receivers carried by night intruders and giving bearing of hostile night-fighter radars (RAF, WW2).

**serrated skin joint** Having a sawtooth edge to minimize radar cross-section.

**SERT** Space electric (or electrostatic) rocket test.

**SERV** Safety enhanced re-entry vehicle.

**Service** See *service* (2).

**service** *1* Use, employment for design function; thus squadron \*, line \* (civil airline) etc.

*2* Major branch of national armed forces.

*3* To carry out routine maintenance and replenishment.

*4* Facility offered to aviators, eg radar \*, ATC \*.

**service area** *1* Geographical extent of coverage of radio navaid or other surface-based electronic system.

*2* Part of airfield assigned to routine servicing.

*3* Part of airfield dedicated to support services, eg crash/fire/rescue, transport vehicles, trolley and stairway parking, etc.

**Service Bulletin** Advisory notice issued by manufacturer of aircraft, engine or equipment alerting operators to actual or predicted faults which require rectification, remedial maintenance or design modification. Some are

## **servo-assisted altimeter**

prefaced mandatory, but, unlike ADs, SBs cannot be legally enforced.

**service ceiling** Basic performance parameter for (usually military) aircraft; height which maximum rate of climb has fallen to lowest value practical for military operations, in UK and US traditionally equal to 100 ft/min.

**Service Deviation** Temporary permitted deviation from MAR to meet urgent OR covering a modification which should eventually be subject to MAR procedures. Aircraft airworthiness under SD is responsibility of the user Service (UK forces).

**service door** Door in aircraft outer skin covering a maintenance or control panel, eg for cargo loading.

**service engineering** Function of determining integrity of materiel and services to measure and maintain operational reliability, approve design changes and assure conformance with approved specifications and standards (USAF).

**service load** "The total weight of crew, removable armaments and equipment normally carried" (UK usage, 1920–40).

**service loads** Structural loads actually met in service.

**Serviceman** Member of the armed forces (UK origin); need for Servicewoman is suggested.

**service module** Major element of spacecraft supplying secondary power and consumables.

**service stand** Place assigned to a particular flight (7); can be gate position or marshalled location on distant apron. Some servicing is normally performed here before departure.

**service tank** Fuel tank located near engine to which fuel from other tanks is pumped and from which fuel is supplied to engine (arch.).

**Service Technique** See *STAé*.

**service test** Test of hardware or technique under simulated or actual operational conditions to confirm satisfaction of military requirements.

**service-test model** Model (full-scale item is implied) used to determine characteristics, capabilities and limitations under simulated or actual service operational conditions (ASCC).

**service tower** Tower used to afford access to whole length of tall (eg ballistic or Shuttle) vehicle before liftoff; generally synonymous with gantry.

**service transport unit** Installation conveying electric and hydraulic (in some cases pneumatic) power and a wide range of liquids across apron-drive bridges to aircraft.

**servicing** To carry out service (3).

**servicing appraisal exercise** Formal study of servicing of particular hardware item (eg combat aircraft) in simulated combat conditions, to yield job times, difficulties, conflicts and shortcomings and make recommendations (UK usage).

**servicing instruction** Issued to remedy or prevent defect in military hardware item when action required may be urgent and recurrent (UK usage). May be issued when defect is suspected but not confirmed; roughly equivalent to Airworthiness Directive.

**serving cord** Usually seven-strand machine cord, used for wrapping control-cable splices.

**servo** Servomechanism, but now word in own right.

**servoactuator** The actuator in a servomechanism.

**servo-assisted altimeter** Pressure altimeter in which capsule movement is measured by sensitive EM pick-off

## servo-assisted controls

whose output is amplified and used to drive motor geared to display.

**servo-assisted controls** See *servocontrols*.

**servocontrols** Not defined, and not recommended. BSI definition: a control devised to reinforce pilot's effort by a relay. A US definition: a \* is practically identical to a trimming tab. Appears to be general vague term for primary flight controls (not mentioned in BSI) where surface deflection is produced by force other than, or additional to, that of muscles. Such added force may come from PFCU or various types of tab (see *servotab*).

**Servodyne** Registered (Automotive Products/Lockheed UK) family of pioneer PFCUs with mechanical signalling and hydraulic output.

**servoed** Operated by servo.

**servo link** See *servo loop*.

**servo loop** Control system in which human input is amplified by servomechanism provided with feedback so that, as desired output is attained, demand is cancelled.

**servomechanism** Force-amplifying mechanism such that output accurately follows input, even when rapidly varying, but has much greater power. Motions can be rotary but usually linear, and can be controlled by input only (open-loop) or by follow-up feedback (closed-loop) forming servo loop. Essential feature is that \* constantly compares demand with output, any difference generating an error signal which drives output in required direction to reduce error to zero.

**servomotor** Rotary-output machine providing power locally; not necessarily part of servomechanism.

**servo optical mechanical** Modelling program for IR ray tracing.

**servo rudder** Auxiliary rudder driven directly by pilot's pedals and moving main rudder by twin cantilever beams attaching \*\* to trailing edge of main surface. Common 1922–38. Precursor of servo tab but not a servomechanism.

**servo system** Servomechanism with feedback.

**servotab** Tab in primary flight-control surface moved directly by pilot to generate aerodynamic force moving main surface.

**SES** 1 Surface-effect ship.

2 Shuttle engineering simulator.

3 Software exploitation segment (JSIPS).

4 Single-event signal.

5 Secure equipment system.

6 Stored-energy system.

7 Support-equipment summary.

8 Société Européenne des Satellites (Luxembourg).

9 Single-engine seaplane.

10 Single European Sky.

11 Space environment simulator.

12 Small-eddy simulation.

13 Space Exploration Squadron (USAF).

**SESA** Society for Experimental Stress Analysis [office, Westport, CT] (US).

**Sesame** Pronounced sessamy [from "Aladdin"], the initial Single European Sky initiative, which explored the possibility of redefining the airspace of the existing 35 ANSPs into a seamless whole; see next (EU, 2000–05).

**Sesar** Single European Sky ATM [air-traffic management] research; new initiative of national governments, ATM service providers [especially Eurocontrol], air oper-

ators and industry, first meeting Brussels 17 November 2005, completion target 2020. (EU).

**SESC** Special environmental sample container.

**SESMA** Special-event search and master analysis.

**SESP** Space Experiment Support Program (USAF).

**Sespo** Support Equipment Systems Project Office.

**sesquiplane** Biplane whose lower wing has less than half area of upper.

**SESS** 1 Space environmental support system.

2 Session.

**Sessia** Société d'Etudes de constructions de Souffleries, Simulateurs et Instruments Aérodynamiques (F).

**SET** 1 Split engine transportation (fan and core travel as two items).

2 The Space Education Trust (RAeS).

3 Science, engineering and technology.

**set** 1 Drift (US, suggest arch.).

2 To place storage device, binary cell or other bistable switch or gate in particular state; condition thus obtained.

3 Complete kit of special tools and/or parts for particular job, eg field modification; also called shop \*.

4 Permanent deflection imparted by straining beyond elastic limit, esp. lateral bending of saw teeth.

5 Hand tool/hammer for closing rivets (rare in aerospace).

**SETA, SE/TA** Systems [or scientific and] engineering technical assistance.

**Setac** German augmented sector-Tacan system used as precision approach aid.

**setback** Distance from mould line (edge) and bend tangent line to allow for radius of bend in sheet metal-work.

**SETD** Scheduled ETD.

**SETE** Supersonic expendable turbine engine.

**SETI** Search for extraterrestrial intelligence.

**SETL** Single-event threshold level.

**Setnet** Science, Engineering, Technology, Mathematics Network [office, London WC2R 3ER] (UK).

**SETO** Single-engine takeoff.

**SETOLS** Surface-effect takeoff and landing system.

**set-on** Assignment of offensive electronics, especially ECM jammer, to counter a particular threat, specifying frequency, signal modulation and, if possible, direction.

**SETP** Society of Experimental Test Pilots [1955–; office Lancaster, CA93584–0986] (Int.).

**SETR** Specific Equipment Type Rating (NATS engineers).

**SETS** 1 Seeker evaluation test system.

2 Severe-environment tape system.

**setting** Angle of incidence of wing, flap, tailplane (or trimmer) or other surface.

**setting hammer** See *peening*.

**setting the hook** Preventing roll reversal in air combat by centralizing stick and using rudder.

**settling** Sink of helicopter on takeoff (if pilot does not increase collective) caused by lift ceasing to exceed weight as rotor rises out of ground effect.

**settling chamber** Section of wind tunnel upstream of working section in which large increase in cross-section results in great reduction in flow velocity and allows turbulence to die out before acceleration into working-section throat.

**SEU** 1 Sensor, or sight, or seat, or system, electronics unit.

- 2 Stores ejector unit.  
 3 Single-event upset.
- SEV** 1 Surface-effect vehicle, usually synonymous with ACV.  
 2 Severe.  
 3 Synthetic[ally] enhanced vision.
- Seval, SEVAL** Sensor EW Tactical Evaluator (USN).
- seven-bar format** Standard format for presenting alphanumeric numerals in electronic displays, all numerals being created by illuminating some of four vertical and three horizontal bars (eg LEDs).
- 7 by 19** Standard high-strength steel cable made up of seven strands each of 19 twisted wires.
- 7 by 7** Standard steel cable made up of seven strands each of seven twisted wires.
- seven flyings** Seven types of flight by dead reckoning, two plane (plane and traverse) and five spherical (composite, great circle, Mercator, middle-altitude and parallel) (US usage, arch.).
- 720° precision turn** Standard US training manoeuvre; two complete circles flown at full power at as near as possible constant height at bank angle of 60°.
- 1760** Standard interface for air-launched stores and other external loads (DoD).
- 7500** International transponder code 'I am being hijacked'.
- Severe Weather Avoidance Plan** Approved plan to minimize ATC disruption caused by occasional need to re-route traffic to/through impacted terminal and/or ARTCC areas (FAA).
- SEVIRI, Seviri** Spinning enhanced visible IR imager.
- SEVVA** Security Evaluation, Validation and Verification Agency (UK).
- Sewaco** Sensor weapon command and control system.
- SEWS** Satellite early-warning system.
- SEWT** Simulator for electronic-warfare training.
- S<sub>exp</sub>, S<sub>EXP</sub>** Exposed wing area.
- sextant** Optical instrument for measuring altitude of celestial bodies.
- Seybolt** Hand tester of aircraft fabric which measures force required to punch a controlled hole.
- SEZ** Selector engagement zone.
- SF** 1 Signal frequency (often s.f.).  
 2 Scheduled freight.  
 3 Stick force.  
 4 Secondary/final talkdown [S/F preferred].  
 5 Special Forces (USA).  
 6 Standard form.  
 7 Sampling frequency.  
 8 Shear force.
- S/F** 1 Ratio of system operating time divided by flight hours.  
 2 Secondary final talkdown.
- SFA** 1 Société Française d'Astronautique (F).  
 2 Sous-direction de la Formation Aéronautique (F).  
 3 Sintered ferrite absorber (RAM).  
 4 Single-frequency approach.
- SFACT** Service de la Formation Aéronautique et du Contrôle Technique; responsible for civil aircraft and aircrew licensing (F).
- SFAR** Special Federal Aviation Regulation[s] (US).
- SFC** 1 Simulated flight cycle[s].  
 2 Surface (ICAO).  
 3 Side-force control.
- 4 School of Fighter Control (RAF Boulmer).  
**sfc, s.f.c.** Specific fuel consumption.
- SFCA** Service des Fabrications du Commissariat de l'Air (F).
- SFCC** 1 Side-facing crew cockpit, ie has flight engineer panel.  
 2 Slat/flap control computer[s].
- SFCS** 1 Survivable flight-control system, USAF/McDonnell FBW programme of 1968.  
 2 Safety flight-control system; protects aircraft (eg Concorde) against excessive AOA or jammed control column.  
 3 Secondary flight-control system.  
 4 Simplified fire-control system.
- SFD** 1 Simple formattable document, immediately ready for message transmission.  
 2 Special Forces Directorate (UK).  
 3 Squeeze-film damper.
- SFDAS** Société Française de Droit Aérien et Spatial (F).
- SFDB** Superplastic forming and diffusion bonding; important manufacturing technique in which structure is welded from sheet into gas-tight envelope and then inflated in heated mould until diffusion-bonded into desired shape.
- SFDC** Satellite Field Distribution Center (NMC).
- SFDF** Subsystem fault-detection function.
- SFDO** School of Flight Deck Operations (UK).
- SFDR** Standard flight-data recorder.
- SFDS** Secondary, or standby, flight-display, or flight-data, system.
- SFE** 1 Supplier, or seller-, furnished equipment.  
 2 Sensor front end; / GA adds gimbal assembly.
- SFEA** Survival and Flight Equipment Association (UK).
- sferics** Study of atmospheric radio interference, esp. from met. point of view; sometimes spelt spherics.
- SFF** 1 Self-forging, or forming, fragment.  
 2 Svensk Flughistorik Forening (Sweden).
- SFFL** Standard foreign fare level (IATA).
- SFG** Standby flight group [display].
- SF/g** Stick force per g.
- SFI** Special flying instruction (CAA).
- SFIRR** Solid-fuel integrated rocket/ramjet.
- SFK** Aramid (spider-fibre) reinforced plastics composite (G).
- SFL** 1 Safe fatigue life.  
 2 Sequenced flashing light[s].
- SFLOC, SFloc** Synoptic filing of location, of sources of atmospherics.
- SFM** 1 Sensor-fuzed munition.  
 2 Self-forging munition.  
 3 Surface feet per minute [machining].
- SFMR** Stepped-frequency microwave radiometer.
- SFNA** Société Français de Navigation Aérienne [formed 1863 by merger of Senama and Sd'A] (F).
- SFNP** Stick-fixed neutral point.
- SFO** Simulated flameout.
- SFOC** Space flight operations center.
- SFOCS** Single fibre optical communications system.
- SFOF** Space Flight Operations Facility, part of DSN.
- SFOR** Stabilization Force (NATO).
- SFOV** Sensor field of view.

**SFPA** Staring focal-plane array; hence SFPAS adds seeker.

**SFPCA** Society for the Preservation of Commercial Aircraft (US).

**SFPD** Smart flat-panel display.

**SFPM** Surface feet per minute; linear speed measure for machining or grinding.

**SFPMAC** Société Française de Physiologie et de Médecine Aéronautique et Cosmonautique [office, Paris 75996] (F).

**SFXML** Structured full-text query language.

**SFR** Stepped-frequency radar.

**SFRJ** Solid-fuel ramjet.

**SFRM** Total hours since factory remanufacture.

**S<sub>FRR</sub>, S<sub>frr</sub>** Distance from brake-release to recognition and reaction to engine failure.

**SFS** 1 Side-force surface.  
2 Simulator/fallback system.

**SFSO** Station Flight-Safety Officer (RAF).

**SFSS** Satellite field service station.

**SFT** 1 Satellite field terminal.  
2 Standard food trolley (loaded, 136 kg, 300 lb).  
3 Surface friction tester.

**SFTTE** Society of Flight Test Engineers; [office, Lancaster CA93539–4047, with a European chapter based at Boscombe Down, SP4 0JF, UK] (Int.).

**SFTS** 1 Service flying training school.  
2 Spaceflight telecommunications system.  
3 Synthetic flight training system.

**SF21** Safe Flight 21, three-year [1999–2001] programme to demonstrate Free Flight, using ADS-B and TIS-B (FAA).

**SFU** Suitable for upgrade.

**SFUV** Self-filtered ultra-violet.

**SFW** Sensor-fuzed weapon(s).

**SFWA** Smart fixed-wing aircraft.

**SG** 1 Specific gravity, or s.g.  
2 Spheroidal-graphite (cast iron).  
3 Screen grid.  
4 Shell gun, = cannon.  
5 Sortie generation, or sorties generated.  
6 Schlachtgeschwader, close-support attack wing (G, WW2).  
7 Symbol, or signal, generator.  
8 Snow grains.  
9 Study group.  
10 Synchronization gap [Arinc 629].

**S<sub>g</sub>** Ground roll in normal takeoff.

**s.g.** 1 Specific gravity.  
2 Shell [-firing] gun.

**SGA** Silicon gate array.

**SGAC** Secrétariat Général à l'Aviation Civile [C adds 'Commerciale'] (F).

**SGAD** Supersonic global attack demonstrator (US AFRL).

**SGC** 1 Symbol-generator computing.  
2 Swept gain control.  
3 Smoke-generator cartridge.

**SGCAS** Study Group on Certification of Automatic Systems.

**SGCI** SG cast iron.

**SGD** 1 Synthesized, or smart, graphic display[s].  
2 Secretary-General for Defence; I adds Investment.

**SGDF** Shaft- and gear-driven fan.

**SGDN** Secrétariat Général de las Défense Nationale [Paris, F-75700] (F).

**SGDP** Selected ground delay program(me); departures causing overload at congested arrival fix are manually assigned chosen later departure time.

**SGDU** Smart graphic display unit.

**SGE** USAF Support Group Europe (RAF Kemble).

**SGEMP** System-generated electromagnetic pulse.

**SGF** Second-generation Flir.

**SGFNT** Significant.

**SGI** Silicon graphics image [generator].

**SGIT** Special-group inclusive tour.

**SGL** 1 Signal (ICAO).  
2 Static ground line.

**SGLS** Space ground link subsystem (USAF).

**SGLV** Second-generation launch vehicle.

**SGME** Self-generated multipath effect.

**SGML** Standard generalized markup language.

**SGN** Standing Group NATO.

**SGP** Smart graphics processor.

**SGR** Sortie-generation rate.

**SG Rep** Standing Group Representative.

**SGS** 1 Surface guidance system.  
2 Sub-grid scale.  
3 Satellite ground system, or station.

**SGSI** Stabilized glideslope indicator.

**SGT** Satellite ground terminal.

**SGU** Signal-generator unit.

**SH** 1 Showers (ICAO).  
2 Support helicopter.

**SH/H** Sample and hold; maintains present analog velocity until next sampling.

**SHA** 1 System hazard analysis.  
2 Sidereal hour angle.  
3 Swiss Helicopter Association.  
4 Sea height anomaly.

**shack** Verb, to score direct hit (colloq.).

**shackle** 1 Loosely used in conventional sense to mean link attaching dropped stores to carrier or rack; not recommended.  
2 To swap places to enable a pair to exploit tactical situation.

**Shade** Shared data environment.

**Shadow** Subsonic hovering armament direction and observation window (UAV).

**shadow** 1 Wingman ordered to stick close to leader in all circumstances.  
2 To duplicate all functions of a manufacturing plant to provide exact second source.

**shadow box** Compartmented container for kit of parts (lean manufacturing).

**shadow factor** Multiplication factor derived from Sun's declination, target latitude and time in determining object heights from reconnaissance picture shadows; also called tan alt.

**shadow factory** Manufacturing plant built and owned by government but managed by selected industrial company to duplicate production of urgently required weapon or product.

**shadowgraph** Technique, or photograph made by it, in which point-source light is focused parallel through tunnel working section and on to film; density gradients are visible as changed tonal values, proportional to

## shadowing

second derivative of refractive index (Schlieren = first derivative).

**shadowing** Interference with an LOS communications channel caused by parts of the aircraft.

**shadow-mask tube** Three-colour TV tube with three guns projecting red/green/blue beams through mask with about 500,000 holes.

**shadow region** Region where EM signals, eg radio or radar, are poorly received, usually because of LOS difficulties.

**shadow shading** Aircraft camouflage (UK, 1936-39).

**shadow squadron** Identity which a flying-training unit would assume in war or national emergency (RAF).

**Shaef** Supreme HQ Allied Expeditionary Force (NW Europe 1944-45).

**Shaft** Smart hard-target attack fuzing technology.

**shaft** Transmitter of torque joining two rotating assemblies, such as a turbine and compressor. In a 3-\* engine the LP [fan] \* passes down the engine centreline inside the IP \*, which in turn is surrounded for part of its length by the HP \*.

**shaft horsepower** Horsepower measured at an engine output shaft, ignoring potentially useful energy in the efflux. Also called torque hp and brake hp. Numerically  $2\pi nQ$  where n is rpm and Q drive torque.

**shaft power** Power available from rotating shaft, = torque  $\times$  rpm.

**shaft speed** Rate of rotation, rpm or rad s<sup>-1</sup>; see *rotational speed*.

**shaft turbine** Turboshaft engine, gas turbine providing power at an output shaft, in some cases driven by free turbine.

**shaker** 1 See *vibration generator*.

2 See *stick\**.

**shaker speed** IAS at which stick shaker is triggered.

**shake-table test** Any of various standard test schedules for delicate items conducted on vibration generator to simulate vibration in service (according to USAF 'during launch of missile or other vehicle').

**shale fuel** Aviation jet fuel, notably JP-4, derived from oil-bearing shales.

**shall** Shipborne [or shipboard] helicopter approach and landing lighting.

**Shamal** NW wind bringing dust storms [Inaq].

**Shanicle** Radio guidance system of hyperbolic type used on TM-61B cruise missile 1954: name from short-range navigation vehicle.

**shank** Inner portion of some propeller blades where section is not aerofoil but circular.

**Shape** Supreme HQ Allied Powers Europe [Belgium B-7010] (Int.).

**shape** Appearance of electronic (eg radar) signal pulse when plotted in form of amplitude against time. This shape is not related to electronic shaping.

**shaped-beam aerial** One emitting beam whose main lobe is shaped by electronic phasing.

**shaped charge** Hollow charge; warhead whose target-facing surface has form of re-entrant cone to generate armour-piercing jet.

**shaped-charge accelerator** Propulsion system using a shaped-charge propellant, a near-explosive, to achieve highest possible speed of man-made object in atmosphere after prior acceleration by rockets.

## shear plan

**shaped sonic boom** Wavefront tailored for rapid attenuation, so that it does not extend to Earth's surface.

**shaper** Machine tool having single unidirectional cutter with horizontal (occasionally vertical) reciprocating action.

**shaping** Particular electronic meaning is tailoring shape of pulses or signal waveform, eg to assist manual command guidance of RPV or missile.

**SHAR, Shar** Shriharikota Range (India).

**Share** Swedish highly advanced research configuration (UAV).

**shared aerial** One used by several receivers.

**Shares** Shared airline reservations system (LA-based).

**Shark** Silent hard-kill [effective against switched-off radars].

**shark's tooth** Several definitions including "a Cuban with straight lines and sharp corners".

**Sharp, SHARP** 1 Standard hardware acquisition and reliability program, which has addressed all military electronics packaging, including shift from DIN to NAC connector system (US).

2 Strapdown heading and attitude-reference platform.

3 Shared reconnaissance pod.

4 System-oriented high-range-resolution automatic target-recognition program (USAF).

**sharp-edged gust** Gust characterized by high rate of change of vertical air velocity per unit horizontal distance at particular place, thus aircraft encounters full gust vertical velocity almost instantaneously.

**Shars** Strapdown heading and attitude reference system.

**shaving** Finishing machine-tool cut removing very small amount of metal; hence shave die, female die with cutting edges for finish-cutting cams etc.

**SHBL** Solid hydrogen, boron lattice.

**SHC** Synthesized hydrocarbons.

**shear** Stress in which parallel planes of loaded material tend to slide past each other; hence also deliberate cutting action by cutting edges which slide past each other.

**shear centre** Of a wing, axis about which wing deflects in torsion, also called flexural centre of elastic axis.

**shear force** Vertical load, especially on the fuselage, usually integrated from tail to nose along the longitudinal axis.

**shearing** Cutting workpiece or material by shears without formation of chips.

**shear lag** Structural stress diffusion in which lag of longitudinal displacement of one part of longitudinal section relative to another is result of shear applied parallel to length of structure.

**shear load** Load (force) applied in shear, eg of engine pod on wing spar.

**shear modulus** E<sub>s</sub>, modulus of rigidity, approximately half modulus of elasticity.

**shear neck** Local reduction in diameter or wall-thickness of a shaft to ensure that, in event of sudden increase in load [eg from something jamming gear teeth], failure will occur at this point.

**shear nut** Thin nut used on bolt where load is entirely in shear, merely to retain bolt.

**shearout** An interconnection or axle [eg in powered flight control] designed to break if overloaded.

**shear plan** Lofting plan of body, eg fuselage, flying-boat

**shear rate**

hull, showing half-sections as numerous transverse planes.

**shear rate** Vertical wind gradient, often measured in kt per 1,000 feet.

**shear slide** Free-sliding piston moved by pressurant along length of propellant tank to force liquid propellant into (usually rocket) engine.

**shear spinning** Method of forming solid rocket case from preformed thick tubular billet by rolling against rotating mandrel, using two rollers 180° apart, normally performed at room temperature.

**shear strength** Stress required to produce fracture in plane of cross-section by two opposed forces with small offset.

**shear stress** Component of any stress lying in plane of area where stress is measured; for fluid, equal to

$\tau, \mu \frac{du}{dy}$  (see *Newton's laws*). Existence of \*\* in fluid is

evidence of viscosity. Integrated over an area = *skin friction*.

**shear wave** Wave in elastic medium causing any element of medium to change shape but not volume; in isotropic medium a transverse wave, mathematically one whose velocity field has zero divergence.

**sheath** 1 Metal tip, and often leading edge, to soft-blade propeller; also called tipping.

2 Envelope of plasma surrounding re-entry body.

**sheathing** See *sheath* (1).

**SHEB** Solid hydrogen, embedded boron.

**shed** Traditional term for shelter (hangar) for aerostats, esp. airship.

**shedding** 1 Action for removal of ice from aircraft in flight, rain from windshield (windscreen) and non-vaporised material separated from ablating surface on re-entry.

2 Rapidly repeated generation and release of vortices from alternate sides of an object in a fluid flow.

**sheep dipping** Process whereby CIA pilots were given fully documented false professional backgrounds.

**sheer lines** Outlines of vertical sections of fuselage [or, especially, hull or float] parallel to longitudinal axis.

**sheet** Standard form of raw material; in case of metal, uniform sheet not over  $\frac{1}{8}$  in (0.125 in, 3.175 mm) thick; thicker metal = plate.

**sheet moulding compound** 2-D fibre-reinforced plastics not needing complex laying-up procedure.

**SHEL** Surrogate high-energy laser (ABL).

**Shelf** Super-hard, extremely low frequency; military communications system.

**shelf** 1 Figurative location where items are stored before use; thus \* life, published maximum period during which item will not deteriorate in suitable storage; off-the-\*; standard commercial product already available.

2 Spanwise strip[s] hinged to leading edge of movable surface and to trailing edge of fixed structure [eg elevator/tailplane]; see compound \*.

3 Longitudinal beams outboard of fighter engine[s] carrying tailplanes.

**shell** 1 Bare monocoque structure, eg fuselage or nacelle; shade of meaning includes thin-skinned and deformable, thus engine carcase excluded. Some definitions state 'curved'.

2 Ordnance projectile launched from gun or other tube, with or without own propulsion, and containing explosive, incendiary or other active filling; calibre normally

greater than 20 mm. Word also applicable to AP projectiles of such calibres.

3 Supposed hollow spheres at different radii from atomic nucleus occupied by electrons, 2 in innermost \*, 8 in next, 18 in next etc, all electrons in each \* sharing similar energy level.

**shellac** Naturally derived resinous varnish.

**shell curve** Plot of control effectiveness [X-axis] against control damping [Y].

**Shelldyne** Family of related synthetic fuels developed by Shell for USAF expendable turbojets, mainly characterized by high energy per unit volume.

**shelter** 1 Unhardened (generally recessed or underground) accommodation for civilians faced with air attack, in some cases attempting to offer some protection against nuclear attack (fallout \*).

2 Unhardened reinforced-concrete structure accommodating (usually single) combat aircraft at dispersal and offering protection against conventional attack, eg Tab-Vee.

**shelter marshal** Officer in charge of security and movements within HAS, HPS or PBF.

**Sheradizing** Anti-corrosion treatment similar to case hardening but employing Zn dust.

**Sheridan tool** Family of large stretch-presses often able to apply double curvature to thick plate.

**SHF** Support helicopter force.

**s.h.f., SHF** Super-high frequency (see Appendix 2).

**SHFE** 1 Sustained hypersonic flight experiment (UK).

2 Small heavy-fuel engine.

**SHFT** Shift.

**SHGR** Hail shower.

**SHGS** Small hail or snow pellets.

**SHI** Standby horizon indicator.

**Shi** Experimental number, with numerical prefix for year of Emperor's reign; thus 16-\* = 1941 (Japanese Navy, 1931-45).

**shield** See *shielding* (1).

**shielded bearing** Ball/roller/needle race with metal ring on each side to reduce ingress of dirt.

**shielded cable** See *screened*.

**shielded configuration** Aircraft deliberately designed so that parts of major structure, eg wing, are often interposed between sources (of noise or IR radiation) and ground observers or defences.

**shielding** 1 Material of suitable thickness and physical characteristics used to protect personnel from radiation during manufacture, handling and transport of radioactive and fissionable materials (DoD, NATO).

2 Obstructions which tend to protect personnel or materials from effects of NW (DoD).

3 Design philosophy of installing crucial parts of primary structure, whether damage-tolerant or otherwise, as far as possible behind others or in some other way geometrically protected from in-service damage.

4 See *screen* (4) (US usage).

5 Structural and other methods used to protect space-craft from serious consequences of micrometeorite impact. Hence \* factor, the ratio of shielded to unshielded construction.

**shift** 1 Ability to move origin of radar P-type display away from centre of display; limit of \* usually to periphery.

2 See *fuel* \*.

**shim**

**shim** Thin spacer, from piece of paper (usually unacceptable) to large precision part tailored to specific application, to fill gap or adjust separation between parts; examples, to obtain exact rig (1) neutral and full-deflection settings of powered flight control surface, and to adjust separation of two ends of recirculating ball screwjack so that when bolted together balls have no play and no friction.

**shim, shimming** To remove small amount of material to improve fit between mating surfaces [opposite of previous].

**shimless assembly** Maintenance of such manufacturing accuracy as to eliminate need for shims [objective in V-22 programme].

**shimmy** Rapid lateral angular oscillation of a trailing castoring wheel running over surface where coefficient of friction exceeds critical value, cured by twin-tread tyre or proper design of landing gear; usually affects unsteered nosewheel or tailwheel (or supermarket trolley).

**shimmy damper** Add-on damper, usually with pneumatic/hydraulic dashpot, resistant to rapid variation of castor angle.

**Shingals** Supplementary high-intensity narrow-gauge approach landing system.

**shingles** Refractory skin panels able to oversail each other at the edges as they expand [eg on Earth re-entry].

**shingling** When the clapper of a fan blade overrides its neighbour.

**shiny switch** Cockpit button, or switch in constant use (colloq.).

**Ship** Software/hardware implemented partitioning.

**ship** Aeroplane (US, colloq., suggest archaic).

**shipboard aircraft** Aircraft designed to operate from surface vessel or submarine, including marine aircraft and rotorcraft (eg rotor-kite). Some definitions equate term with land aeroplane based on carrier.

**shipboard rolling vertical landing** Arrival on carrier deck by STOVL aircraft with considerable airspeed [reduces propulsion-system stress and increases bring-back load].

**shipborne aircraft landing system** Tracks helicopter from ship, and cockpit display guides pilot in radio silence.

**shipment** Complete consignment of hardware (probably not conveyed by ship), eg from manufacturer to operator or logistic base to user unit.

**ship-plane** Imprecise; most definitions restrict term to land aeroplane for operation from deck of carrier but USN includes catapulted seaplanes formerly used from surface warships.

**ship-set** Complete inventory of particular items for one aircraft.

**shirtsleeve environment** Popular and often true description of desired environment in high-flying aircraft and spacecraft in which human performance is improved if special clothing does not have to be worn.

**SHK** Space hit-to-kill (NMD).

**SHLD** Shaped-hole laser drilling.

**SHLW** Shallow.

**SHM** Simple harmonic motion.

**SHNKUK** Roman initials of Society of Japanese Aerospace Companies.

**SHNMO** Shape host-nation management office (NATO).

**shoals** Scanning hydrographic operational airborne lidar survey.

**shock softening**

**Shoc** Standoff high-speed option [or operation] for counterproliferation.

**shock** 1 Shockwave.

2 Single large-energy pressure wave (see *shock front* (2)).

3 Often used to mean impact, single large externally applied impulse causing acceleration.

**shock-absorber** Device for dissipating energy by resisting vertical movements between landing gear (wheels or floats) and aircraft when running across surface, usually with unidirectional quality to reduce rebound and bounce (see *oleo*); other methods include simple steel or composite leaf springs, steel ring springs, rubber blocks in compression and bungee in tension.

**shock body** Streamlined volume added (eg on rear of wing) to improve area-rule distribution; also called Whitcomb body, Küchemann carrot, speed bump, etc.

**shock cloud** Localized cloud caused by violent changes in flow conditions in close proximity to supersonic aircraft, notably in Prandtl-Meyer expansions, eg over wing and canopy.

**shock compression** Fluid flow compression occurring virtually instantaneously in passage through shockwave; for normal shock, ratio of pressures  $p_1/p_2 = 7M^2/6-1/6$  where M is initial Mach.

**shock cord** See *bungee*.

**shock diamonds** Approximately diamond-shaped reflections, brilliantly luminous in hot jet (eg from rocket or afterburner), caused by reflection of internal inclined shocks from edge of jet at boundary with atmosphere.

**shock drag** That drag associated with a shockwave (which always causes loss in total or static pressure), normally varying as fourth power of velocity or pressure amplitude.

**shock excitation** Generation of oscillations in circuit at natural frequency by external pulses, eg for sawtooth generation.

**shock expulsion** Faulty operating condition of inlet to supersonic airbreathing engine in which, for various reasons, gross flow breakdown occurs and inlet shock system is expelled forwards; accompanying large and possibly dangerous increase in drag. Often used synonymously with inlet unstart.

**shock front** 1 See *shockwave*.

2 Boundary between pressure disturbance created by explosion (in air, water or earth) and ambient surrounding medium.

**shock isolator** Device, usually mechanical and assembled from solid parts such as deformable rubbers/plastics or metal deflecting well within elastic limit, which absorbs input movements (eg to accommodate input vibration while keeping output still) or cushions large impacts (by permitting output to travel over a distance which absorbs energy within permitted limits of acceleration). Thus, some absorb vibration, usually of small amplitude, while others absorb shock, which in case of ICBM suspended in silo may require travel in order of 1 m.

**shock loading** Suddenly applied violent and abnormal mechanical stress, such as fan-blade-off.

**shock mount** Shock isolator on which delicate object is mounted.

**shock softening** Reduction of linear rate of pressure rise through shockwave, esp. in proximity to subsonic

## shock spectrum

boundary layer; ie increase in thickness of shock (1) from about  $10^{-3}$  mm by several orders of magnitude.

**shock spectrum** Plot of peak amplitude of response of single-degree-of-freedom system to various single applied shocks (3).

**shock stall** Gross breakdown of flow behind shockwave on wing (esp. one of large t/c ratio or for any other reason causing large airflow acceleration) at about critical Mach number, causing symptoms of loss of lift and turbulent wake resembling stall, but at normal AOA.

**shock strut** Main energy-absorbing member of landing gear; may or may not be main structural member but (unlike shock absorber) is always part of structure.

**shock tube** Wind tunnel for hypersonic studies in which fluid at high pressures, usually involving rapid combustion to increase energy, is released by rupturing diaphragm and accelerates through evacuated working section containing model. Many varieties, most having stoichiometric gas mixture as driver and large-expansion-ratio (over 200) supersonic nozzle upstream of working section, giving M up to 30 and T around 18,000° K.

**shockwave** 1 Surface of discontinuity between free-stream fluid and that affected by body moving at relative velocity greater than speed of sound in surrounding fluid. As fluid accelerates round body, if it eventually reaches local Mach 1 a weak shock forms perpendicular to flow, called a normal shock. Pressure difference  $(p_1 - p_0)/p_0$  is zero and flow downstream is subsonic. As M increases, shock leans back, becoming an inclined shock, at angle  $\alpha = \sin^{-1} 1/M$ , or  $\sqrt{1-M^2}$ , pressure ratio and velocity of propagation  $V_0$  increase according to M and angle of deflection, a property of geometry of body; for 15° deflection (ie wedge or cone of 15° semi-angle) at Mach 3 static and  $(p_1 - p_0)/p_0$  and  $V_0/a_0 = 2.1$ , ie \* moves at twice speed of sound.

2 Continuously propagated pressure pulse formed by blast from explosion in air by air blast, underwater by water blast and underground by earth blast (DoD, NATO).

**Shodop** Short-range Doppler.

**shoe** Detachable interface between pylon or hardpoint and store, often specific to latter.

**Shols, SHOL** Ship/helicopter operational limit[s].

**shoot bolt** Linear bolt type of panel latch.

**shooter** 1 Aircraft detailed to attack a target, as distinct from one whose task is to mark or designate.

2 The catapult control officer.

**shooting the breeze** Engaging in casual shoptalk (US).

**shoot up** 1 To attack a surface target with gunfire.

2 To simulate this at an airshow.

**shop head** End of rivet upset when rivet is used.

**shop visit** Removal of item from aircraft for repair or other attention in specially equipped workshop, usually of customer.

**shop-visit rate** Frequency, measured on occasions per unit of flight-time [eg, per  $10^5$  h] with which particular item [eg, engine] is removed from aircraft for repair or overhaul; often a global fleet average.

**Shorad** Short-range air-defense; S adds system (USA).

**Shoran** From short-range navigation, precision radio navaid based on timing pulsed transmissions from two or more fixed stations; in conjunction with suitable computer used for blind bombing.

**shore** Strut supporting airship during manufacture.

## shot-peening

**shoreline** Line drawn straight across all inlets less than 55.6 km (30 nm) wide (ICAO).

**short-distance navaid** One usable within 320 km/200 miles (NATO).

**short field** Limiting field or runway demanding special takeoff procedure.

**short final[s]** 1 Last part of approach, usually defined as that commencing at inner marker.

2 Radio call made from aircraft 2 n.m. (3,706 m) from threshold, or on final approach from shortened circuit.

**short-haul** Several definitions, eg maximum-payload range (knee of graph) 1,609 km (1,000 statute miles) or less; see also *short-range transport*.

**short hundredweight** US unit of mass = 100 lb = 45.3592 kg.

**short-life engine** One designed for single flight or any other purpose not requiring prolonged use, and normally qualified for running time of 50 h.

**short lift** Use of STO to enable powered-lift aircraft to carry enhanced payload.

**short-lift rating** Thrust rating permitted for [usually] 15 s for VTO or VL.

**short period** In assessment of factors such as lateral-control damping of fighters, usually means  $\leq 1.5$  s.

**short-range attack missile** ASM launched at range not exposing launch aircraft to terminal defences (USAF).

**short-range ballistic missile** Up to about 600 nm (1,112 km, 691 miles) (DoD).

**short-range clearance** Authorizes IFR departure to proceed to a fix short of destination pending further clearance.

**short-range Doppler** Trajectory measurement using Dovap plus Elsse.

**short-range transport** Range at normal cruising conditions not to exceed 1,200 nm (2,224 km, 1,382 miles).

**short round** 1 Round of ammunition deficient in length (DoD 'in which projectile has been seated too deeply'), causing stoppage.

2 Ordnance delivered on friendly troops.

**short stacks** Briefest form of piston engine exhaust for cowled engine.

**short takeoff and landing, STOL** Usually defined as able to take off or land over 50 ft screen (note, not 35 ft) within total distance of 1,500 ft (457 m).

**short ton** US ton of 2,000 lb, = 907.185 kg.

**short trail** Towing position for sleeve (presumably other forms) of target in which target is immediately astern of towing aircraft.

**short wave** 1 Not defined and rare in aerospace: traditional radio meaning is decametric (10-100 m) corresponding to 30-3 MHz; FAA meaning is frequencies 7.7-2.8 MHz; for IR means wavelength 1-2.5 $\mu$ ; scientific is 0.4-1 $\mu$  wavelengths.

2 In spectrometry, band 2.5-45  $\mu$ .

**shot** 1 Commercial lead \* for shotguns, normally used as cheap variable mass.

2 Tailored hardened steel balls of graded sizes.

3 Solid-projectile ammunition, eg for air-firing practice or AP type.

4 Report indicating a gun has been fired (DoD).

5 Single flight of unguided ballistic rocket, eg probe.

**shotgun wind** Appearing to come from all points of the compass.

**shot-peening** Bombarding metal surface with air-

propelled shot (2), usually to harden and relieve internal stress.

**shoulder** 1 Area immediately beyond edge of pavement, such as a runway or parking apron, so prepared as to provide transition between pavement and adjacent surface.

2 Added paved area at taxiway corners and intersections to ensure outboard megajet engines do not operate over grass.

3 See \* *season*.

**shoulder bolt** Thread of smaller diameter than shank; for attaching plastics parts where over-tightening must be avoided.

**shoulder cowl** Usually means cowling panel(s) hinged upwards near top of sides.

**shoulder fare** That charged for period between standard and off-peak.

**shoulder harness** Seat harness including straps passing over shoulders to prevent body jack-knifing forward.

**shoulder pylon** Auxiliary pylons [usually for AIM-9 or similar missiles] on sides of main pylon for tank or other heavy store.

**shoulder season** Intermediate demand between low and peak, or intermediate time of day, in determining passenger fare structure.

**shoulder wing** Wing attached between mid and high positions. Original German *Schulterdecker* implied wing depth more than half that of fuselage, with blended wing/body junction.

**show** Preplanned air operation, especially over hostile territory (RAF, WW2, colloq.).

**shower(s)** Precipitation from convective cloud characterized by sudden onset, rapid variation in intensity and sudden stop, with intervening periods of part-clear sky.

**showerhead** Liquid-propellant rocket injector in which numerous fuel and oxidant sprays are distributed (with various forms of impingement) over flat or curved surface.

**show finish** Glass-like finish (on homebuilts, usually) achieved by repeated doping and rubbing down.

**shp, s.h.p.** Shaft horsepower [sometimes written SHP].

**SHR** 1 Shear (weather).

2 Superheterodyne receiver.

**SHRA** Heavy rain showers.

**shrapnel** Anti-personnel device comprising gun-launched projectile which near target explodes, projecting numerous lethal fragments and contained balls or cubes. No aerospace relevance, but included here because word has become commonly used to mean any damage caused by high-velocity splinters.

**shrimpboat** Small marker of clear plastic on which controller writes flight identity, FL and other information, subsequently moved by hand to remain adjacent to blip on display.

**shrinkage** Natural reduction in dimensions of most castings on cooling (see *shrink rule*).

**shrink fit** Force for interference fit between two metal parts obtained by heating outer, cooling inner, or both.

**shrink rule** Casting mould made  $\times 0.010$  (linear) oversize to allow for shrinkage.

**shroud** 1 Plate formed integrally with gas-turbine fan, compressor or turbine blade usually in plane perpendicular to blade major axis. In fan and upstream compressor blades usually as part-span, \* being formed in halves on

each side of blade and mating with those adjacent to damp vibration. In turbine rotor invariably on tip, serving as ring minimizing gas leakage around periphery.

2 Circular duct surrounding propeller or propulsive fan.

3 Heat-resistant aerodynamic fairing over space payload or any forward-facing projection on space launch vehicle, ICBM or other hypersonic vehicle.

4 Extensions of fixed surface of aerofoil (eg wing, tailplane) projecting behind hinge line of movable surface (eg flap, aileron) to reduce drag or improve flight control.

5 Main upper hinged flap at rear of augmentor CCW wing, downstream of intake; can have trailing tab.

6 Covering plate on face of centrifugal impeller enclosing flow passages and preventing leakage.

**shroud coolant** Refrigerant cooling volume in which cryogenic cooling takes place, eg LH<sub>2</sub> serves as \*\* surrounding liquefaction of helium.

**shrouded balance** Leading edge of control surface enclosed within trailing edge of fixed structure.

**shrouded blade** Blade fitted with shroud (1).

**shrouded impeller** Centrifugal impeller, eg of supercharger, enclosed by shroud (2).

**shrouded insulator** Radio aerial insulator (eg HF wire) fitted with overlying shroud (normal meaning of word) to prevent ice connection to metal structure.

**shroud lines** Main suspension cords of parachute connecting load to canopy.

**SHRS** Stabilized horizon-reference system.

**SHS** Since hot section (inspection flight hours).

**SHSS** Short-haul system simulation.

**Shud, S-HUD** Smart HUD.

**shunt connection** Bypass circuit, usually taking most of current.

**shunt excitation** Feeding mast radiator (aerial) about 0.25 of way up, earthed at base.

**Shup** Silo-hardness upgrade program (USAF).

**shutdown** 1 For rocket engine, cut-off.

2 For conventional aircraft-propulsion engine, reducing power to zero and rendering inactive, eg by turning off HP cocks. If in flight becomes IFSD. Normally follows obvious or signalled failure.

3 Event in which (2) occurs.

**shuttered fuze** Inadvertent initiation of detonator will not initiate booster or burst charge.

**shuttle** 1 Generalized term for reusable space launch vehicle recovered by aeroplane-type flight.

2 High-frequency trunk-route service characterized by no-reservations, payment on board and, in some cases, aircraft always boarding, and departing if full before announced time.

3 Sliding drive member of flight-deck accelerator (catapult).

**shuttle bombing** Use of two bases, aircraft making one-way bombing missions between them.

**shuttle valve** Fluid-flow valve of bistable type which passes flow from one line and isolates other or vice versa.

**SHWR** Shower.

**ShyFE, Shyfe** Sustained hypersonic flight experiment (UK).

**SI** 1 Système International d'Unités; standardized system of units adopted (but not yet fully implemented) by all industrialized nations.

2 Servicing instruction.

- 3** Straight-in (approach).  
**4** Spark-ignited, or ignition.  
**5** Single [or spark].  
**6** Standby instrument[s].  
**7** Supporting interrogator.  
**8** Surveillance [and] intelligence.  
**9** Suomen Ilmaluliitto, aeronautical association (Finland).  
**10** Selective interrogator.
- Si** **1** Silicon.  
**2** On an oil analysis = dirt, foreign matter.  
**S<sub>i</sub>** Imposed stress in fatigue calculation.  
**Si<sub>3</sub>N<sub>4</sub>** Silicon nitride.
- SIA** **1** Structural-integrity audit.  
**2** Service de l'Information Aéronautique (F).  
**3** Semiconductor Industry Association (US).  
**4** Silent Aircraft Initiative, 2005 (BA/Boeing / CAA / Cranfield / Marshall / NATS / Rolls-Royce).
- SIAE** Salons Internationaux de l'Aéronautique et de l'Espace (F).
- SIAG** Salons Internationaux de l'Aviation Générale (F).
- Sialon** Silicon-aluminium-oxinitride.
- Siam** Self-initiated anti-aircraft missile; carries out IFF interrogation and handles subsequent interception automatically.
- siamese** To join two similar items into single paired unit or to bifurcate duct into two equal parts; hence siamesed, adj.
- SIAP** **1** Systems integration and assurance phase, of procurement process (UK).  
**2** Standard instrument approach procedure.
- Siap[s]** Straight-in approach procedure[s].
- SIAR** Service de Surveillance Industrielle de l'Armement (F).
- SIAT** Service instructor aircrew training.
- SIATI** Society of Indian Aerospace Technologies and Industries [office, Bangalore 560 075] (India).
- SIB** **1** Special Investigation Branch (UK).  
**2** Service Information Bulletin.  
**3** Subject indicator box [message sent by signal].  
**4** System isolation breaker.
- sibilant filter** One removing hissing frequencies from speech on R/T.
- SIC** **1** Steady initial climb, ie V<sub>4</sub>.  
**2** Standards Information Center (NBS).  
**3** Service instruction circular.  
**4** Second in command.
- SiC** Silicon carbide.
- Sicas** SSR improvements and collision-avoidance system [P adds panel].
- SICBM** Small ICBM.
- sick** Faulty.
- SICM** Small intercontinental missile.
- SID** **1** Standard instrument departure.  
**2** System integration demonstration.  
**3** Spray-impingement drag (marine aircraft).  
**4** Supplemental inspection document.  
**5** Switch-in deflector.  
**6** Situation information display.  
**7** Sensor-image display.
- SIDA** Security identification display area.
- SIDC** Space Innovation and Development Center [Schriever AFB, Colorado] (USAF).

- Sidcot** One-piece flying suit with numerous pockets and zips and high fur collar, widely used from 1919 including by RAF (from designer Sidney Cotton).
- SIDE** Suprathermal ion detector experiment.
- side-arm controller** Primary flight-control input in form of miniature control column at side of cockpit (of combat aircraft) on console incorporating armrest to facilitate accurate flight under conditions of large applied acceleration.
- sideband** Band of frequencies produced above and below carrier frequency by modulation; sum and difference products are called upper \* and lower \*.
- side-by-side** **1** Two-seat aircraft in which seats are in same transverse plane at same level.  
**2** Piston engine in which connecting rods are both same, with big ends side-by-side on crankpin (thus, cylinders of opposed banks are not quite in line); constructional form of most modern light aircraft engines.
- side car, sidecar** **1** Airship car suspended away from centreline plane.  
**2** A parallel emitter, notably an LWIR boresighted alongside a laser.
- side direction** Normal to plane of symmetry.
- side elevation** Portrayed as seen from side, in case of drawing as seen from infinite distance, ie orthographically.
- side fence[s]** Fences above wing and/or flap of USB aircraft to restrain lateral spread of main engine jet.
- side float** Usually means sponson.
- side force** Force acting normal to plane of symmetry.
- side-force control** Aircraft flight-control system capable of exerting lateral [transverse] force, normally by vertical surfaces in front of as well as behind c.g. Aircraft with \*\* can almost instantly change track by flying diagonally, without need to roll or change fuselage axis; make immediate lateral corrections to line of fire of fixed gun; move laterally out of hostile gunfire without prior roll.
- side-force surface** One designed to generate transverse force acting almost through c.g., as on NASA TIFS C-131.
- side frequencies** Carrier plus or minus audio frequency.
- sideline noise** Measured beside takeoff run at distance from centreline of 450 m (ICAO Annex 16) or 0.35 nm (FAR 36 CAN 5, 4-engined aircraft) or 0.25 nm (2-, 3-engined). See *noise*.
- sidelobe** Lobes of aerial radiation propagated at angle to main lobe, normally unwanted and cause of clutter or false returns, eg obscuring actual location of sender.
- sidelobe clutter** Echoes caused by intersection of radar sidelobes with the ground.
- sidelobe suppression** Various techniques for eliminating not presence of sidelobes but their effects.
- side-looking** Scanning to either side of aircraft track; hence SLAR, radar whose output is detailed picture of terrain near track, either all on one side or equally on both sides, depending on aerial arrangement.
- side marker board** Display beside airport gate arranged for nose-in parking giving indicator marks, usually vertical white bars on black board; when aligned with captain's left shoulder, airbridge is aligned with passenger door.
- Sident** Site identification.
- side number** Bold three-digit Modex number (US Navy).

## side oblique

**side oblique** Photograph taken with camera oblique and perpendicular to longitudinal axis of aircraft.

**sidereal** Pertaining to stars, but see following entries. Rhymes with material.

**sidereal day** Time for one rotation of Earth as defined by period between successive transits of vernal equinox (in ASCC wording, alternative name, First Point of Aries) over upper branch of any chosen meridian, equal to 24 h of mean sidereal time or 23 h 56 min 4.09054 s of mean solar time.

**sidereal hour angle** Angular distance west of vernal equinox; arc of celestial equator or angle at celestial pole between vernal equinox and hour circle of observer (see *right ascension*).

**sidereal month** Average period of revolution of Moon with respect to stars: 27 days 7 h 43 min 11.5 s.

**sidereal period** 1 Time taken by planet to complete revolution around primary as seen from primary and referred to fixed stars.

2 Interval between two successive returns of Earth satellite to same geocentric right ascension.

**sidereal time** Time measured from rotation of Earth related to vernal equinox, called local time or Greenwich time depending on choice of meridian; when adjusted for nutation inaccuracy called mean time.

**sidereal year** Period of Earth's rotation around Sun, related to stars; in 2002 equal to 365 days 6 h 9 min 9.55454 s and increasing at about 0.000095 s per year (see *tropical year*).

**sideslip** Flight manoeuvre in which controls are deliberately crossed, eg to \* to left aeroplane is banked to left while right rudder is applied; result is not much change in track but flight path inclined downwards, ie steady loss of height without significant change in airspeed and with longitudinal axis markedly displaced from flightpath. Angle of \* is angle between plane of symmetry and direction of motion (flightpath, or relative wind), usual symbol  $\beta$ . Rate of \* is component of velocity along lateral axis.

**sidestep** Following an instrument approach, clearance to land on a parallel runway not more than 1,200 ft away laterally.

**sidestick** Small control column on cockpit side panel, usually on R, often sensing input force with almost no noticeable movement.

**sidetone** Reproduction of sound in a speaker or headset from speaker's own transmitter, thus hearing own voice.

**sidewalk** Chordwise walkway above wing root.

**sidetracking skate** See *skate*.

**sidewall treatment** Addition of sound-absorbent material along sides of passenger cabin.

**sidewash** Sideways deflection of free stream behind wing in sideslip or yawed flight, dominated at tail by vortex flow.

**sideways translational tendency** Characteristic of single-rotor helicopter to drift to L or R under thrust of anti-torque tail rotor, unless main rotor tip-path plane is tilted in opposition to neutralize this thrust.

**SIDs** Standard instrument departures; SIDS, standard instrument departure system.

**SIE** Self-initiated elimination, = dropout.

**siemens** Not Siemens, SI unit of conductance, reciprocal of ohm,  $S = 1/\Omega$ ; also SI unit of admittance and susceptance.

## signal

**SIERE** Syndicat des Industries Electroniques de Reproduction et d'Enregistrement (F).

**Sierra** Prefix, supersonic (esp. SST) airway (ICAO).

**Sierracote** Family of patented glass and/or acrylic transparencies which may include anti-icing heating by transparent film.

**sievert** Unit of equivalent radiation dose, symbol Sv, units  $J \text{ kg}^{-1}$ .

**SIF** 1 Selective identification facility (or feature).

2 Standard interchange format.

3 Spares investment forecast.

4 System interrogation facility.

**Sifbronze** British alloys of copper, silicon and zinc for low-temperature gas welding.

**SIFF** Successor IFF.

**SIFL** Standard industry fare level (US).

**Sifet** Società Italiana Fotogrammetria e Topografia [office, I-20121 Milan] (Italy).

**SIFTA** Sistema Interamericano de Telecommunicaciones para las Fuerzas Aereas (Int.).

**SIFV** Sensor instantaneous field of view.

**SIG** 1 Signature (DoD, ICAO).

2 Significant (ICAO).

3 Stellar/inertial guidance.

4 Simplified inertial guidance.

5 Special industry group.

**sight** 1 Optical device for measuring (eg drift \*) or aiming (gun \*), often incorporating magnification or combined with HUD (Hud-\*).

2 To take observation with sextant.

**sight gauge, sight glass** Graduated vertical window in fluid container indicating level of contents; alternative to dipstick.

**sighting** Visual contact; does not include other forms of contact, eg radar, sonar.

**sighting angle** Angle between LOS to aiming point and local vertical; at time of bomb release, same as dropping angle (ASCC).

**sighting out of wind** Rigging by eye (arch.).

**sighting pendant** Vertical plumb wire ahead of airship control car to aid in steering and drift estimation.

**sighting station** Crew station from which sight (2) taken or other optical measures made.

**sight tracking line** LOS from a computing gunsight reticle image to target.

**SIGI** Space integrated GPS/INS.

**Sigint** See *signal intelligence*.

**Sigma** 1 Scale of statistically measuring products and services by counting rate of defects; thus  $4\Sigma$  is average and  $6\Sigma$  near-perfect.

2 Originally in French, system for interception, goniometry, monitoring and analysis.

3 Trade name SiC fibre grown on a tungsten core (Tisics).

**Sigmat** Weather advisory service to warn of potentially hazardous (significant) extreme meteorological conditions dangerous to most aircraft, eg extreme turbulence, severe icing, squall lines, dense fog.

**signal** 1 Anything conveying information, eg by visible, audible or tactile means.

2 Pulse(s) of EM radiation conveying information over communications system.

3 Information conveyed by (1, 2).

**4** Any electronic carrier of information, as distinct from noise.

**5** Standard visual symbols displayed on simple airfield.

**signal area** Plot of ground at simple airfield, usually adjacent to tower, set aside and equipped for display of ground-to-air signals (5) for informing pilots of aircraft not equipped with radio, eg of circuit direction, local hazards, prohibitions, etc.

**signal data** General term for elint output or for any recorded (if possible quantified) information on received signals (2).

**signal flare** Flare pyrotechnic whose use conveys known meaning, eg two-star red.

**signal frequency** Frequency of transmitted carrier as distinct from component parts, or received carrier as distinct from intermediate frequency to which it is converted.

**signal generator** Versatile oscillator capable of outputting any desired RF or AF at any selected amplitude and with output modulated to simulate actual transmission.

**signal intelligence** General term for communications intelligence plus electronic intelligence; art of detecting, recording, analysing and interpreting all unknown or hostile signals.

**signalling lamp** Usually means hand-held lamp [e.g., Aldis] capable of sending Morse.

**signalman** Authorized person using hands, wands and/or lights to marshal aircraft on apron or elsewhere on airport manoeuvring area.

**signal pistol** Projector of pyrotechnics, eg Very pistol.

**signal rocket** Pyrotechnic fired from launcher on ground.

**signal star** Pyrotechnic of distinctive character emitted from cartridge or signal pistol.

**signal-to-noise ratio** Ratio of amplitude of desired signal to amplitude of noise signals at a given point in time (DoD). Ratio, at selected point in circuit, of signal power to total circuit noise power (ASCC). Number of dB by which level of fully modulated signal at maximum output exceeds noise level, all values being rms.

**signature** Characteristic pattern of target displayed by detection and identification equipment (DoD, NATO etc). Like thumb-print, \* analysed with sufficient accuracy can identify source as to type and even to specific example of emitter. Can be EM (radar, IR, optical), acoustic (eg SST boom \*) or velocity (Doppler \*).

**significant obstacle** Posing potential threat to aircraft.

**significant tracks** Tracks of aircraft or missiles which behave in an unusual manner which warrants attention and could pose a threat to a defended area (DoD, NATO).

**significant turn** Change of heading large enough for explicit account to be taken operationally of reduction of climb gradient.

**significant weather** Potentially dangerous to aviation.

**Sigsec** Signals security (USA).

**SIGWX** Significant weather [also Sigwr].

**SIIDAS** Sensor independent integrated defensive aids suite.

**SIIS** Skills interactive information system.

**s(i,k)** Slope of sound pressure level; change between  $\frac{1}{3}$ -octave SPLs at i-th band at k-th moment in time. Hence  $\Delta s(i,k) = \text{change in SPL slope}$ ,  $s'(i,k)$  is adjusted slope

between adjacent adjusted bands, and  $-\bar{s}(i,k)$  is average slope (see *noise*).

**SIL** 1 Suomen Ilmailu Litto (Finnish Aeronautical Society).

2 Site d'intégration lanceurs (F); launcher assembly site.

3 System[s] integration laboratory.

4 Service information letter.

5 Speed interference level.

**Silane** Proprietary hypergolic liquid used to initiate combustion of fuel [usually LH<sub>2</sub>].

**Silastic** Proprietary range of silicone rubbers and sealants including many resistant to hydrocarbon fuels.

**SILC** 1 Space-object identification in living colour.

2 Semiconductor IR laser countermeasure[s].

**Silcodyne** High-temperature hydraulic fluid for supersonic aircraft, also called DP.47 (UK).

**Silence** Significantly lower community exposure to aircraft noise and emissions.

**Silencer** Significantly lower aircraft noise for community in Europe research [acronym] (EC).

**silencer** In piston-engine exhaust, common meaning.

**silent target** Non-emitting, ie no radio, radar, IR, laser, TV or other detectable radiation.

**silica** Silicon dioxide, quartz, SiO<sub>2</sub>.

**silica gel** Numerous stable sols of colloidal particles, some important as drying agents.

**silicon** Si, abundant versatile solid element with many forms, eg dark crystal or brown powder; important in alloys, in vast range of compounds and in pure crystalline form as semiconductor; basis of major part of microelectronics. Density 2.3, MPt 1,410°C.

**silicon chip** Popular name for microcircuit fabricated in chip scribed from slice of single-crystal epitaxial silicon. Formerly each chip contained devices and subcircuits, today can be a complete equipment requiring only packaging and human interfaces.

**silicone** Generalized term for polymeric organosiloxanes of form (R<sub>2</sub>SiO)<sub>n</sub>, including elastomers, rubbers, plastics, water-repellants and finishes, eg resins, lacquers and paints.

**silicone cork** Relatively cheap ablator and heat insulator, eg on Shuttle external tank.

**silicon nitride** Refractory ceramic, Si<sub>3</sub>N<sub>4</sub>; increases strength slightly to 1,200°C, good thermal shock resistance because of small thermal expansion, and resists many forms of chemical attack.

**silk** Parachute (colloq.), hence hit the \*, take to the \*.

**SILL** Strategic illuminator laser.

**SilMU** Silicon micro-machined electromechanical system inertial measurement unit.

**silo** Missile shelter that consists of hardened vertical hole in ground with facilities either for lifting missile to a launch position or for direct launch from shelter. Normally closed by hardened lid and provided with shock-isolating missile supports.

**silver** Metallic element, Ag, density 10.5, MPt 962°C, important in electronics, photography, joining metals, cloud seeding and disposal of explosives and nerve gases.

**silver ball** Inceptor controlling Stovl engine nozzle[s] (colloq.).

**Silver bullet** Procurement process for highly classified items (US).

**Silver C** Intermediate certificate and badge for gliding,

## silver cell

requiring flight of at least five hours, gain in height of at least 1,000 m (3,281 ft) and straight flight of at least 50 km (31 miles).

**silver cell** Silver/zinc.

**Silver Flag** Exercises training combat support forces to operate in a hostile bare/austere base environment.

**silver iodide** AgI, sprayed into clouds to promote rainfall [seeding].

**silver plating** This is often resorted to on the tooth faces of either one, or both mating gears. The soft skin provides a malleable surface on engine start-up before oil begins to flow.

**silver solder** Jointing alloy of silver, copper and nickel.

**silver-strip indicator** Inserted in fuel filter, detects any abnormal concentration of sulphur in fuel.

**silver tux** Astronaut suit (US, colloq.).

**silver/zinc** Ag/Zn elecric dry battery common in applications calling for single-shot high-power electric supply.

**SIM** 1 SAM (1) intercept missile; bomber defence.

2 System improvement modification.

3 Space interferometry mission.

4 Security identification module.

5 Serial interface module [A629].

**Sim** Simulation, simulator.

**SIMA** Scientific Instruments Manufacturers Association of GB (UK).

**Simaf** Simulation and Analysis Facility (USAF).

**SIMD** Single instruction, multiple data stream.

**simmer** On-line flight-simulator player using home PC.

**Simmonds-Corsey** Mechanical remote-control system in which push/pull commands are transmitted by flexible cable in conduit on which are threaded mating tubes and 'olives' giving bidirectional control.

**Simmonds nut** Pioneer stop nut incorporating tightly held fibre washer.

**Simop** Simulataneous operation of co-located radios.

**Simos** Simulator orthogon system.

**Simoun** Violent hot, dry, sand-laden wind.

**Simp** Solid isotropic microstructure with penalization.

**simple architecture for full electrical** Landing-gear brake-by-wire system in which both main and alternate [alternative] systems are electric, mainly or wholly eliminating hydraulics.

**simple flap** Hinged wing trailing edge, with or without shroud (4) but without intervening slot.

**simple harmonic motion** Regular oscillation as exemplified by alternating current or drag-free swinging pendulum; projection on any axis in same plane of point moving round circle with constant angular velocity; expressed by  $y = a \cos(2\pi nt + b)$  where  $y$  is distance from origin (at centre) at time  $t$ ,  $n$  frequency and  $b$  a phase constant such that at  $t = 0$ ,  $y = a \cos b$ . A plot of SHM is a characteristic wavy line, passing through the origin (displacement zero) with peak velocity, rising to maximum displacement where velocity passes through zero and reverses, returning through the origin to describe a precise mirror-image terminating at the start of the next cycle. The sum of positive and negative displacements [peaks plus troughs] is called the amplitude, the time between successive passes through the same point in the cycle the period, and the reciprocal of the period [or number of cycles per unit time] the frequency.

**simple stress** Either pure tension, pure compression or pure shear.

## simultaneous pitch control

**simplex** 1 With no provision for redundancy.

2 Communication on a single channel which is unidirectional in operation; thus, when receiving, cannot transmit.

**simplex burner** Simple gas-turbine fuel burner fed by single pipe leading to nozzle surrounded by air swirl vanes and with flow proportional to square root of supply pressure.

**simplex communications** Communications technique in which signals pass in one direction only at any one time; can be single or double channel and switched by press-to-speak, manual T/R switch or voice-operated.

**simplified directional facility** ILS localizer (108.1-111.9 MHz) with aerial offset from runway and emitting beam usually not exactly aligned with it nor providing G/S information.

**simplified passenger travel** Attempt from 1999 to streamline 'repetitive identity checks at airports'. Since 11 September 2001 emphasis has included new identification measures (ICAO).

**simply supported beam** Pin-jointed at both ends.

**SIMR** Svalbard initial mission recovery.

**Sims** 1 Secondary-ion mass spectrometry.

2 Signal-identification mobile system.

**SIM2** Use of three sets of axes (wind, tunnel stability and body) for force and moment equations (NASA 1980 onwards).

**Simu** Single-input multi-unit.

**SIMUL** Simultaneously (ICAO).

**simulated forced landing** Includes all actions except landing.

**simulated-operations test** Operational test needed to support statements of new requirements and support positions and programmes (USAF).

**simulated attack profile** Typically, lo mission in which pilot is tasked to find and attack several point targets.

**simulator** Dynamic device which attempts to reproduce behaviour of another dynamic device, eg aircraft or missile, under static and controlled conditions for research, engineering design, detail development or personnel training. Those used for research are similar in appearance to other large electronic items; those for training often incorporate a complete cockpit or flight deck carried on hydraulic rams giving motion about all three linear axes and three rotary axes (eg exactly reproducing asymmetric swing on take-off engine failure or buffet at approach to stall with correct fuselage pitch attitudes), and model-form or electronically generated external scene for flight in neighbourhood of particular selected airport(s).

**simulator sickness** Caused by conflict between sensations, control inputs and visual cues.

**Simulink** Versatile software tool for enabling systems engineer to explore function and performance (Parker Aerospace).

**simultaneous approach** Two aircraft land on parallel runways at the same place.

**simultaneous dual field of view** Split-screen system generated by two LOS telescopes focusing IR on single detector array, converted to formatted electronic picture, half wide FOV and half magnified narrow FOV (Hughes/Eltro).

**simultaneous engagement** Concurrent engagement of target by interceptors and SAMs (DoD).

**simultaneous pitch control** See *collective*.

## simultaneous range

**simultaneous range** Radio range which simultaneously broadcasts voice messages.

**SIN** Significant-item number.

**Sinaga** Sindicato Nazionale Gente dell'Aria (I).

**SINCgars, Sincgars** Single-channel ground and airborne, or ground/air, radio subsystem; SIP adds system-improvement programme and V adds vhf.

**sine curve** Obtained by plotting sine on linear axis, graphically identical to plot of SHM.

**sine wave** Wave of SHM form, eg EM radiation.

**sine-wave flight** Repeated SHM in vertical plane, especially spacecraft skipping in and out of sensible atmosphere.

**sine-wave spar** Structural member whose web has a sine-wave profile.

**S-ing** Performing succession of S-turns.

**single** A single-engine aircraft, term normally used for GA aeroplanes.

**single-acting** Actuator pushing in one direction only, with spring return; push-push.

**single-aisle aircraft** Narrow-body, having twin or triple seats on each side of one axial aisle.

**single-axis autopilot** One offering stability or control about one aircraft axis only, eg pitch, roll or yaw.

**single-axis head** Homing head whose sensor scans only in one plane.

**single-base propellant** Traditional term originating in so-called smokeless powders based on either Nc or Ng alone (see *double-base*).

**single-bay** Having only one set of interplane struts joining wings of biplane on each side of centreline.

**single-channel simplex** Same frequency in both directions.

**single-configuration fleet** Not only are all aircraft in airline fleet of same type but all have same build-standard, avionics, cockpit and furnishing.

**single-crystal alloy** Complete workpiece formed in piece of metal grown as single crystal, possibly containing occasional atomic imperfections but devoid of gross intercrystalline joints and as far as possible with lattice orientation selected to increase strength in direction of greatest applied stress.

**single curvature** Curved only in one plane, as surface of regular cylinder.

**single-direction route** Self-explanatory, usually high-altitude IFR.

**single-entry compressor** Radial or centrifugal impeller with vanes on one side only.

**Single European Sky** Overdue plan for unified ATC, adopted by EC December 2002, still years from implementation.

**single-expansion ramp nozzle** One form of non-axisymmetric jet engine nozzle in which supersonic jet is accelerated along sloping wall (expansive flow) on one side only. Has attractions for SSTOVL.

**single-face repair** Repair to sandwich structure involving core and one face only.

**single-flare joint** End of rigid pipe flared out but not turned back on itself.

**single-float seaplane** Large central float and small stabilizing floats outboard.

**single ignition** One coil of magneto, feeding one plug per piston engine cylinder. Thus, there is no redundancy.

## single-wind construction

**single-pass heat-exchanger** Each fluid passes once through without turning.

**single-pole electrical system** The bonded airframe provides the return path for the current.

**single-regime engine** One designed to operate always under same conditions, eg jet VTOL.

**single-rotation** 1 Composed of one unit (propeller or propfan), as distinct from two equal units rotating in opposite directions.

2 Flap hinged about a single fixed axis well below the wing, and thus moving along a circular arc.

**single-row engine** Radial engine with all cylinders in same plane driving one crankpin.

**single-shaft engine** Gas turbine in which all compressor stages are connected to the same turbine. There may be an independent shaft linking a free turbine to a shaft output.

**single-sideband** Reduction of bandwidth by transmitting only one sideband and suppressing other (and usually carrier also); receiver heterodynes at original carrier frequency.

**single-sideband suppressed carrier** Band of audio-intelligence frequencies translated to radio frequencies with no distortion of signal.

**single-sink flow** Fluid flow capable of exact representation using a single sink.

**Single Sky** Wide range of measures intended to consolidate Upper Airspace throughout Europe by end of 2004 (EU).

**single-spar wing** Wing in which primary flight loads are borne by one spar (as distinct from a box), possibly made with two booms on at least one edge or having U or circular section. Does not preclude secondary spanwise member(s) for trailing-edge surface loads.

**single-spring flexure** Tunnel balance in which model is supported by single (usually vertical transverse) member locally thinnned at one transverse point to serve as pivot sensitive to forces or couples about that axis only.

**single-stage compressor** Compressor achieving total overall pressure ratio in one operation, eg by centrifugal impeller or single row of axial blades.

**single-stage turbine** Turbine having only one set of axial rotor blades or inward radial vanes.

**single-stage vehicle** Aerospace vehicle (aircraft, RPV, missile, rocket) with only one propulsion system. It is hoped eventually to create a \* to orbit, or to interplanetary space.

**single-surface rudder** Normal leading edge back to spar [near maximum thickness], aft of which skin is on centreline with half-ribs on each side. Also called splitter-plate rudder or tadpole rudder.

**single-surface wing** Wing having upper [lifting] surface only, characteristic of pre-1914 aeroplanes and many hang gliders and microlights.

**single-target track** Traditional fighter radar tracking mode, usually with phase-comparison monopulse.

**single-tipping** Sheath (1) made in one piece.

**single-up** Competition in which winner takes all.

**single-wedge aerofoil** Cross-section has sharp leading edge, flat sides and blunt or square trailing edge, eg vertical tail of X-15. Extremely inefficient at low speeds.

**single-wheel gear** Main landing gear of large aircraft with one wheel on each shock strut.

**single-wind construction** Making an item, especially a large section of airframe, from a single continuous high-

tensile filament, normally wound on a mandrel and bonded with adhesive.

**sinide** Silicon nitride.

**sink** 1 Theoretical point in fluid flow at which fluid is consumed at constant rate. The opposite of a source

2 Large mass to which waste heat can be rejected.

**sinking** Rapid uncontrolled increase in rate of descent with little change in horizontal attitude, usually caused by increasing AOA at approach to stall.

**sinking speed** Vertical component of velocity of aircraft without propulsive or sustaining power in still air; for glider or engine-out aeroplane, = TAS  $\times$  sin gliding angle = TAS  $\div$  glide ratio.

**sink rate** Rate of descent of free-fall unpowered lifting-body, especially glider at best L/D. Usually same as sinking speed. Often denoted, confusingly, by V<sub>s</sub>.

**SINS, Sins** Ship's inertial navigation system (FBMS).

**Sintac** Système intégré d'identification, de navigation, de contrôle du trafic aérien, anti-collision et de communication (F).

**sintering** Bonding powder or granules under heat and pressure; no melting takes place and product may be ceramic, cermet, metal or many other types of material, and compact or having any desired degree of controlled porosity. Related terms: diffusion bonding, hot isostatic pressing, isothermal forging, powder metallurgy.

**sinusoidal** Having form of sine waves; characteristic of SHM.

**SIO, SI/O** Special input/output.

**SIOE** Space and Information Operations Element (USSPACECOM).

**SIOM** Standard input/output module.

**SIOP** Single integrated operational, or operating, plan [use of NW] (UK, US).

**SIOU** Serial input/output unit (threat warning).

**SIP** 1 Surface-impact, or impulsion, propulsion.

2 Self-improver pilot.

3 Single inline package.

4 Stockpile, or system, improvement program.

5 Structural, or system[s] or subsystem[s], integrity program.

6 Session initiation protocol.

**Sipac** Sindicato Italiano Piloti Aviazione Civile (I).

**Sipaer** Serviço de Investigação e Prevenção de Acidentes Aeronáuticos (Brazil).

**siphoning** Transfer of fluid out of container by suction, possibly unwanted.

**Sipri** Stockholm International Peace Research Institute.

**Siprnet** Secure international protocol router network (DoD).

**Sips, SIPS** 1 Survey information processing system.

2 Small integrated propulsion system.

3 Software-intensive projects.

4 Structural-integration program[me] system.

**SIPT** Service instructor pilot training (RAF).

**SIPU** Super-integrated power unit, engine designed to run on many fuels including MOM and MEPU.

**SIR** 1 Strip, inspect and rebuild.

2 Snow and ice on runway.

3 Search/interrogation radar.

4 Shuttle-imaging radar.

5 System integrated receiver (TJS).

6 Screening information request.

**SIRA** Sensor IR/acoustic.

**Siral** SAR2 interferometric radar altimeter.

**SIRCM** Pronounced surcom, suite of integrated IR countermeasures.

**SIRE** Satellite IR experiment.

**siren noise** Caused by escape of air or gas under pressure between fixed and rapidly moving apertures, such as engine blading, successive pulses giving frequency.

**SIRFC** Suite of integrated RF countermeasures, pronounced Surfac, sometimes written SIRFCM.

**Sirias** Synergistic integrated receiver techniques for interference adaptation and suppression, for M-code GPS (AFRL).

**Sirocco** Strong dust-laden wind [Mediterranean region].

**Sirpa** Service d'Information et de Relations Publiques des Armées (F).

**Sirs, SIRS** 1 Signal-intelligence receiving system.

2 Satellite IR spectrometer.

3 Satcom interference response system, [defensive counter-space] (AFSPC).

**SIRST** Surveillance IR search and track.

**SIRTF** Space [originally Shuttle] IR telescope facility.

**SIRU** Space inertial-reference unit.

**SIS** 1 Stall-identification [rarely, inhibition] system.

2 Standard instruction sheet.

3 Software-interface specification.

4 Semiconductor/insulator/semiconductor.

5 Signal in space.

6 Superheterodyne IFM subsystem.

7 Secret Intelligence Service.

8 Satellite interceptor system.

**Sisal** Single-assignment language.

**SISC** Standard Information Systems Center, part of AFCAC (Gunter AFB).

**SISCM** Suite of integrated sensors and counter-measures.

**SISD** 1 Space Information Systems Division (USAF Colorado Springs).

2 Single instruction, single data-stream.

**SISO** 1 Simulation Interoperability Standards Organization (Int.).

2 Single input, single output.

**SIT** 1 Silicon-intensified target.

2 Selective-identification transponder.

3 Surplus-inventory tag.

4 Spontaneous-ignition temperature.

5 System integration [and] test.

6 Sydney Institute of Technology [NSW2006] (Australia).

**Sita** Société Internationale de Télécommunications Aéronautiques [serves 680 air-transport organizations in 220 countries; head office, F-92522 Neuilly-sur-Seine) (Int.).

**site error** Radio navaid inaccuracy caused by radiation reaching destination by indirect, ie reflected, routes; eg NDB or VOR radiation reflected from building near beacon.

**Sitelesc** Syndicat des Industries de Tubes Electroniques et Semi-Conducteurs (F).

**SiTF** See *STF*.

**SITI** Sold inside, ticketed inside (IATA, ISI).

**SITO** Sold inside, ticketed outside.

**SITP** System-integration test plan; /D adds description.

**SITR** System-integration test report.

**SITREP, Sitrep** Situation report.

**SITS** Systems integrated test station.

**situational awareness** A buzz-word in air-combat theory; unquantifiable ability of pilot to keep abreast of what is happening to all friends and all foes. Not related to experience.

**SIU** 1 Sensor, or server, or systems, or satellite, or Standard, or Sidewinder, or secure, interface unit.

2 Supportability and infrastructure upgrade[s].

**SIV** Separation integration vehicle.

**Sivam** System for vigilance of the Amazon.

**SIVSG** Silicon vibrating-structure gyro.

**SIWB** Smart integrated weapon bay.

**SIWL** Single isolated-wheel load.

**SIWR** Self-induced wing rock.

**six** Six-o'clock position, ie directly behind one's own aircraft; hence "check \*!".

**6 by 7 cable** Flexible aircraft cable with cotton core surrounded by six cables each twisted from seven wires.

**six-component balance** Wind-tunnel balance that simultaneously measures forces and moments (couples) about all three axes.

**Six Cs** A checklist for an emergency: confess (problem), climb, communicate, conserve, comply, consult.

**6-DOF** Six degrees of freedom; two directions in each of three dimensions.

**Six-sigma** Method of quantifying and measuring products and services to achieve 'world class' performance; common denominator is number of defects per unit or task.

**666** IFR currency requirements: previous calendar months, number of approaches, hours.

**16-g seat** Strength requirement of airline seat (current FAR).

**sized fibre** Virgin carbon fibre sized with resin binder.

**SJ** Ski-jump.

**SJAC** Society of Japanese Aircraft Constructors; Japanese-language acronym = SHNKUK.

**SJB** Semi-jetborne (jet VTOL).

**SJC** Standard job card.

**SJF** Standing Joint Force; HQ adds Headquarters [one for each US Command] (JFC).

**SJI** Stores jettison indicator.

**SJR** Single jet-driven rotor (helicopter).

**SK** Station keeping.

**Skad, SKAD** Survival kit, air-droppable.

**skate** Platform(s) with castoring wheels or air-cushion pads for moving large aircraft on ground.

**SKB** Student construction (design) bureau (USSR).

**SKC** Sky clear (ICAO =  $\leq \frac{1}{8}$  cloud).

**SKD** Semi-knocked-down.

**SKE** 1 Station-keeping equipment.

2 Secondary kinetic energy.

**sked** Scheduled (ICAO).

**skeg** 1 Small fixed fin at rear of afterbody step of marine aircraft to improve stability when taxiing.

2 ACV sidewall.

3 Ventral strip along seaplane afterbody serving as support on land.

**skew aileron** One whose hinge axis is markedly not parallel to transverse axis but diagonally across tip.

**skew angle** Angle between principal axes of fuselage and wing of oblique-wing aircraft.

**skew compressor** Fluid compressor intermediate between centrifugal (radial) and axial.

**skew sensor** Pickup detecting any asymmetry in movement of flaps, slats, lift dumpers or similar movables.

**SKF** Superkritischer Flügel; supercritical wing (G).

**SKG** Schnellkampfgeschwader, fast bomber wing (G, WW2).

**Skiatron** Dark-trace CRT or related display.

**skidding** 1 Sliding outward in turn because of insufficient bank or excess rudder, opposite of slip.

2 Incorrect operation of ball or roller bearing in which sliding friction occurs instead of pure rolling, for various reasons.

**Skidometer** Towed runway-friction measurer with 17%-slip braked centre wheel.

**skid fin** Fixed fin mounted high above c.g., eg above upper wing of biplane, to reduce skidding (1).

**skid landing gear** 1 In early aeroplanes, rigid ski-shaped member projecting ahead of landing gear to prevent nosing-over.

2 In helicopters, fixed tubular landing gear, often provided with small auxiliary wheels (eg winched down by hand) to confer ground mobility.

**skid-out** See *skidding* (1).

**skid transducer** Input sensor of anti-skid wheel brake system, able to sense any sudden variation in wheel rotational speed.

**skiing glider** Skier also wearing lifting aerofoil or parafoil.

**ski-jump** Take-off over a \* ramp.

**ski-jump ramp** Curved ramp terminating at (ideally) about 12° to horizontal providing large benefits to rolling take-off by vectored-thrust STOVL aircraft, including shorter run and/or greater weight of fuel/weapons, and increased safety (particularly off ship) in event of failure of engine or nozzles.

**ski landing gear** Designed for ice or compacted snow, often with heating to prevent adhesion.

**skimmer** 1 Missile, eg anti-ship category, programmed to fly just above crests of waves.

2 ACV (colloq.).

**skin** 1 Outer covering of air vehicle, ACV or spacecraft, except that in case of vehicle covered with ablative layer or thermal-insulating tiles \* is underlying structural layer. Can be made of any material including fabric or Mylar.

2 Outer component of sandwich.

**skin Doppler** Determination of air-vehicle velocity by radar.

**skin drag** See *surface-friction drag*.

**skin echo** Popular term for object, especially aircraft, as seen on radar.

**skin effect** Concentration of AC (electron flow) towards surface of conductor.

**skin friction** See *surface-friction drag*.

**skin-friction coefficient** Non-dimensional form of skin-friction drag on body immersed in a laminar, viscous,

incompressible flow,  $\gamma = \frac{\tau_0}{\frac{1}{2} \rho U_m^2}$  where  $\tau_0$  is shearing stress at solid surface,  $\rho$  density and  $U_m$  mean flow velocity ( $= \frac{16}{R}$  where R is Reynolds No.).

**skin mill** Large machine tool with revolving cutter(s) under which passes workpiece with linear motion; cutter

## skin paint

axis can vary from horizontal to vertical. Often NC machine and able to sculpt complete wing skin.

**skin paint** 1 Radar indication caused by reflected radar signal from object (DoD); ie blip.

2 Fix obtained by ground radar on aerial target.

**skin temperature** Temperature of outer surface of body, esp. in sustained supersonic flight.

**skin tracking** Tracking of object by means of a skin paint (1) (DoD). Specifically, without assistance of a transponder.

**skip** See *skip re-entry*.

**skip altitude** Lowest point of a trough.

**ski pad** Large-area pad attached to helicopter landing gear for operations from snow, tundra, muskeg, swamp and sand.

**skip bombing** Method of aerial bombing in which bomb is released from such a low altitude that it slides or glances along surface of water or ground and strikes target at or above water or ground level (DoD).

**skip distance** Distance from transmitter at which first reflected sky wave can be received, increasing with frequency.

**skip/glide** See *boost/glide*.

**skip it** Air intercept code: "Do not attack, cease interception".

**skipping** Sine-wave flight.

**skip re-entry** Atmospheric entry by lifting-body space-craft in which energy is lost in penetrating atmosphere in curving trajectory reminiscent of stone skipping on pond, possible only with very accurate trajectory control if first skip is not to result in permanent departure from Earth (see *lifting re-entry*).

**skirt** 1 Lowest part of body of large ballistic vehicle surrounding rocket engine(s).

2 Lowest part of parachute canopy.

3 Lowest part of envelope of hot-air balloon.

4 Flexible structure surrounding and containing cushion of amphibious and many other types of ACV enabling vehicle to run over waves or rough ground.

**skirt fog** Steam cloud during launch from wet pad.

**ski-toe locus** Imaginary object shaped like front of ski which TFR runs along terrain by electronic means; size and form are often variable to give soft to hard ride.

**SKPP** Separation kernel protection profile [most demanding for Common Criteria] (NSA).

**SKRVT** State Commission for Development and Co-ordination of Science and Technology (Czech Republic).

**SKSV** National certification authority (Yugoslavia).

**SKT** Specialty knowledge tests (USAF).

**sky compass** Instrument for determining azimuth of Sun from polarization of sunlight.

**sky conditions** Amount of cloud in oktas.

**sky diver** Sport parachutist.

**Skydrol** Synthetic non-flammable phosphate ester-based hydraulic fluids (Monsanto).

**Sky Guards** Trained professionals flying as passengers to protect against any airborne threat [first introduced by ANA, Japan].

**Skyhook** Plastic balloon for meteorological observation and rocket launch (see *rockoon*).

**skyhopper** Simplest aircraft: balloon [invariably hot-air] under which aeronaut is suspended by harness.

**skyjack** Aerial hijack (colloq.).

**skyline** Verb, to get low enemy aircraft visibly above

## slag refining

horizon with sky background, or to expose own aircraft in same way.

**Skymarshals** Armed Federal security officer riding on US commercial flights to deter hijacking 1970-73, and reintroduced 2001 (US Customs Service).

**Sky Miles** Free travel assigned by airline to frequent flyer, or offered as competition prize.

**skyquake** Sonic boom from large hypersonic aircraft.

**sky screen** Simple optical (camera obscura) device showing range safety officer if vehicle departs from safe trajectory; often one for track and another for vertical profile.

**sky shouting** Use of aircraft-borne loudspeaker; in most countries prohibited for private use.

**sky wave** That portion of a radiated wave that travels in space and is returned to Earth by refraction in ionosphere (ASCC). Several other authorities use word 'reflection'. Also called ionospheric or indirect.

**sky-wave correction** Factor to be applied to some hyperbolic navaids, eg Loran, if sky waves are used instead of ground waves; varies with relative distances to master and slave(s).

**sky writing** Writing, if possible against blue-sky background, using oil added to exhaust or other system and forming characters by accurately flying along their outlines, or using tight formation to switch smoke under computer/radio control while flying straight along words.

**SL** 1 Sea level, also S/L.

2 Space-limited, or launcher.

3 Service letter.

4 Schätzstellen für Luftfahrtzeuge (G, Austria).

5 Short landing.

6 Sensitivity level.

7 Start line.

8 Standing lenticular.

9 Sound level.

10 Stereolithography.

**S/L** 1 Shoot/lock.

2 Sub-level.

3 Sea level.

**S<sub>1</sub>** Wing area outboard of fuselage, i.e. net area.

**SLA** 1 Small light aeroplane.

2 Self-launching aircraft.

3 Service-level agreement.

4 Spacecraft/Lunar-module adaptor.

5 Stage-length adjusted [CASIM].

6 Super lightweight ablator.

**Slab** Sealed lead-acid battery.

**slab-sided** Having essentially flat (usually near-vertical) sides.

**slab tailplane** Horizontal tail formed as single pivoted surface and used as primary flight control; no fixed tailplane or hinged elevators (US: horizontal stabilizer). Called taileron when installed in left/right halves capable of being driven in opposite directions.

**slab trailing edge** Blunt trailing edge, esp. squared off normal to line of flight.

**SLAE** Now SLAET.

**SLAEA** The Society of Licensed Aircraft Engineers Australia.

**SLAET** The Society of Licensed Aircraft Engineers & Technologists [formed 1943, reconstituted 1962, office Kingston-upon-Thames] (UK).

**slag refining** See *electro-slag refining*.

## SLAM

**SLAM** 1 Supersonic low-altitude missile.

2 Standoff land attack missile [ER adds extended range or expanded response].

3 Scanning laser acoustic microscopy.

**Slam** RAAM surface-launched advanced medium-range AAM, ie SL-Amraam. Suggest confusion with Slammer.

**slam acceleration** Most rapid possible acceleration of engine, esp. gas turbine, typified by violent forward movement of power lever to limit. Hence, slam deceleration.

**Slammer** Amraam, or especially aircraft armed with live Amraams.

**slamming** Impact of front or rear wheels (depending on design geometry) of bogie on ground at vertical velocity greater than that of aircraft, caused by added velocity imparted by rotation of bogie beam.

**Slammr** Sideways-looking airborne multimission radar.

**Slam-R** Small lightweight airborne MTI-radar.

**Slams** Surface look-alike mine systems.

**slant course line** Intersection of course surface and plane of nominal ILS glidepath.

**slanted deck** Angled deck.

**slant range** LOS range between aircraft (aerial target) and fixed ground station; not same as range plotted on map, hence \*\* correction to radio navaid distances which is small until aircraft height is greater than 20% of \*\*.

**slant visual range** SVR (1).

**SLAP** 1 Saboted light-armour penetrator.

2 Slot-allocation procedure.

3 Service-life, or structural life, assessment program.

**slap** See *rotor* \*.

**SLAR** Side[ways]-looking airborne, or aircraft, or aperture, radar.

**slash** Radar beacon reply presented as a short line on display.

**slash mark** Oblique stroke /.

**slash rating** 1 For electric machines and other accessories, normally 150% of base load.

2 More generally, any special increased rating of an engine or other machine, printed to right of a slash mark.

**SLAT, Slat** 1 Slow, low, airborne target.

2 Supersonic low-altitude target.

3 Ship-launched air [or aerial] target.

**slat** 1 Movable portion of leading edge of aerofoil, esp. wing, which in cruising flight is recessed against main surface and forms part of profile; at high angle of attack either lifts away under its own aerodynamic load or is driven under power to move forward and down and leave intervening slot.

2 Fixed leading-edge portion of aerofoil, either wing or tailplane (in latter case often inverted, lying along underside), forming slot ahead of main surface. Both (1, 2) postpone flow breakaway at high AOA and thus delay stall.

**Slate** Small lightweight altitude-transmitting equipment, beacon for GA (FAA 1961).

**slatted** Fitted with a slat (1, 2).

**slave** 1 See *slaving*.

2 See *slave station*.

3 Adjective descriptive of any item installed in an aircraft purely to check the dimensions and interface connections; hence \* engine, \* APU, not intended to be operated.

**Slave actuator** Actuator, usually ballscrew, forming one

## sleeve target

of a number transmitting motion originating at a remote power source. Distributed along wing to move flaps, and around engine to move reverser blocker doors.

**slave aerial** Mechanically scanned aerial slaved to another, eg SSR slaved to surveillance radar but off-mounted.

**slaved gyro** One whose spin axis is maintained in alignment with an external direction, eg magnetic N or local vertical.

**slave engine** In a multi-engine aircraft with engines synchronized, all engines other than the master.

**slave landing gear** Temporary landing gear used in factory to move incomplete aircraft.

**slave shaft** Short shaft on which rotating item is temporarily mounted (possibly loosely) when perfecting balance.

**slave station** Radio station whose emissions are controlled in exact synchronization or phase with a master station at different geographical location.

**Slavianoff** System of arc welding using metal wire or rod as positive electrode.

**slaving** 1 To constrain a body to maintain an attitude in exact alignment with another.

2 To key a transmitter to radiate in exact phase or synchronization with a master.

**SLB** 1 System link budget.

2 Sidelobe blanking.

**SLBM** Submarine-, or sea-, launched ballistic missile.

**SLC** 1 Sidelobe clutter, or cancellation.

2 Software life cycle.

3 Space launch complex (pronounced slick).

4 Submarine laser communications.

5 Source lines of code.

6 Sonobuoy launch container.

7 Sensitivity-level command (TCAS).

8 Synchronous-link control.

9 Storage and launch container.

**SLCM** 1 Submarine- [or sea- , or ship- ] launched cruise missile.

2 Survivable low communications system.

**SLD** 1 Short lift, dry.

2 Supercooled large droplets.

3 Solid sky cover.

**S/LD** Spoiler(s) and lift dumper(s).

**Sleaford Tech** Derogatory term for RAF College, Cranwell.

**SLECR** Software-loadable equipment configuration report.

**sed** Track-mounted wheelless vehicle accelerated to high [often supersonic] speed by rocket[s] on which test devices [such as fighter forward fuselage with ejection seat] can be mounted.

**Sleec** Slender lifting-entry emergency craft.

**sleet** Precipitation of rain/snow mix or partially melted snow. Two special US usages: frozen rain in form of clear drops of ice, and glaze ice covering surface objects; both highly ambiguous.

**sleeve** 1 Sleeve target.

2 Plastics cylinder used as colour-coded electrical cable marker.

3 Valve mating with bore of sleeve-valve cylinder.

4 Fabric tube for filling gas aerostat.

5 Windsock [not common].

**sleeve target** Tapered tube of flexible fabric, open both

## sleeve valve

ends and towed large-end first; can incorporate reflective prism, mesh, MDI or other enhancement.

**sleeve valve** Any of various techniques for piston-engine valve gear using one or two concentric sleeves between piston and cylinder with suitably shaped ports in walls lining up intermittently with inlet/exhaust connections on cylinder; usual is Burt-McCollum single sleeve.

**slender body** One of such large slenderness ratio that squares and higher powers of disturbances can be ignored.

**slender delta** Aeroplane whose wing has ogival delta plan with very low aspect ratio such that at Mach numbers exceeding 2 entire wing lies within conical shockwave from nose.

**slenderness ratio** Length/diameter of fuselage or other slender body. Generally, synonymous with fineness ratio.

**slender wing** Not defined: any wing of very low aspect ratio.

**SLEP** 1 Service-life extension programme.

2 Structural-life enhancement program[me].

**SLES** Spacecraft life-extension system.

**SLEW** Single-tone link-11 waveform (Int.).

**slew** 1 To rotate in azimuth.

2 To offset centre of P-type or similar display laterally, eg to study air traffic or surface feature off edge.

3 To rotate gyro spin axis by applied torque at 90°.

**slewed flight** Yawed, eg with applied rudder while holding height and with wings level.

**slewing** Slew; also defined as changing scale on radar display (not recommended).

**slew-wing aeroplane** One whose wing is pivoted as one unit about mid-point, thus as one tip moves forward opposite tip moves aft. In some forms there is no fuselage, and wing obliquity to airflow is determined solely by tip fin(s) and engine pod angles.

**SLF** Shuttle landing facility.

**SLFCS** Survivable LF communications system (SAC, USAF).

**SLFP** Suction-lift fuel pump.

**SLG** Satellite landing ground, ie auxiliary field.

**SLGPS** Small lightweight GPS.

**SLGT** Slight; CHC adds chance = <20% likelihood.

**SLH** System-level health.

**SLI** 1 Staatliche Luftfahrtinspektion (DDR).

2 Space launch initiative (NASA, 2000-).

3 System-level interface.

**SLIC** Submarine-launched intercontinental missile.

**slice** Internationally agreed subdivision of international funds, usually allocated in \* groups or as 1-year \* for infrastructure (NATO).

**slice** 1 Possibly violent uncontrolled departure in yaw, usually at extreme AOA.

2 Intended rapid yaw.

**slice(d)** Maximum-performance hard nose-down turn, over 90° bank.

**slice weight** Maximum mass of bird material between consecutive fan blades.

**slick** Any streamlined free-fall store, especially GP bomb.

**slick wing** One with no provision for pylons or hard-points.

**SLICS** Safe-lane indicator computing system.

**slide raft** Escape slide which can be detached and used subsequently as fully equipped life raft.

## slippage mark

**slidewire** Wire carrying transport trolley providing emergency escape from top of space-launch service tower.

**sliding carpet** Moving aircraft-carrier flight deck, never actually tested.

**sliding window** Figurative (electronic) window in SSR which looks into each range bin in turn, feeds any traffic or other reply found there to plot extractor and usually also defruipts.

**SLIM** 1 Surface-launched interceptor missile (concept).

2 Software life-cycle management.

3 Simplified logistics and improved maintenance.

**slime light** External low-voltage strip light to facilitate night formation flying.

**slim jet** See *single-aisle, narrow-body*.

**slinger ring** Channel or pipe around propeller hub (inside spinner if fitted) to which controlled supply of deicing fluid can be fed for centrifugal distribution along blades.

**slinging point** Clearly indicated location on airframe or major assembly around which sling of crane can be passed as loop for hoisting.

**slip** 1 Sliding towards inside of turn as result of excessive bank.

2 Loosely, any yawed flight causing indication towards centre of turn or lower wing on turn/\* indicator, eg forward \*, side-\*; in particular, controlled flight of helicopter in direction not in line with fore/aft axis.

3 Measure of loss of propulsive power defined as difference between geometric and effective pitch, see *propeller pitch*.

4 Slurry composed of finely divided ceramic or glass suspended in liquid, eg for coating surfaces in precision casting techniques.

5 Difference between speed of induction motor under load and synchronized speed, expressed as percentage.

6 Crystalline defect characterized by (usually local) displacement of atoms in one plane by one atomic space.

7 Launch slipway for marine aircraft.

8 Shackle for bomb or other dropped store (becoming arch.).

9 To change flight crews at one stopping place on airline route.

**Slipar** Short light pulse alerting receiver [laser].

**slip bands** Microscopic parallel lines visible on polished metal stressed beyond yield point.

**slip cover** Fabric cover previously cut to shape and sewn, available from store tailored to aircraft type.

**slip crew** Airline flight or cabin crew who leave or join as operating crew at intermediate point in multi-sector flight. In some cases crew may continue on same aircraft but off-duty.

**slip flow** Flow in extremely rarefied fluid where mean free path is comparable with dimensions of body (see *free-molecular flow, Newtonian flow*).

**slip function** Basic propeller parameter, also called effective pitch ratio, see *propeller pitch*.

**slip gauge** Extremely accurate wafers of steel of known thicknesses which can be stacked to build blocks accurate to within  $0.25 \mu$  ( $10^{-5}$  in).

**slip-in** See *slip* (1).

**slip joint** One permitting axial sliding, eg in exhaust manifold to allow for expansion.

**slippage mark** White rectangle painted on wheel/tyre to show relative rotation.

## slip pattern

**slip pattern** Planned arrangement for slipping crews detailed on crew roster.

**slipper** 1 Adjective describing drop tank or other air-dropped or externally carried store shaped to fit underside and leading edge of wing.

2 Generalized term for precision part designed to slide over another, eg in air or other fluid bearings, or in con-rod big end which mates on periphery of master rod and held in place by rings, there being no ring-type big end but only a driving \*.

**slippery** Having large momentum and little drag (colloq.).

**slipping torque** Torque at which piston-engine starter clutch will slip.

**slipping turn** Turn with slip (1).

**slipping** Conducting ring rotating with rotor of electrical machine to transfer current without commutating.

**slip speed** Supercharger rpm required to maintain given pressure differential between inlet and delivery manifold when no air is being delivered.

**slipstream** 1 Airflow immediately surrounding aircraft; if behind propeller \* is propwash. Velocities are measured relative to aircraft, propwash typically TAS  $\times$  1.2.

2 To follow direction of streamlines, eg in case of freely hinged nozzle tailfeathers or elevator.

3 To follow in wake of another aircraft. Note: (2, 3) are verbs.

**slipstream factor** Usually means ratio of mean speed of propeller slipstream relative to aircraft divided by true airspeed.

**slipstreaming** Slipstream (2, 3).

**slip tank** A tank, eg fuel, water, oil, which can be jettisoned; used in airships and a few aeroplanes but now overtaken by *drop tank*.

**slipway** Sloping ramp along which marine aircraft can enter or leave water.

**SLIR** Sideways-looking IR.

**SLIRBM** Submarine-launched IRBM (proposal, USN).

**SL-ISA** Sea level, international standard atmosphere.

**slitting shear** Hand or powered shears of lever type used for heavy or very wide sheet (not plate).

**sliver fraction** Volume of slivers remaining in case of web burnout divided by total propellant volume, symbol  $\lambda_s$ .

**slivers** Fragments of solid propellant which are left unconsumed after rocket-motor burnout.

**SLKT** Survivability, lethality and key technologies.

**SLM** 1 Standard-length message.

2 Spatial light modulator.

3 Service, or simulation, life-cycle management.

**SLMG** Self-launching motor glider.

**SLMM** Sea-launched mobile mine.

**SLO** Slow.

**SLOA** Special Letter of Authorization.

**SLOC** 1 Sea lines of communication.

2 Source lines of code [also SLoC].

**Slomar** Space logistics, maintenance and rescue.

**SLOP, Slop** Strategic lateral offset provision[s].

**slope** 1 Glideslope angle to horizontal, usually 3° but steeper for STOL or noise-reduction approaches.

2 Rate of change of one variable with respect to another, tangent from origin to any point on curve plotting y against x or dy/dx.

## slow-blow fuse

3 Of runway, mean inclination,  $\Delta h/L$  expressed as percentage.

**slope angle** Acute angle measured in vertical plane between flightpath and local horizontal.

**slope line system** Approach-light system giving vertical guidance by appearance of ground lights (UK 1946-50).

**slope of lift curve** Unit is increment of lift per radian change in AOA.

**SLOR** Swept local-oscillator receiver.

**SLOS** 1 Star line of sight.

2 Stabilized long-range observation system, or optical sight.

**sloshing** Gross oscillatory motion of liquid in tank sufficient to impose severe structural stress or affect vehicle trajectory; one cause of pogo effect; \* is short-term, unlike fuel shift.

**sloshing baffles** Transverse perforated bulkheads, usually part of tank structure, to curb sloshing; strictly anti-\*\*.

**Slot** Sequential logic tester.

**slot** 1 Suitably profiled gap between main aerofoil, esp. wing or tailplane, and slat or other leading-edge portion through which airflow is accelerated at high AOA to prevent breakaway; usually curves up and back to direct air over upper surface but on tailplane often inverted.

2 Gap between wing and hinged trailing-edge surface, eg flap or aileron, through which air flows attached across movable upper surface.

3 Particular allotted time for using facility (eg gunnery range), for space launch (also called window) or for controlled aircraft departure or arrival, esp. at busy airport; hence to secure a \*, to miss one's \*.

4 Physical aperture for \* aerial.

5 Particular band of aircraft weight or flight performance.

6 Figurative situation or position, esp. a target situation, eg in the \* = correctly set up for landing.

7 In carrier flying, to enter landing pattern by flying up ship's starboard side followed by break downwind.

8 Amplifying (7), window in sky about 300 ft to right (stbd) of ship's bows and 600 ft above sea.

**slot aerial** Aerial (antenna), eg for DME, in form of slot cut in metal skin, often backed by reflective cavity and aerodynamically faired by dielectric; normally 0.5 wavelength long and 0.05 wide, with polarization usually 90° to plane of slot.

**slot/spoiler control** Lateral, and alternatively multi-axis, flight control combining powered variable slot [or leading-edge flap] and upper-surface spoiler [also serving as airbrake when used symmetrically].

**slotted aerofoil** One incorporating a fixed slot (1); if slot results from motion of a slat correct adjective is slatted.

**slotted aileron** Aileron separated from wing by slot (2).

**slotted flap** Flap, usually not translating but simply hinged, forming whole of local trailing edge and separated from wing by slot (2).

**slottery** 1 Allocation of capped number of slots (3) by lottery. Generally, supposed unfair allocation and horse-trading.

2 Arrangement of slots (1), especially when complex (colloq.).

**slow-blow fuse** Cartridge designed to withstand brief overload (electrical).

**slow-CAP**

**slow-CAP** Combat air patrol to protect slow-flying aircraft.

**slow roll** Precision flight manoeuvre in which aircraft, usually fixed-wing, is rolled through 360° by ailerons (using rudder as necessary) while keeping longitudinal axis sensibly constant on original heading; unlike barrel roll imparts -1 g in inverted attitude. Can be performed with longitudinal axis at any inclination in vertical plane. In US called aileron roll.

**slow-running cut-out** Pilot-operated valve which stops piston engine by turning off supply of metered fuel (carburettor engine only).

**slow-running jet** Fine carburettor jet which alone supplies fuel to piston engine mixture when throttle is at idling position.

**SLP** 1 Space-limited payload.

2 Survivor-locator package (USAF).

3 Sequential linear programming.

4 Slope; SLPG sloping.

5 Sea-level pressure.

6 Speed-limiting point on procedural chart.

**SLR** 1 Side-, or sideways-, looking radar.

2 Slush on runway.

3 Standard lapse rate.

**SLRR** Side-looking reconnaissance radar.

**SLSR** Space lift range system.

**SLS** 1 Side-lobe suppression.

2 Sea-level static [or standard].

3 Self-launching sailplane.

4 Strained-layer superlattice.

5 Satellite landing system.

**SLSAR** Side-looking synthetic-aperture radar.

**SLSL** Space Life Science Laboratory (KSC, 2003–).

**SLST** Sea-level static thrust.

**SLS-TO** Sea-level static, takeoff.

**SLT** 1 Sleet.

2 Squadron- level trainer.

**SLTA** Small laser transmitter assembly.

**SLTO** Sea-level takeoff.

**SLU** 1 Surface-launched unit.

2 Stabilized laser unit.

3 Switching logic unit.

**SLUC** System-level use case.

**sludge** Viscous slimy deposit gradually formed in lubricating oil by oxidation, water contamination and other reactions.

**sludge chamber** Cavity, tube or other region in crank-shaft web or crankpin, supercharger drive gear or other rotary component in which sludge is deliberately trapped by centrifugal force.

**SLUFAE** Surface-launched unit fuel/air explosive.

**slug** 1 Non-SI (UK only) unit of mass = g lbf =14.5939 kg.

2 Pre-rivet forming feedstock for Drivmatic or similar riveting machine.

3 Ferritic cylinder for varying coil permeability or inductance.

4 Metal or dielectric cylinder for waveguide impedance transforming.

5 Slab of alloy from which SFF warhead is formed.

6 Body of water or other contaminant in tank of fuel or other liquid.

**slugging** Malfunction in vapour-cycle ECS in which the compressor pumps liquid refrigerant.

**small light aeroplane**

**slung load** Payload carried below helicopter on single cable. Class A, does not extend below landing gear, is fixed and cannot be jettisoned; Class B is jettisonable; Class C remains touching land or water.

**Slurs** Shoulder-launched unmanned reconnaissance system.

**slurry** Suspension of finely divided solid particles in liquid, usually capable of being pumped; physical form of experimental fuels, particles often being metal.

**slush** Mixture of snow and water with SG 0.5 to 0.8; below these values is called wet snow, above is called standing water.

**slush fund** Money allocated for bribery, usually of persons able to influence potential customers.

**slush hydrogen** High-energy H<sub>2</sub> slurry, typically with 116 per cent density of LH<sub>2</sub>, in some forms gelatinous and in others a pumpable mix of solid, liquid and gas.

**SLV** 1 Satellite, or small, launch vehicle.

2 Space-launched vehicle.

3 Synchronization lock valve.

4 Service-level verifier.

**SLW** 1 Short-lift wet [T adds thrust].

2 Supercooled liquid water [C adds content].

3 Slow.

**SM** 1 Statute mile (often s.m. or mile).

2 Static margin.

3 Service, or simulation, module.

4 Sandwich moulding.

5 Strategic missile (former DoD designation prefix).

6 Standard missile (USN).

7 Special mission (US).

8 Standards manual.

9 Stockpile memo (NW).

10 Smoke.

11 Signature, or stealth, management.

**sm, s.m.** 1 Statute mile[s].

2 Short emission.

**SMA** 1 Squadron maintenance area.

2 Stato Maggiore Aeronautica (I).

3 Surplus military aircraft.

4 Shape-memory alloy.

5 Surface-movement advisor (ATC).

6 Signal message address.

7 Service de la Maintenance Aéronautique, part of DGA (F).

8 Sensory motor apparatus.

**SMAC** Scene-matching area-correlator.

**SMAAC** Structural maintenance of ageing aircraft (EU).

**SMAE** The Society of Model Aeronautical Engineers [1922–, office, Leicester] (UK).

**small aircraft** 1 One of below 12,500 lb (5,670 kg) MTOW (US).

2 Between 17 and 40 tonnes MTOW (UK wake turbulence).

**small arms** All arms up to and including 0.6 in (15.24 mm) calibre (DoD). Despite ‘all arms’, term normally means guns.

**small business** One with fewer than 500 employees.

**small circle** That described on spherical or spheroidal surface by intersection of plane not passing through body’s centre.

**small end** End of connecting rod pin-jointed to piston.

**small light aeroplane** Two groups seek definition.

## small/medium enterprise

SMEU

**small/medium enterprise** Less than £30m annual turnover, <250 employees, <25% owned by voting rights in another company (EU).

**small perturbation** One for which 2nd and higher-order terms are ignored.

**smallsat** Small satellite: FAA < 2,000 lb; ESA < 400 kg (882 lb), < €15 million.

**small-scale integration** Usually 10 or fewer gates or other functions per IC.

**SM&E** Semiconductor materials and equipment.

**SMAP, Smap** 1 Systems-management analysis project (AFSC).

2 Simultaneous MAP (10).

**Smart** 1 Secure mobile anti-jam reliable [tactical] terminal.

2 Scalable multiprocessor architecture for real time [U-\* = ultra].

3 Spurt message alphanumeric radio terminal.

4 Small-firms merit award for research and technology (UK).

5 Supersonic military aerospace research track.

6 Situation-monitoring analysis and reporting tablet.

7 Smart munition advanced rocket.

8 Small missions for advanced research in, or and, technology (ESA).

9 Smart-material actuated rotor technology.

10 Simulated mission and rehearsal training.

**smart** 1 Capable of being guided, by self-homing or external command, to achieve direct hit on point target.

2 Generalized term for clever, eg smart jammer listens for hostile emission and then jams on correct wavelength.

**smart actuator** Containing an embedded processor.

**smart bogey** Formidable opponent in air combat.

**smart display unit** Combines functions of mission computer, colour-graphics processor and display/control panel.

**smart electromechanical actuator** Based on brushless motors using rare-earth magnets, with position feedback using Hall-effect sensors.

**smart fixed-wing aircraft** One whose shape, especially that of the wing, incorporates active technology to reduce drag, noise and gust response.

**smart fuze** Fuze incorporating linear accelerometer and processor chip to measure decelerations after first contact with target and detonate warhead at a predetermined point.

**smart graphics processor** Locally generates display imagery on which overlays merge external video.

**Smart Label** See TTI2.

**smartlet** Smart bomblet.

**smart-material actuated rotor** Helicopter main rotor fitted with electrically controlled trailing-edge flaps which react to sensor signals to modify vibratory and acoustic signatures.

**smart skin** 1 External skin incorporating microstructures in micron range of size which can gang together like phased arrays to allow transmission, reception and processing of EM information in skin surface.

2 Loosely, any electrically conductive skin.

**Smart-T** Secure mobile anti-jam reliable tactical terminal.

**Smash** Southeast Asia multisensor armament system, helicopter.

**Smatcals** Signature-managed ATC approach and landing system (USN).

**Smaud** Special materials aero urban decoy [IRCM decoy].

**SMAU** Stop-motion aim-point upgrade.

**SMAW** Shielded metal-arc welding.

**SMB** Side marker board, for airport parking guidance.

**SMC** 1 Standard mean chord.

2 Surface movement control (ICAO).

3 Space and Missile-systems Center (USAF, Los Angeles AFB).

4 System management and communication.

**SmCo** Samarium cobalt, chief rare-earth magnetic material accepting 20 to 30 times normal current for short overload periods.

**SMCS** 1 Spoiler mode control system.

2 Structural mode control system.

3 Survivable missile control station (USAF).

**SMD** 1 Shop modification drawing.

2 System management directive.

3 Surface-mounted device (electronics).

4 Sauter mean diameter.

5 System maintenance diagnostics.

6 Stores-management display.

7 Special-materials decoys (IRCM).

**SMDARS** Sea-based mid-course defense advanced radar suite.

**SMDC** 1 Shielded mild detonating cord.

2 Space & Missile Defense Command (USA).

**SMDI** Smart-motion de-interlacing.

**SMDP** Standardized military drawing program, for microcircuits (US).

**SMDPS** Strategic-missile defense and planning system.

**SMDS** Switched multi-megabit data service.

**SMDU** Strapdown magnetic detector unit.

**SME** 1 Small/medium enterprise.

2 Special mission equipment.

3 System-management entity.

4 Solar mesosphere explorer.

5 Society of Manufacturing Engineers [office, Dearborn, MI] (US).

**smear** Degraded radio reception due to another transmission on same frequency or degraded TV picture due to ghost image closely following primary image.

**smear camera** See *streak camera*.

**smearer** Subcircuit to eliminate pulse-amplification overshoot.

**smear metal** Metal melted by high-speed machining or welding and deposited on workpiece.

**SMEA** Skylab medical experiments altitude test.

**SMEC** Strategic Missiles Evaluation Committee (USAF, formerly).

**smectic phase** Liquid-crystal phase having layered structure with constant preferred direction; flow is abnormal and X-ray diffraction pattern is obtained from one direction only.

**SMED** Single-minute exchange of dies [to eliminate extended set-up times].

**SMEI** Solar mass ejection imager.

**SMER** Smart multiple ejector rack.

**SMES** 1 Strategic Missile Evaluation Squadron.

2 Superconducting magnetic-energy storage.

**SMET** Simulated mission endurance testing.

**SMEU** Switchable main electronic unit.

## SMF

**SMF** 1 Sintered metal fibre.

2 Surrogate management framework[s].

**SMFA** Service du Matériel de la formation Aéronautique (F).

**SMFD** Secondary multifunction display.

**SMG** 1 Sync/message/guard time-slot.

2 Spinning-mass gyro.

3 System Management Group (ICAO AAG).

**SMGCS** Surface-movement guidance and control system, pronounced smigs.

**SMHMS** Standardized magnetic helmet-mounted sight (USN).

**SMI** 1 Structural merit index.

2 Standard message identifiers.

3 San Marco Island.

**SMILS** Sonobuoy missile-impact location system.

**S<sub>min</sub>** Minimum detectable signal power.

**Smith-Barry** Pioneer formalized system of flying training, 1914.

**Smith diagram** Standard plot for solving electrical transmission-line problems.

**SMK** Smoke.

**SML** Small.

**SMLS** 1 Interim standard MLS.

2 Seamless (pipe, tube).

**SMLV** Standard memory-load verification.

**SMM** 1 Space manufacturing module.

2 Solar maximum mission.

3 Service Météorologique Métropolitain (F).

**SMMC** System maintenance monitoring console.

**SMMR** Scanning multi-frequency microwave radiometer.

**SMO** 1 Supplementary meteorological office.

2 Synchronized modulated oscillator.

3 Shelter management office.

**smog** Fog contaminated by liquid and/or solid industrial pollutants, particularly smoke.

**SMOH** Since major overhaul; suffixes LE, RE = left/right engine.

**smoke angel** The self-explanatory appearance of the visible after-effect of discharging IR decoy flares into trailing wingtip vortices.

**smoke apparatus** Aircraft installation for leaving either a smoke screen or, today more often, smoke trail of desired colour for display purposes.

**smoke bomb** Air-dropped pyrotechnic, able to float, for indicating wind velocity.

**smoke box** Container of slow-burning fuel for producing wind-indicating smoke trail.

**smoke filamanet** Any of many techniques for rendering airflow visible.

**smoke float** See *smoke bomb*.

**smoke generator** Pyrotechnic device for generating visible smoke, for laying smokescreen or dropped on surface to facilitate wind measurement.

**smokehood** Light but fire-resistant transparent bag enveloping wearer's head to offer short-term protection against smoke and toxic fumes; must withstand decompression.

**smokejumper** Firefighter who parachutes, abseils, or [less often] is air-landed, on burning area.

**smoke pot** Remotely triggered device fired to indicate a hit on ground target.

**smoke tunnel** Not precisely defined; wind tunnel in

## Smurf

which either general recirculating smoke or discrete streams give visible flow indication.

**SMOLED** Often pronounced smo-led, small-molecule organic LED.

**SM** 1 Self-maintenance period (aircraft carrier).

2 System[s] management processor (1553B data bus).

3 Sintered metal powder.

4 System management and performance [testing].

5 Stores-management processor.

6 System main processor (SMGCS).

7 Service, or servicing, management plan.

**SMPS** Switched-mode power supply.

**SMR** 1 Surface-movement radar (ICAO).

2 Svenska Mekanisters Riksförening (Sweden).

3 Selective message routing.

4 Stores management and release; S adds system.

**SMRD** Spin motor detector (rate gyro).

**SMRS** Stores management and release system.

**SMRT** Soldier metabolic remote telemonitor (AFRL).

**SMS** 1 Strategic Missile Squadron (USAF).

2 Stores-management set, or system.

3 Suspended manoeuvring system.

4 Supply and movements squadron (RAF).

5 Space mission simulator.

6 Sensor monitoring set.

7 Smart materials and structures.

8 Synchronous meteorological satellite.

9 Setting mini-station.

10 Signal-measurement system.

11 Short message, or messaging, service.

12 Spectrum monitoring system.

13 Safety management system (airline).

14 Stratosphere, or stratospheric, and mesosphere, or mesospheric, sounder.

15 Structural monitoring system; see CVM.

**SMSC** Space and Missile Systems Center [Colorado Springs] (USAF).

**SMT** 1 Shadow-mask tube.

2 Système modulair thermique, IR common module (F).

3 Sector management tool.

4 Surface-mount[ed] technology.

5 Static/mobile/transportable.

6 Square-mesh track.

7 Servo-mount [elevator, or aileron/rudder].

8 Station management.

9 Standard-message text.

**SMTC** Space and Missiles Test Center (Vandenberg AFB, USAF).

**SMTD** Stol/manoeuvring technology demonstrator.

**SMTM** Smooth.

**SMTI** Selective, or surface, or spot moving-target indicator.

**SMTO** Space & Missile Test Organization (AFSC).

**SMTP** Standard mail transfer protocol.

**SMTS** 1 Store (4) management test set.

2 Space and missile tracking system.

**SMU** System[s]-, or sensor, management unit.

**SMUD** Standoff munitions disrupter, for destroying unexploded anti-airfield munitions.

**Smurf** 1 Side-mounted under-root fin, small curved surface ahead of and below LE root of horizontal tail to eliminate pitch-down in low-airspeed manoeuvres.

2 SFMR [slang].

**SMV** Space maneuver vehicle (US).

**SMW** Strategic Missile Wing (USAF).

**SMWHT** Somewhat.

**SMWP** Standby master warning panel.

**SN** 1 Snow (ICAO).

2 Since new (often S/N).

3 Shipping notice.

4 Scout trainer (USN aircraft category 1939-48).

5 Secretary of the Navy (US).

6 Strategic navigation.

7 Subnetwork.

**S/N** 1 Stress against number of alternating load cycles to failure; S is normally ratio of alternating load to ultimate strength, so that for  $S = 1$   $N = 1$ , while for  $S = 0.8$   $N$  may be  $10^4$ .

2 Serial number.

3 Signal/noise ratio.

**Sn** Tin.

**sn** Sthène.

**SNA** 1 Sindicato Nacional dos Aeronautas [civil pilot trade union; office, Rio de Janeiro 20020] (Brazil).

2 System network analysis, or architecture.

3 National aero club (Slovakia).

**SNABV** Syndicat National des Agences et Bureaux de Voyages (F).

**SNAC** Subnetwork access; P adds protocol.

**SNAEC, Snaec** Special notice to aircraft and engine contractors (UK, MoD).

**snag** 1 Fault condition or impediment to progress (UK, colloq.), hence \* list.

2 Dogtooth or other abrupt discontinuity in leading edge.

**Snagfa** Syndicat National des Agents et Groupeurs de Fret [freight] Aérien (F).

**snake drill** Hand drill with tool bit driven by flexible connection.

**snake mode** Control mode in which pursuing aircraft flies preprogrammed weaving path to allow time to accomplish identification functions (DoD).

**snaketrack** Weaving flight path, under pilot control or preprogrammed, in case of aerial target to provide greater challenge to defences.

**snaking** Natural oscillation in yaw at approximately constant amplitude.

**SNAP, Snap** 1 Systems for, or supplementary, nuclear auxiliary power; former major programme for space electric power generation using RTG and similar methods.

2 Synchronous numeric array processor, an add-on to enable small computers to act as simulators.

3 Steerable null antenna processor.

**Snapac** Sindacato Nazionale Autonomo Personale Aviazione Civile (I).

**snap-action** 1 Positive full-range movement of bistable device, esp. mechanical, eg spring-loaded two-pole switch or valve.

2 Various meanings in electronics, esp. abrupt jump in output of magnetic amplifier with large positive feedback.

**snap-down** Ability to see, engage and destroy target at much lower level, esp. one very close to surface; hence \* missile. Crucial factor is ability of radar or other sensor to see target against ground clutter.

**snap gauge** C-frame go/no-go gauge for shaft measures, usually with one anvil adjustable.

**snap in** Of combat aircrew, to enter and connect up to aircraft prior to mission.

**snap report** Preliminary report by aircrew of observations, prior to compilation of mission report (ASCC etc). Term not to be used (DoD).

**snap ring** Sprung fastener which locks into peripheral groove on either inside or outside diameter.

**snap roll** See *flick roll*.

**snap-shoot** Traditionally, quickly aimed shot; in modern air combat, shooting with fixed gun without need for prior tracking using correctly interpreted HUD sight symbology, usually providing a tracer line.

**snapshot** ‘Photograph’ of all input parameters recorded at particular points in time by HUM to log steady-state conditions for future long-term analysis.

**snap start** Prelaunch AAM condition in which weapon is pre-tuned to guidance radar and then returned to passive mode but ready for instant launch.

**snap-up** Rapid maximum-performance pull-up to engage target at higher altitude. US aerodynamicists have called the Cobra manoeuvre a snapup [one word].

**snap-up missile** AAM capable of engaging and destroying target aircraft at much greater height than launch platform.

**snatch** Pick up of a [large military] glider by a tug flying low overhead. Also called \* launch.

**snatch load** Suddenly applied load, very quickly reaching maximum value, as applied to shroud lines by a rapidly opened parachute.

**SNavO** Senior, or station, navigation officer (RAF).

**SNAW** School of Naval Air Warfare (St. Merryn, UK).

**SNC** 1 Standard navigation computer; small leg-strapped box giving continuous moving-map readout showing aircraft position.

2 Strategic Nuclear Command (India).

**SNCO** Senior NCO.

**SNCR** Subnetwork connection reference.

**SNCTA** Syndicat National des Contrôleurs du Trafic Aérien [office, F-13601 Aix-en-Provence] (F).

**SNCTAA** Syndicat National des Cadres et Techniciens de l’Aéronautique et de l’Astronautique (F).

**SND** Secondary navigation display.

**SNDC** Subnetwork dependent convergence; F adds function, P protocol.

**SNDV** Strategic nuclear delivery vehicle[s].

**SNEA** Sindicato Nacional das Empresas Aeroviárias (Brazilian Air Transport Association).

**Snell law** Law of index of refraction,  $n$ ,  $\sin \theta = n_2 \sin \theta_2$  where  $n$  are refractive indices of two media.

**Sneta, SNETA** Sindicato Nacional das Empresas de Táxi Aéreo [office, Rio de Janeiro, over 80 members] (Brazil).

**SNF** Short-range nuclear force(s).

**SNFLK** Snowflakes.

**SNG** Synthetic (or synthesized, or substitute) natural gas.

**SNI** 1 Signal/noise index (Omega).

2 SNA network interconnection.

3 Stand number indicator.

**SNIFC** Subnetwork independent convergence function.

**snifter(s)** Small spin motors (often one motor with tangential nozzles) for small (eg anti-tank) missiles.

**SNII** Aeroplane scientific test institute of GVF (USSR, R).

**Snipag** Syndicat National des Industriels et Professionnels de l'Aviation Générale [office, F-75009 Paris] (F).

**snips** Hand shears for cutting sheet metal.

**Snirfag** Syndicat National des Industriels Réparateurs et Fournisseurs de l'Aviation Générale (F).

**SNL** Sandia National Laboratory [NNSA] (US).

**SNLE** 1 Sous-marin nucléaire lanceur engins (missile-firing submarine, F).

2 Subnetwork link establishment.

**SNM** Special nuclear material.

**SNMP** Simple network management protocol.

**SNO** Snow.

**SNOE** Smart noise operation equipment (ECM).

**SNOINCR** Snow depth increase in past hour.

**Snomac** Syndicat National des Officiers Mécaniciens de l'Aviation Civile (F).

**Snorac** Syndicat National des Officiers Radios de l'Aviation Civile (F).

**snorkel** Pipe through which a helitanker can refill its tank[s] while hovering over a source.

**Snort** Supersonic naval ordnance rocket track.

**snort** Submarine schnorkel pipe, esp. tip seen on radar above ocean.

**Snorun** Snow on runway.

**snout** In a gas-turbine engine with one or more drum-like combustion chambers, the entrance for primary air upstream of the burner, also called primary-air scoop. Absent from annular chamber.

**snow** 1 Precipitation in form of feathery ice crystals (BSI); better definition is: small (under 1 mm) grains, granular \*; long (2 + mm) grains, ice needles; large agglomerations in form of flakes, \*. Dry \* is SG 0.2 to 0.35; wet \* is 0.35 to 0.5.

2 Speckled interference on electronic display.

3 Air-intercept code: sweep jamming (ie display looks like \*).

**Snowdrop** Service Policeman (USAAF, from white helmet; RAF term was snoop).

**snow gauge** Combination of rain gauge and vertical measuring stick to determine snow moisture content.

**snow lights** Specially designed runway-edge lights which stand above level of any snow yet snap off if struck by aircraft.

**snow pellets** Small white opaque pellets of water/ice, softer than hail.

**snowplough mode** Use of canards as airbrakes after landing.

**snow static** Severe R/F interference caused by snow.

**Snowtam** Special-series Notam announcing presence or removal of hazardous conditions due to snow, ice, slush or standing water in association with these on movement area.

**SNPA** Subnetwork point of attachment.

**SNPC** National civil protection (rescue) service (I).

**SNPDU** Subnetwork protocol data unit.

**SNPL** Syndicat National des Pilotes de Ligne (F).

**SNPNAC** Syndicat National du Personnel Navigant de l'Aéronautique Civile; [F-75017 Paris] (F)

**SNPNC** SNPN Commerciale [F-75017 Paris] (F).

**SNPO** Space Nuclear-Propulsion Office (AEC, NASA)

**SNPVAC** Sindicato Nacional de Pessoal de Voo da Aviacao Civil [civil aircrew, office, Lisbon] (Portugal).

**SNR, S/NR** Signal to noise ratio.

**SNRS** Sunrise.

**SNS** Secure network server.

**SNSDU** Subnetwork service data unit.

**SNSH** Snow showers.

**SNST** Sunset.

**SNTA** Syndicat National des Transporteurs Aériens [office, Paris] (F).

**snubber** 1 Device which greatly increases stiffness of elastic system whenever deflection or travel exceeds given limiting value, eg rubber block to arrest travel of shock suspension and special features (often hydraulic) to arrest travel of actuator at full stroke.

2 Very loosely used to mean part-span shroud on fan blade.

**snubbed** Fitted with one or more snubbers.

**SNVQ** Scottish National Vocational Qualification.

**SNVS** Stabilized night-vision system.

**SNW** Snow.

**SNWFL** Snowfall.

**SNY** Spanish navy [UK usage].

**SNZF** Sintered nickel/zinc ferrite (RAM).

**SO** 1 Second Officer.

2 Scout observation (USN aircraft category 1934-46).

3 Special order.

**SOA** 1 Spectrometric oil analysis.

2 State of the art.

3 Special Operations aircraft.

4 Space-surveillance network optical augmentation.

5 Separate operating agency.

6 Service-oriented architecture.

7 Soft-object animation.

**SOACMS** Special-operations aircraft combat-mission simulator.

**SOAG** Special Operations Aviation Group (USA).

**SoAG** School of Air Gunnery.

**soakdown** Period after engine shutdown when heat is dissipated from engines and, especially, wheel brakes. Also called soaking.

**SOAP, Soap** 1 Spectrometric oil-analysis programme.

2 Simple object access protocol.

**SOAR** 1 Shuttle Orbiter applications and requirements.

2 Special Operations Aviation Regiment (USA).

**soar** To prolong sailplane flight by seeking upcurrents, especially thermals.

**Soarex** Sub-orbital aerodynamic re-entry experiment[s].

**SOAU** Special-operations avionics upgrade.

**SOAWS** Satellite on-board attack warning system.

**SOB** 1 Souls on board, traditional maritime count of everyone on board.

2 Stand-off bomb.

**SOC** 1 Struck off charge, no longer on unit strength.

2 Shut-off cock.

3 Sector Operations Centre (RAF).

4 Satellite, or systems, operations complex.

5 Start of climb.

6 Single overhead camshaft.

7 State of charge.

8 System on a chip.

9 See *Socom*.

**S<sub>oe</sub>** All-engines take-off distance (FAR).

**SOCC** 1 Sector Operations Control Centre.

2 Space Operations Control Center (NOAA, Suitland, MD).

**SOCJ** Standoff communications jammer.

**socked-in****software**

**socked-in** Airfield closed by weather, especially by fog (colloq.).

**Socom** Special Operations Command (USA).

**Socrates** Sensor for optically characterizing remote [or ring-eddy] turbulence emanating sound (FAA), i.e. laser detection and plotting of turbulent wakes.

**Socus** South Continental US Loran chain.

**SOD** Satellite Operations Directorate.

**Soda** Statement of demonstrated ability.

**Sodals** Simplified omnidirectional approach-light system.

**Sodar** Sonic detection and ranging, usually for wind velocity and turbulence.

**sodium** Na [natrium], silvery reactive metal, density 0.97, MPt 98°C, vast range of compounds and used as heat-transfer medium in piston-engine exhaust valves.

**sodium acetate** Soluble solid used as solid or liquid deicer, principally for airfields.

**sodium light** Deep yellow, wavelength 589.6 nm, approach lighting loosely called sodiums, same wavelength for \* line-reversal pyrometer.

**SODP** Start-of-deceleration point.

**Sod's law** If a particular mechanism can malfunction, sooner or later it will [see Murphy].

**SOE** 1 The Society of Engineers (UK, 1854–).

2 Supervised operator experience.

3 Solid oxide electrolyte [fuel cell].

**SOF** 1 Service Officiel Français (F).

2 Special Operations Force(s) (USAF, USA).

3 Stand-off flare (IRCM).

4 Strategic offensive forces.

5 Supervisor of flying.

6 Safety of flight [I adds issue].

7 Satellite Operations Facility (UK).

**Sofa** Status of forces agreement.

**SOFAG** Special-ops force assistance group (USAF).

**Sofar** Sound fixing and ranging, technique for fixing position at sea by time-difference measures of sound from explosion (eg of depth charge, usually at considerable depth) or impact of spacecraft on surface. Hence \* bomb, special sound-producing bomb.

**Sofats** Special Operations Forces aircrew training system.

**SoFC** School of Flying Control.

**SOFI** 1 Sprayed-on foam insulation.

2 See *SOF* (6).

**Sofia** Stratospheric observatory for IR astronomy.

**Soflam** Special operations forces laser marker.

**Sofnet** Solar observing and forecasting network (DoD, 1963–72).

**Sofprep** Special Operations Forces, planning, rehearsal and execution preparation.

**S of S** Secretary of State, = minister (UK).

**SOFT** Site operational functional test.

**Soft** See *soft keys*.

**soft** Not hardened against NW explosion.

**soft-blade propeller** Made of wood, glass-fibre or other abradable material.

**soft bomb** Bomb dropped for purpose other than causing damage or casualties.

**soft factor** The proportion of announced orders [e.g., for commercial aircraft] which eventually lead to cancellations or deferrals.

**soft failure** 1 Usual interpretation is cessation of func-

tion without any incorrect function (eg no hardover signal).

2 In EDP, short-term transient failure followed by return to normal; believed caused by alpha particles.

**soft flutter** Flutter that is possibly severe but non-divergent, and confined within apparently safe amplitude limits.

**soft hail** See *snow pellets*.

**soft-in-plane** Semi-rigid helicopter main rotor of subcritical type, fundamental lag frequency being less than  $N_1$  (rotor rpm) at normal operating speed.

**soft iron** Iron containing little carbon, as distinct from steel; loses nearly all magnetism when external field is removed.

**soft keys** MFD keys which give direct pilot control of individual system or other hardware items via databus. Function of each is displayed by caption.

**soft landing** Gentle landing as distinct from hard (free fall); term applies to arrival on surfaces other than Earth.

**soft life** TBO or similar period decided by operator and varied according to own experience, instead of being mandated by manufacturer or other authority.

**soft obstacle** 1 Conceptual obstacle, eg 35 ft screen.

2 One physically present, eg ILS localizer, but whose engineering design minimizes damage to colliding aircraft.

**soft radiation** Unable to penetrate more than 100 mm of lead.

**soft ride** Ride, esp. in lo-flying aircraft at high-subsonic speed, judged comfortable and in no way rough enough to impair crew functions. Normally defined as fewer than two 0.5 g bumps per minute (see *LLDF*). Occasionally selected mode in TFR system.

**SOFTS** Special Operations Force[s] training system (USA).

**soft skin** Composite structure which removes major loads from outer skin and concentrates stresses or underlying [usually under/over woven] fibre stiffeners.

**soft target** 1 Not hardened or armoured, such as house or merchant ship.

2 In air-to-air firing practice, a sleeve or banner.

**soft tooling** Tooling whose dimensions can be adjusted, normally within small limits (eg could not accommodate different 707 fin sizes, which required new tooling).

**soft undocking** One that does not influence subsequent trajectory, eg by not using separating thrusters.

**soft valve** Thermionic valve into which some air has leaked.

**software** 1 All programs and component parts of programs used in EDP (1), eg routines, assemblers, compilers and narrators. Divided into two parts. Basic \*, usually provided by equipment manufacturer, is machine-oriented and is essential to permit or extend use of particular hardware; examples are diagnostic programs, compilers, I/O conversion routines and programs for file or data-management. Application \* is normally user-oriented and often compiled by user or a subcontracted \* house, to enable machine to handle specific tasks; may include GP packages, eg NC tool, payroll or airline booking, or locally created programs for highly specific tasks, eg exploring flight characteristics of unbuilt aircraft.

2 Ambiguously, also used for parachute or drogue

## software-enabled control

packs, esp. those installed in aircraft. This usage is potentially misleading.

**software-enabled control** Systems giving intelligent UAVs ability to respond autonomously to external threats and internal faults.

**Software Specification Review** A parallel procedure to the hardware SDR, if anything running slightly later to incorporate upgrades or limitations resulting from refinement of the hardware design.

**SOG** 1 Special Operations Group (US).

2 Singlet oxygen generator, supplies excited oxygen for high-power COIL.

**SoGR** School of General Reconnaissance.

**SOH** 1 Since overhaul.

2 Start of header.

**Soho** Solar and heliospheric observatory.

**SOI** 1 Space object identification (Norad).

2 Silicon-on-insulator (Mosfet).

3 System operator instructions.

4 Saturn orbit injection.

**SOIA** Simultaneous offset instrument approach.

**SOIC** Small outline integrated circuit.

**SOICA** The State Organization for Iraqi Civil Aviation.

**SOIR** Study Group, operations on parallel instrument runways.

**SOIS** 1 Silicon on insulating substrate.

2 Space-object identification system.

**SOIT** Satellite operational implementation team (FAA).

**SOJ** Stand-off jammer, or jamming.

**SOL** Solenoid valve.

**sol, Sol** 1 Martian day, 39 min 35 s longer than Earth day.

2 Solenoid.

**SOLAP** Shop-order location and reporting.

**Solar** Shared on-line automated reservation system.

**solar apex** Point on celestial sphere towards which Sun is moving.

**solar array** Large assembly of solar cells, on rigid frame, folding, in roll-up sheet or other geometric form.

**solar atmospheric tides** Cyclic variations in atmospheric pressure ascribed to Sun's gravitation, with primary 12-h component (about  $\pm 1.5$  mb at Equator, 0.5 in mid-latitudes) and much smaller 6-h and 8-h effects.

**solar battery** See *solar cell*.

**solar cell** Photoelectric (photovoltaic) device converting sunlight direct into electricity, usually by liberating electrons and holes in silicon p-n junction.

**solar chamber** Test chamber in which is simulated solar radiation outside atmosphere.

**solar constant** Rate at which solar radiation is received outside atmosphere on unit area normal to solar radiation at Earth's mean distance from Sun, about  $1.38769 \text{ kW/m}^2$ .

**solar cycle** Approx 11-year cycle in sunspot frequency.

**solar day** 1 Time between two successive solar transits of same meridian, ie time for Earth to rotate once on its axis with respect to Sun (mean or apparent), see *, *.**

2 Time for Sun to rotate on its axis with respect to fixed stars.

**solar electric** Propulsion based on jet of ions accelerated magnetically, thrust measured in grams but specific impulse typically 1,500.

**solar flare** See *flare* (2).

**Solar Happ** Solar high-altitude powered platform.

## solid propellant

**solari board** Usual type of large electromechanical display at airports indicating flight arrivals and departures.

**solar noise** Solar radiation at RF frequencies.

**solar paddle** Solar-cell array on fixed frame resembling paddle.

**solar panel** Any fixed planar solar array.

**solar-particle alert network** Global observation system to warn astronauts of solar flares.

**solar propulsion** Loose term sometimes used for rocket systems based on electric power, which can be derived from solar cells, but best restricted to solar sailing using a sail (2).

**solar radiation** Solar constant.

**solar simulator** Device for simulating solar radiation outside Earth's atmosphere.

**solar wind** Plasma radiating from Sun, assumed equally in all directions, which in vicinity of Earth has T about  $200,000^\circ\text{K}$ , V about 400 km/s and density of  $3.5 \text{ particles/cm}^3$ ; grossly distorts terrestrial magnetic field, causing upstream shock front; another effect is to blow comet tails downstream from Sun.

**Solas** Safety of life at sea.

**solar year** 365 days 5 h 48 min 45.5 s.

**solderless splice** Joint made by crimping or machine-wrapping.

**SOLE** 1 Start-of-life efficiency of thermoelectric module or other progressively degraded power-conversion device.

2 Society of Logistics Engineers (US).

**solenoid** 1 Range of simple electromagnetic devices in which current in a coil (usually of cylindrical form) moves iron core, eg to operate a switch.

2 Tube formed in space by intersection of two surfaces at which a particular quantity (eg pressure, temperature) is everywhere equal.

**Solic** Special-operations low-intensity combat.

**solid** Apparently immovable [flight controls, especially ailerons].

**solid angle** Portion of space viewed from given point and bounded by cone whose vertex is at that point, measured by area of sphere of unit radius centred at same point cut by bounding cone. SI unit is steradian.

**solid conductor** One containing single wire.

**solid fuel** Preferably reserved for fuel not used as propellant but as energy source, eg for EPU. For rocket, see *solid propellant*.

**solidification** By 2003 a common word meaning the firming-up of a [initially USA] plan of action.

**solidity** 1 Ratio of total area (not projected area but integral of chord lengths across length of blade) of propeller or rotor to disc area. Basic measure of proportion of disc occupied by blades. See *chord length ratio*.

2 At standard radius, ratio of sum of blade chords to circumference, which is not same as (1) since blades of different rotors or propellers are not all same plan shape.

**solid motor** Rocket filled with solid propellant.

**solid nose** Term to distinguish aircraft nose with metal skin or radome from others of same aircraft type which are glazed (colloq.).

**solid propellant** Rocket propellant containing all ingredients for propulsive jet in solid form, either in cast, extruded or otherwise prepared grain or in granular,

**solids**

powder, multiple-rod or other form. Some definitions questionably exclude non-monolithic forms.

**solids** In ag-aviation, non-liquid chemicals, eg powders, dusts and granules.

**solid-shaft engine** Not free turbine.

**solid-state bonding** Joining [welding] in which no part of the workpiece is melted; see diffusion bonding, friction welding and inertia welding.

**solid-state devices** Electronic devices using properties of solids, especially semiconductors.

**solid-state oxygen** Alkali-metal chlorates which can readily be made to yield free oxygen.

**solid surface** RF reflector, esp. for very large aerial, whose reflective surface is not wire mesh but aluminium sheet.

**solid target** Not banner or drogue but towed aerodyne.

**solid wire** Single tinned or galvanised steel wire.

**SOLL, Soll** Special operations, lo-level.

**solo** According to some definitions, pilot flying unaccompanied by instructor, but this could admit passengers; invariably means pilot is only human occupant of aircraft.

**solstice** Either of two points on ecliptic furthest from celestial equator, direction of Sun's centre at maximum declination; N hemisphere is summer \*, about 22 June; S hemisphere is winter \*, about 23 December.

**solstitial colure** Celestial great circle through poles and solstices.

**solution heat treatment** First stage of heat treatment of certain light alloys in which salt bath (often  $\text{NaNO}_3/\text{KNO}_3$ ) is used for accurate heating followed by room-temperature cooling or quenching.

**solvent extraction** Various processes in which solvents, often hydrocarbons, eg propane, are used to separate lube-oil products from pipe-still distillates. Other meanings in processing of coal.

**SOM** 1 Stand-off missile.

2 Simulation object model.

3 Search on the move [sensor].

4 Servo optical mechanical.

5 System operator manual.

6 Side oblique mode.

**somatic** Affecting exposed individual only, as distinct from offspring.

**somatogravic** Relating the human body to acceleration;

\* illusion is dangerous feeling that overshooting aircraft (especially jet) is entering steep climb when it is actually very close to ground.

**Sommerfield matting** Mass-produced airfield pavement in form of 75 ft (22.86 m) rolls of 13 SWG wire mesh reinforced at 8 in (203 mm) intervals by steel rod with hooked end linking to adjacent strip (UK, WW2).

**SON** 1 Statement of operational need; regarded as a statement of deficiency.

2 Silicon-on-nothing, Mosfet supported at edges only.

**sonar** From sound navigation and ranging. Use of word as method of communication under water, detection of surface or submerged targets and measurement of range, and in some cases bearing and relative speed. Analogous to radar, and similarly may be active (emitting high-energy sound waves of tailored form, eg from \* transducer) and working with reflections from all submerged objects, or passive, in which receivers listen for sounds emitted from targets.

**sonar capsule** Device giving enhanced echoes to sonar to assist location of marine object, eg floating RV or space payload.

**sonar transducer** Translates electrical energy into high-intensity sound, normally used in multiple to form a sonar stave (typically radiating 500-1,000 W), which in turn is used in multiple to form 360° or directional array.

**SoNC** School of Naval Co-operation.

**sonde** Airborne telemetry system, to transmit meteorological or other atmospheric data.

**sone** Primitive unit of perceived noise equal to that from simple 1 kHz tone 40 dB above listener's threshold. Subjective judgement of any sound enables it to be expressed in sones (0.001 \* = millisone); useless for noise investigation (see *noise*).

**sonic** 1 Pertaining to local speed of sound.

2 Approximately at local speed of sound.

**sonic bang** Noise heard as shockwave(s) from super-sonic object pass hearer's ears; small object at close range generates sharp crack, normal aircraft at close range one or more loud bangs (resembling close thunder) and distant SST dull boom(s) resembling distant thunder (see *boom signature*). Crack of a whip and natural thunder are both examples.

**sonic barrier** See *sound barrier*.

**sonic boom** See *boom, sonic bang*.

**sonic drilling** See *ultrasonic machining*.

**sonic erosion** See *ultrasonic machining*.

**sonic fatigue** Suffered by structure, especially thin sheet, subject to intense sound.

**sonic line** Curved surface above or below wing or other body which has accelerated flow beyond Mach 1, at which  $M = 1$ , enclosing region of supersonic flow terminated at rear by shockwave.

**sonics** 1 Aggregate of installed sonars, sonobuoys and displays in platform, eg in aircraft.

2 Technology of applying sound to functions other than those related to hearing.

**sonic soldering** See *ultrasonic bonding*.

**sonic speed** Local speed of sound, symbol  $a$ .

**sonic venturi** Venturi in which sonic speed is reached at throat, thereby automatically limiting maximum flow (eg in bleed systems).

**Sonne** Pioneer German long-range navaid, developed from radio range, became Consolan.

**sonobuoy** Discrete sonar devices immersed or dropped into water; can be active (emitting) or passive, directional or non-directional, and except when dunked by helicopter normally provide readout by radio, usually upon command.

**sonodunking** Action of dunking permanently attached sonobuoy.

**Sons, SONS** Self-organised nanostructure[s].

**SOO** Standard operations (or operational) orders.

**SOON, Soon** Solar-observatory optical network (USAF).

**Sootie** Fitter, Engines [c1955-90] (RAF colloq).

**SOP** 1 Standard operating, or operational, procedure, or platform, or practice.

2 Confusingly, special operating procedure[s].

**SoP** Standard of preparation.

**SOPA** Standard operating procedure amplified.

**SOPC** Shuttle Operations and Planning Complex (USAF).

## Sopemea

source

**Sopemea** Société pour le Perfectionnement des Matériels et Equipements Aérospatiaux (F).

**SOPGM** Stand-off precision-guided munition.

**SOPS** Special-Operations parachute system.

**SOR** 1 Struck off records.

2 Specific, or statement of, operational requirement.

3 State of readiness.

4 Specific Operational Requirement (USAF).

5 Station Operations Room (RAF).

6 Strategic offensive reductions.

**sorb** To acquire gas by sorption; hence sorbent material.

**Soreas** Syndicat des Fabricants d'Organes et d'Equipements Aéronautiques et Spatiaux (F).

**SORM** Second-order reliability method.

**SORO** Scan on, receive only.

**sorption** Taking up of gas by absorption, adsorption, chemisorption or any combination of these.

**SORR** Stage Operations Readiness Review (NASA).

**SORT** 1 Structures for orbiting radio telescopes.

2 Simulated optical range tester.

3 Strategic offensive reductions treaty [24 May 2002] (Int.).

**sortation** Process of reading airline baggage bar code and online \* messages and directing item accordingly; must handle airline's own code, IATA 10-digit, Code 39 [old USPS] and Code 93 [new USPS].

**sortie** An operational flight by one aircraft. It is generated when the aircraft takes off. Some authorities insist mission must be offensive against surface target. Thus an effective \* crosses enemy frontier or front line, an accredited \* places bomb[s] on target.

**sortie capacity** Maximum number of sorties mounted by unit or other airpower source (eg one airfield) in stated period, usually 24 h.

**sortie generation** Ability of combat unit to put its aircraft in air, especially around clock.

**sortie number** Reference identifying all images secured by all sensors on one air reconnaissance sortie.

**sortie plot** Map overlay representing area(s) covered by imagery during one sortie.

**sortie rate** Number of combat missions actually performed by unit (eg squadron or polk) in 24 h period.

**sortie reference** See *sortie number*.

**SOS** 1 International distress signal.

2 Silicon on sapphire.

3 Special, or Space, Operations Squadron (USAF).

4 Sidewall overhead stowage in passenger airliner.

5 Stabilized optical sight.

6 Squadron Officer School (AU).

7 Systems of systems [A adds analysis] (SJFHQ).

**Soscoe, SOSCOE** System of systems common operating environment (NATO).

**Sostar** Stand-off surveillance and target acquisition radar (F, G, Spain, Netherlands).

**Sosus** Sound surveillance system.

**SOT** 1 Stator outlet temperature.

2 Small outline transistor.

3 Specific operational test.

4 Stand-off tactical [countermeasures evaluation trainer].

5 Solar optical telescope.

6 Supply officer training; C adds course (RAF).

**Sotas** Stand-off target acquisition system.

**SOTD** Stabilized optical tracking device.

**SOTI** Sold outside, ticketed inside.

**SOTO** Sold outside, ticketed outside.

**SoTT** School of Technical Training.

**SOTV** Solar orbit transfer vehicle.

**sound** Longitudinal pressure waves transmitted through elastic medium. In atmosphere velocity is a =

$$\sqrt{\frac{\gamma p}{\rho}} = c332.2 \text{ ms}^{-1} \text{ at } 0^\circ\text{C} \text{ and } 344 \text{ at room temperature; in fresh water } 1,410 \text{ ms}^{-1}, \text{ in sea-water } 1,540. \text{ Audible to ear at frequencies } <20 \text{ Hz to } 20 \text{ kHz. See } noise.$$

**sound attenuation** Reduction in sound intensity, esp. through deliberate conversion to other energy forms, eg heat, in absorbent or other layers of material.

**sound barrier** Conceptual barrier to manned flight at supersonic speed when this was extremely difficult, ie before about 1952.

**sound energy** Measure of either total emitted energy (for brief sound, eg explosion) or sustained rate of energy transfer for prolonged sound, in latter case measured in watts.

**soundning** 1 Any penetration of natural environment for observation or measurement.

2 Complete set of measures taken in and of upper atmosphere for met or other purpose. Hence \* balloon, unmanned free balloon carrying upper-atmosphere instruments; \* rocket, stabilized but usually unguided rocket carrying upper-atmosphere instruments.

**sound intensity** Average sound power passing at given point through unit area normal to propagation, expressed either in  $\text{W/cm}^2$  or as sound level.

**sound level** Ratio of sound power to a zero reference, expressed in dB (see *noise*).

**sound locator** Device for concentrating incident noise from aircraft, usually by one or more large exponential horns rotated in azimuth and elevation until intensity is maximum.

**sound power** Sound energy (rate for sustained sound) in watts.

**sound pressure** Total instantaneous pressure at point at given time minus static pressure; unit is  $\text{N/m}^2$ .

**sound pressure level**  $20 \log \text{SPL}/\text{reference pressure}$  (see *noise*).

**sound probe** Instrument responding to sound, eg sound pressure, without significantly altering sound field.

**sound ranging** Determining location of sound source by measuring times of arrival at different locations.

**sound suppressor** See *suppressor*.

**sound wave** Disturbance conveying sound in form of longitudinal alternate compressions/rarefactions through any medium. Frequency spread may be much greater than human aural range, and extreme-energy case is blast wave, which initially (like shockwave) travels faster than sound.

**souped up** Tuned to generate maximum possible power [engine of racing aircraft] (colloq.).

**source** 1 Contractor for entire article, eg aircraft or missile (see *second*\*). More recently, a \* of small items or material for restoration.

2 Origin of noise.

3 Origin of fluid in fluid flow, or of large uniform air mass in atmosphere. The counterpart of a sink.

4 Solid-state electrode connection corresponding to cathode.

- 5** Verb, to assign a \* 1.
- source noise** Generated noise, that emitted by source in all directions as distinct from that received by observer.
- source panel** A planar source sheet [next].
- source sheet** Hypothetical 2-D sheet of infinite number of infinitesimally weak sources.
- Sourdine** Study of optimization procedures for decreasing the impact of noise around airports.
- souris** Inlet centrebody shock-cone (F, literally 'mouse').
- southerly burster** Line squall [S and E Australia].
- SOV** 1 Shut-off valve.  
2 Simulated operational vehicle.  
3 Space operations [or operating, or observation] vehicle, part of MSP.
- SOV-AB** Replacement persistent Toxic-B lethal gas and dispenser system (USSR).
- sovereignty** ICAN Rule 1 decrees every state has "complete and exclusive" \* over the airspace above its territory."
- SOW** 1 Stand-off weapon.  
2 Statement of work.  
3 Special Operations Wing.
- SOWG** Science Operations Working Group (JPL).
- SO<sub>x</sub>** Oxides of sulphur, SO<sub>2</sub> and SO<sub>3</sub>.
- SP** 1 Stabilized platform.  
2 Speed brake.  
3 Scheduled passenger.  
4 Staging post.  
5 Self-propelled.  
6 Single-phase.  
7 Schedule planning.  
8 Software protocol.  
9 Solar-powered.  
10 South Pacific ocean (ICAO).  
11 Snow pellets.  
12 Special, or special performance.  
13 Self-protect (ARM mode).  
14 Space.  
15 Service provider.
- S/P** 1 Speed/power measurement point, ie 1 g, level flight, constant V.  
2 Serial/parallel.
- SPA** 1 Solar-powered aircraft.  
2 Seaplane Pilots Association [office, Frederick MD21701] (US).  
3 Special-purpose aircraft, usually RPV.  
4 Surplus Property Administration (US).  
5 Schedules planning and analysis.  
6 Special-Purpose Audit.  
7 SkyTeam Pilot Alliance (Delta/Air France).
- SP/A** Smart procurement, acquisition.
- SpA** Società per Azioni [company, I].
- SPAAG** Self-propelled anti-aircraft gun.
- Spacdar** Specialist Panel on Automatic Conflict Detection And Resolution (ICAO).
- Space** Software productivity and cost estimation.
- space** Various precise definitions, but loosely volume in which celestial bodies move and esp. local portion of solar system outside Earth's atmosphere.
- space age** Conceptual period in which human beings first learned to operate in space, beginning 1957 (first artificial satellite) or 1961 (first manned space flight).
- space/air vehicle** See *aerospace vehicle*.
- space biology** See *bioastronautics*.
- spaceborne** Travelling through space; suggest unnecessary word.
- space capsule** Environmentally controlled container in which device or living organism flies in space; suggest not used for human occupation.
- space charge** Negative charge carried by cathode electrons which unless continuously accelerated away bar further emission.
- space-charge region** See *depletion layer*.
- SpaceCom** Space Command (USAF).
- spacecraft** Self-contained space vehicle, manned or unmanned.
- spaced armour** Fitted in layers with sufficient gaps to defeat HEAT or hollow-charge weapons.
- spaced-diversity** Radio communications technique which avoids fading by using three or more receiver aerials spaced 10 or more wavelengths apart, all feeding separate amplifying channels.
- space defence** All measures designed to destroy attacking enemy vehicles, including missiles, while in space, or to nullify or reduce effectiveness of such attack (DoD).
- space equivalent** Region in atmosphere where one particular parameter is similar to that in space.
- space-erectable** Capable of being assembled in space, eg radiation shield.
- space fabrication** Manufacturing or building operations in space.
- spacefighter** Aerospaceplane with sufficient endurance and manoeuvrability to survey and if necessary disable hostile satellites.
- space-fixed reference** 3-D cartesian co-ordinate system related to fixed stars.
- spaceflight** 1 Journey through space of man-made object.  
2 The technology required for (1).
- spaceframe** 3-D framed structure assembled from simple tubes or girders with pinned or fixed joints, usually built up from succession of triangulated assemblies for rigidity. Note: may have nothing to do with space.
- space gyro** Gyro having complete freedom about all axes, as distinct from rate, tied or Earth gyros.
- spacelab** Laboratory for operations in space; with capital S, ESA/NASA programme.
- Space Launch Initiative** Far-ranging study of Shuttle-replacement options (NASA).
- spacelift** Transport of material/materiel from Earth to locations in space.
- space medicine** Branch of aerospace medicine concerned with health of human beings before, during and after spaceflight.
- Spacemetal** Range of corrugated-core sandwich structures in stainless steels patented in 1957–60 by North American Aviation [initially for Navaho missile].
- space operations vehicle** Primary component of MSP, reusable launch vehicle [probably T<sup>3</sup>O] carrying various upper mission stages.
- spaceport** Site dedicated to launch and recovery of humans engaged in spaceflight as paying passengers.
- space probe** See *probe* (3).
- space qualified** Certificated for prolonged use in space environment, especially outside a satellite or space station.

## spacer

## spark discharge

**spacer** See *shim*.

**space segment** That in space forming part of large system with stations on Earth.

**space simulator** Simulator wherein is reproduced one or more parameters of space environment; arguably impossible to simulate all.

**space situational awareness** Continuously updated awareness of all human activity in space (US).

**space station** Permanent structure, probably manned, established in space; probably in Earth orbit, and with routine crew replacement and import of materials.

**spacesuit** Pressurized suit for EVA and other operations in space or on lunar surface.

**Space tasking order** Describes the configuration of constellations required to support a specific mission (US).

**space tourism** Self-explanatory; by 2006 plans included sub-orbital and orbited flights, and trips to the ISS and around the Moon. Hence space tourist, human paying for spaceflight.

**Spacetrack** Global system of radar, optical and radiometric sensors linked to computation/analysis centre at Norad for detection, tracking and cataloguing of all man-made objects in Earth orbit. USAF portion of Spadats (DoD).

**space tug** Propulsion vehicle for attachment to space materials, capsules, payloads and laboratories delivered to local area by Shuttle for onward exact positioning.

**space wave** Combined direct wave and ground-reflected wave from transmitter to receiver, as distinct from surface wave or ionosphere-refracted wave.

**space zones** Loose subdivision of local space into translunar (between or near Earth and Moon); interplanetary; interstellar.

**SPAD** Signal processing and display (sonar).

**Spadats** Space detection and tracking system; reports orbital parameters of all satellites and debris to central control facility (DoD).

**SPADCCS** Space command and control system.

**SPADE, Spade** 1 Single programmable access demand exchange; for small comsat-users.

2 Space acquisitions defence experiment.

**spade** 1 Term for several detail features of aircraft, notably fixed or retractable blades projecting into propulsive jet in attempt to enlarge and break up periphery, promote mixing and reduce noise.

2 In particular, a small horizontal plate or aerofoil mounted on a miniature pylon under an aileron to give area ahead of hinge axis.

**Spades** Small parafoil autonomous delivery system.

**Spadoc** Space Defense Operations Center (USAF).

**SPAé** Service de la Production Aéronautique (F).

**SPAF** Svenska Privat och Affärs Flygföreningen (Swedish AOPA).

**spaghetti** 1 Complex masses of electrical, hydraulic or other pipes or cables (colloq.).

2 Insulating or colour-identification tubing slipped over wires (colloq.).

**spallation** Particular forms of spalling resulting from various separation mechanisms, notably between coatings and base material.

**spalling** 1 Separation of pieces of armour from inner face of sheet after warhead impact.

2 Failure mode of surface of concrete under impingement of hot jet.

**SPAM, Spam** Special-purpose aircraft modification.

**Spamcan** All-metal light aircraft (US derogatory colloq. c1945–60).

**SPAN, span** 1 Solar-particle (or proton) alert network (NOAA).

2 Stored-program alphanumerics, ATC system tested at Indianapolis ARTCC 1965.

3 Spacecraft analysis (NASA).

**span** 1 Distance between extremities of wingtips. Term not normally applied to rotorcraft and often a nominal dimension which may or may not take into account tip tanks, ECM pods, winglets and similar extras. When folding wings are folded term is width. With variable sweep or slew wing, angular position must be quoted. Symbol *b*.

2 For a quasi-vertical winglet, the height.

3 Operative radial distance from root to tip of rotating aerofoil (eg of helicopter, gas-turbine compressor blade) discounting any inner porton not of aerofoil section. Not defined whether should include tip appendage, eg shroud or tip-drive propulsion. Note: effectively radius, not diameter.

4 Elapsed time within which NW should detonate.

5 Axial distance between centres of bearings supporting a shaft, or between supports of a beam or truss.

**span efficiency factor** Symbol  $e_s = \frac{1}{1 + K_D}$  where  $K_D$  is the induced-drag factor.

**spanloader** Aeroplane (conceivably, glider) carrying payload distributed across most or all of span (1), normally in ISO containers fitting within wing profile.

**span loading** Weight of aeroplane or glider divided by square of span (1);  $W/b^2$ .

**Spanwar** See *Spawar*.

**spanwise** In a lateral (transverse) direction, esp. along wing towards tip.

**spanwise lift distribution** Plot in front elevation of actual wing lift for elemental chordwise sections of wing from tip to tip, normally (ie without active ailerons or DLC) having semi-elliptic form falling to zero at tips.

**SPAR, Spar** 1 Semi-permanent airfield runway.

2 Solid-state phased-array radar.

3 Special progressive aircraft rework.

4 Special problem areas report.

5 Super-precision approach radar.

6 Survivability planner associate re-router.

**spar** 1 Major structural member of slender form projecting out from one end (which may be pinned or fixed).

2 Specifically, main spanwise structural member(s) of wing or rotorcraft rotor. Wing may have one to many discrete \*, or two may be made into single strong box-\* (often integral tank) to which secondary leading and trailing structures added. D-\* is box structure formed by thick leading edge and a \* forming upright of D. Usually formed from web and two or more booms.

**spare** Item certified as suitable to replace one that is faulty.

**spareable** Item capable of being supplied, esp. from stock, as spare.

**spar frame** Particularly strong frame or bulkhead to which a spar (2) is attached.

**Spark** Solid-propellant advanced ramjet kinetic-energy missile.

**spark discharge** Electrical discharge, usually brief,

resulting in very large electron flow linking points of high potential difference along narrow and brilliantly luminous path.

**spark erosion** See *spark machining*.

**spark-ignition engine** Piston engine, eg of Otto type, in which hot electrical spark is used to ignite mixture before each power stroke; thus, not diesel.

**sparkling plug** Term (spark plug in N America) reserved for plugs for spark-ignition engine and those few jet engines where ordinary commercial plug is used; term for gas turbines generally is igniter plug.

**spark machining** Precision machining of extremely hard or otherwise difficult material by minute stream of HF sparks struck between anode tool (often of particular shape) and cathode workpiece; usually action is purely thermal.

**spark photography** 1 Simplest and oldest method of high-speed photography, in which shutter is left open and scene is illuminated by single point-source brilliant spark at exact time.

2 Various techniques, eg in tunnels, in which hot spark is used to create local airstream of contrasting refractive index.

**sparks** Wireless operator (UK traditional colloq.).

**SPARP** SPAR(2) program.

**Spars** Women's arm of USCG (from semper paratus).

**Sparta** Special anti-missile research tests, Australia (US programme).

**SPAS** 1 Shuttle pallet satellite.

2 Safety performance analysis system (ATOS).

**SPASC** System planning and system control.

**Spasm** Self-propelled air-to-surface missile.

**Spasur** Space-surveillance system with mission of detecting and establishing orbital parameters of every man-made object in Earth orbit, using fan of CW, across Conus; US Navy portion of Spadats.

**Spasyn** Space synchro.

**spat** See *spats*.

**Spate** Special-purpose automatic test equipment.

**spatial** Relating to space, not in sense of cosmonautics but 3-D volume of any (possibly very small) size; thus, concerned with geometric position. Normal dictionary entries need revision.

**spatial awareness** Suggest same as situational awareness.

**spatial disorientation** Colloq. usually, not knowing which way is up; eg after losing control of aircraft in cloud.

**spatial light modulator** Hybrid optoelectronic module combining speed and parallelism of optics with integration of electronic chips.

**spatial resolution** Ability of sensor to distinguish between two very close distant objects; thus an angular measure (see *resolution*).

**spatiography** Mapping ('geography') of space.

**Spato** Single-pilot air-taxi operator (US).

**spats** Aerodynamic fairings over fixed landing wheels, but no other part of landing gear; purists do not allow term to encompass trousers.

**Spawar** Space and Naval Warfare Systems Command (USN).

**Spawn** Space protection and warning (Darpa).

**SPB** Seaplane base.

**SPC** 1 Synthetic particulate chaff.

2 Software productivity consortium.

3 Special-purpose company.

4 Statistical process control.

5 Stored-program control.

**SPCD** Space Communications Division (USAF).

**SPCV** Special-purpose corporate vehicle.

**SPD** 1 Spectral power distribution.

2 Speed.

3 System programme director.

4 Spool positioning device (umbilical lock).

5 Surface-position display.

**SPDA** Secondary-power distribution assembly.

**SPDM** 1 Solid-propellant divert motor[s] (MKV).

2 Special-purpose dexterous manipulator.

**SPDS** System project definition study.

**SPE** 1 Solar-particle event.

2 Solid-polymer electrolyte.

3 Seller-purchased equipment.

**Spear** 1 Selectable precision effects at range (RAF).

2 Support programme for evaluation of activities in research.

3 Spontaneous protection enabling accelerated response.

4 Special emitter array.

**Spears** Screener performance evaluation and reporting system (FAA).

**SPEC** Standard for professional engineering competence (UK).

**Spec** Special meteorological report, pronounced speck.

**spec** Specification, pronounced speck.

**SPECI** Special, especially special Metar.

**special access** See *SAO*.

**special air mission** One conducted by 89 Military Airlift Wing, whether or not President is aboard (USAF).

**special-assignment airlift** Airlift which for any reason cannot be accommodated by channel airlift (DoD).

**special cargo** Item requiring unusual handling, eg detonators, precision instruments.

**special flight** One set up to move a specific load.

**special flying instruction** Warning issued to pilots regarding handling of particular aircraft type [usually temporary].

**specialized undergraduate pilot training** After division into FB or TTT (USAF).

**special material** Nuclear, esp. fissile, material not naturally occurring, eg Pu-239, U-235 or enriched uranium.

**Special-Operations parachute system** Semi-rigid lift/control system worn by Special-Operations personnel enabling them to travel silently up to 200 km (124 miles) after leaving high-altitude aircraft.

**special pilot ratings** Instrument rating and instructor rating (US).

**special qualification** Required, after special training, by pilots of US commercial aircraft on scheduled routes into airports likely to experience unusual turbulence or other hazards.

**special reconnaissance** Flight made covertly, ie without hostile detection.

**special rules zone** Protected airspace surrounding minor airfield which does not justify a control zone; extends from surface to published (usually low) FL.

**Special Security Agreement** Allows a non-US owner of a US company to employ security-cleared US citizens named and approved by US Government in order to bid for classified defense work.

**special summary drawing** Prepared for each production

aircraft in GA and certain other civil categories listing all equipment fits, avionic fits, furnishing fabrics/colours, seat types and similar customer choices.

**special technical instruction** Commands urgent non-recurrent action to remedy serious defect (UK military).

**Special Traffic Management Program** Reservation programme implemented to regulate arrivals and departures at airports serving special events attracting heavy traffic (FAA).

**Special-use airspace** Too numerous to define; includes any precisely defined area that either cannot be entered or cannot be entered except by special aircraft, or with prior permission.

**Special VFR** Particular weather minima below those for normal VFR but which permit VFR flight; hence \*\* operations = flight within control zone under Special VFR clearance.

**specific air range** See *specific range*.

**specification** 1 Numerical and descriptive statement of capabilities required of new hardware item, eg future type of aircraft.

2 Concise list of basic numerical measures describing existing hardware item.

**specific consumption** See *specific fuel consumption*.

**specific energy** Energy per unit mass, whether released by chemical combustion or degradation of KE, units (SI)  $J\ kg^{-1}$ .

**specific enthalpy** Enthalpy per unit mass or volume. Conversions include  $Btu/ft^3 = 37.2589\ kJm^{-3}$ ;  $Btu/lb = 2.326\ kJ\ kg^{-1}$ .

**specific entropy** Entropy per unit mass, see *entropy*. Units,  $1\ kJ\ kg^{-1} = 0.4299\ Btu/lb$ ;  $1\ Btu/lb = 2,326.00\ J\ kg^{-1}$ .

**specific excess power** Propulsion power available over and above that needed to propel aircraft in level flight at given reference speed, and thus available for climb or manoeuvres at sustained high speed. With streamlined aeroplane (fighter) drag is small in relation to thrust at most reference speeds, so SEP is broadly governed by thrust/weight ratio T/W.

**specific fuel consumption** Symbol  $c'$ , rate of consumption of fuel for unit power or thrust, and thus basic measure of efficiency of prime mover; term confined to air-breathing engines (equivalent for rocket is specific impulse). SI unit for jet engines (turbojet with/without afterburner, turbofan, ramjet or pulsejet) is  $mg/Ns$  (milligrams per Newton-second); traditional Imperial measure is  $lb/h/lb$  thrust, measure being for SL static ISA condition unless otherwise specified. For shaft engines (turboshaft, turboprop, piston) SI unit is  $\mu g/J$  (micrograms per joule); traditional Imperial unit is  $lb/h/hp$ ,  $hp$  being qualified for turboprop as shaft or equivalent. Conversions, jet engines,  $1\ mg/Ns = 0.0353\ lb/h/lb\ st$ ;  $1\ lb/h/lb\ st = 28.325\ mg/Ns$ ;  $1\ kg/h/kN = 0.0098\ lb/h/lb\ st$ ;  $1\ lb/h/lb\ st = 102.04\ kg/h/kN$ ; shaft engines,  $1\ \mu g/J = 0.00592\ lb/h/shp$ ;  $1\ lb/h/shp = 169.0\ \mu g/J$ ;  $1\ kg/h/cv = 2.2352\ lb/h/shp$ ;  $1\ lb/h/shp = 0.4474\ kg/h/cv$ .

**specific gravity, SG** Density of material expressed as decimal fraction (less than or greater than unity) of density of water at  $4^\circ C$ .

**specific heat** Quantity of heat required to raise unit mass of material by unit temperature, usually from  $0^\circ$  to  $1^\circ C$ . Traditional measure is calories per gramme, the SI unit is  $kJ/kg$  K,  $= 0.238846\ Btu/lb^\circ F$ ,  $CHU/lb^\circ C$ ,  $Cal/g^\circ C$ . For gases thermodynamic process must be stated;  $C_p$  (\*\* at

constant pressure) and  $C_v$  (\*\* at constant volume) are not same.

**specific humidity** Ratio of mass of water vapour to total mass of moist gas (dimensionless).

**specific impulse**  $I_{sp}$  basic performance parameter of rocket, = thrust divided by rate of consumption of propellants in compatible units, = total impulse divided by total mass of propellants (see also *motor* \*\*, = total impulse divided by total loaded mass of solid motor), in general = effective jet velocity divided by g; unit = s (seconds) derived from force  $\times$  seconds divided by mass (strictly, in SI Newtons force cannot be divided by kilogrammes mass).

**specific optical density** Numerical scale of atmospheric opacity, on which dense smoke = 800.

**specific power** Not defined; often used for thrust/weight ratio of prime mover, esp. including electrical battery or fuel cell. For air-breathing engines see *power* or *thrust/weight ratio*.

**specific propellant consumption** Reciprocal of  $I_{sp}$ , mass flow of propellants or rate of burning to generate unit thrust in rocket.

**specific range** Air distance flown for unit consumption of fuel; traditional unit is  $nam/lb$  (NAMP), while SI would be  $air\text{-km}/kg$ . One rendition is  $R_s = \frac{V_g}{Q}$

**specific search** Reconnaissance of limited number of points for specific information.

**specific speed** Basic performance parameter of hydraulic turbine; trad. unit is rpm at which 1 hp is generated with head of 1 ft. SI unit needed for modern hydraulic motors and rocket turbopumps.

**specific stiffness** Stiffness (usually Young's modulus) divided by density,  $E/\rho$ .

**specific strength** Ratio of ultimate (tensile/compressive/shear/bending) strength to density.

**specific tasking** Planning phase in which commanders designate actual units to fill force list of operation plan.

**specific thrust** 1 Net thrust of jet engine divided by total inlet mass flow.

2 Confusingly, propulsive thrust divided by engine mass (not normally applicable to rockets).

**specific volume** Volume per unit mass, reciprocal of density;  $1\ cm^3 [cc]/kg = 0.02768\ in^3/lb$ .

**specific weight** 1 Symbol  $\bar{\rho}$ , engine mass divided by net thrust (air-breathing jet engines).

2 Symbol  $\bar{\rho}$ , engine mass divided by net thrust (stub) power (piston engines). Strictly, mass should include cowl and propeller.

3 Dynamic equivalent of density, force [not mass] divided by volume;  $1\ kN/m^3 = 6.365858\ lbf/ft^3$ .

**specified approach funnel** Funnel extending about  $0.5^\circ$  above and below PAR gildepath and  $\pm 2^\circ$  of PAR centreline within which aircraft is not advised by PAR controller monitoring ILS approach.

**specimen performance** Performance, esp. of civil transport, worked out and presented as guide to correct procedures and methods of compliance.

**specklegram** Photograph taken by laser speckle interferometry.

**speckle interferometry** Technique for measurement of almost vanishingly small angles.

**spectacles** 1 Main control wheel comprising single left/

## Spectra

## spherical angle

right curved handlebars, suggest synonymous with ram's horn; yoke is generalized term for all configurations.

2 Figure-eight manoeuvre in the vertical plane.

**Spectra** High-modulus composite material for body armour to protect against explosions and mechanical impacts (trade name).

**spectral line** Indication of single frequency, or very narrow band, in continuous spectrum (2), denoting presence of identifiable atoms or molecules.

**spectrograph** Spectroscope with camera or other recorder.

**spectroheliograph** Takes pictures of Sun in monochromatic light; spectrohelioscope is for direct viewing.

**spectrometer** Instrument for analysing spectrum to read out wavelengths and/or energies.

**spectrometric analysis** Usual method is to analyse spectrum of light as test substance is burned in electric arc.

**spectrophotometer** Photometer which measures variation of radiant intensity with wavelength.

**spectropyrometer** Measures variation of intensity of direct solar radiation with wavelength.

**spectroradiometer** See *spectrophotometer*.

**spectroscope** Instrument for dispersing light into spectrum.

**spectrum** 1 Visual display, EDP (1) printout, photo record or other presentation of variation of radiation intensity (sometimes other parameters, eg sound pressure level) with wavelength/frequency or other variables.

2 Continuous range of electromagnetic wavelength/frequencies within which radiation forms common grouping, eg visible \*, IR \*.

3 Stylised colours of visible \*.

4 Various specialized terms in maths, mechanics etc.

**spectrum line** *Spectral line*.

**specular** Offering a smooth reflecting surface; rule-of-thumb demarcation from diffuse scattering surface is roughness factor. In low-level attack with radar/laser, reflection from calm sea is \* up to grazing angles near 20°; steeper attack gives diffuse. Hence importance in stealth aircraft of non-\* RAM.

**SPED** 1 Small-parcel explosive detection; S adds system.

2 Supersonic planetary entry decelerator.

**Speea, SPEEA** Society of Professional Engineering Employees in Aerospace (US, office Seattle, WA).

**speech inversion** Simple form of scrambling in which frequencies relative to a reference value are inverted.

**speed** Scalar quantity, as distinct from velocity; see *airspeed*; also used for rotational \*, see *shaft* \*, *engine* \*, not used for other rate-type quantities such as *frequency* (Appendix 2). SI unit is  $\text{ms}^{-1} = 2.23694 \text{ mph} = 1.94386 \text{ kt} = 3.6$  [exact]  $\text{km/h}$ ;  $\text{km/h} = 0.621373 \text{ mph} = 0.53961 \text{ kt}$ ;  $\text{kt} = 1.60934 \text{ mph} = 1.85318 \text{ km/h} = 0.514773 \text{ ms}^{-1}$ ;  $\text{in/min} = 0.42333 \text{ mm s}^{-1}$ ;  $\text{ft/min} = 0.00508 \text{ ms}^{-1}$ .

**speed brake** See *airbrake*.

**speed bulge, speed bump** See *shock body*.

**speed capsule** See *shock body*.

**speed control computer** Accepts flight data from aircraft sensors and provides flight-management outputs for throttle servoactuators and, probably, flight director and autopilot to maintain selected TAS.

**speed control governor** Engine control device invariably based on centrifugal flyweights adjusting a fuel orifice, in

some engines with datum reset for emergencies or W/M injection.

**speed course** Accurately surveyed course for attempts on speed records; previously also used for true G/S measures (now arch.).

**speed-damping derivative**  $C_{DV}$ , due to compressibility effects, =  $M(\delta C_D/\delta M)$ .

**speed generator** See *engine* \*.

**speed jeans** G-suit (colloq.).

**speed lock** Autopilot sub-mode in which TAS (in some systems G/S) is held constant.

**speed of rotation** *Rotational speed*.

**speed of sound or light** See *sound, light*.

**speed/power** See *power/speed coefficient*.

**speed probe** Basic sensor for rpm of shaft, with magnetic pole piece held close to teeth of existing gear or special toothed disc to generate emf whose frequency is transmitted. Has virtually replaced tachometer except in GA aircraft.

**speed range** Aircraft maximum level speed minus minimum speed, eg  $V_{mc}$ .

**speed reference system** Chief meaning is subsystem on advanced transports (Airbus) which provides flight director visual guidance on how far pilot should haul back in windshear without triggering stick shaker.

**speed rotor** Main input sensor of anti-skid brake, whose angular velocity is held against sudden reductions.

**speed stability** Condition such that aircraft tends to return to preset speed following any excursion, thrust remaining constant; condition not obtained below  $V_{md}$ .

**Speedtape** Commercially available thin aluminium sheet, resembling stout foil, with adhesive backing revealed by peeling off skin; for rapid repair, which can be surveyed as permanent.

**speed trend** Additional protection against windshear, shows what speed/AOA will be 10 s hence with no action by pilot.

**spelk** Unusable bundles of short lengths of surplus reinforcing fibres.

**spent fuel** Fissile fuel whose allotted life has been consumed, though material still fissile.

**SPER, Spér** 1 Syndicat des Industries de Matériel Professionnel Electronique et Radio-Electrique (F).

2 Strategic-planning executive review.

**SPERT, Spert** Scheduled (or simplified) programmed evaluation and review technique.

**SPET** Solid-propellant electric thruster.

**SPETC** Solid-propellant electrothermal-chemical (gun).

**SPEW, Spew** Small-platform electronic warfare.

**Spews** Self-protection electronic-warfare system.

**SPF** 1 Svensk Pilotförening (Sweden).

2 Superplastic forming.

**SPFDB** See *SFDB*.

**SPGG** Solid-propellant gas generator.

**SPGR** Special-purpose GPS receiver.

**sphere of influence** Volume around body in space within which small particle is attracted to body; in case of Earth not true sphere.

**Spheres** Synchronized position hold, engage and reorient experimental satellites.

**Spheric** System for protection of helicopters by radar and IR countermeasures.

**spherical angle** Angle between two great circles.

## spherical convergent flap nozzle

spin in

**spherical convergent flap nozzle** Propelling nozzle of augmented turbofan providing not only variable area and profile but also flow blocking and reversal and  $\pm 20^\circ$  vectoring in any plane.

**spherical data system** Long-range navigation system, eg for maritime patrol aircraft, related to spherical Earth surface.

**spherical triangle** Formed by arcs of three great circles.

**spherics** See *sferics*.

**spherodizing** Hot soaking of irons and steels close to (usually just below) critical temperature followed by slow cooling.

**spherometer** Instrument with three legs and central micrometer leg for measuring radius of convex or concave spherical surfaces.

**SPHVM** Self-propelled high-velocity missile.

**sphygmomanometer** Instrument for measuring blood pressure.

**SPI** 1 Surface position indicator.

2 Short-pulse insertion (SSR).

3 Spike-position indicator.

4 Scatter-plate interferometer.

5 Special position identification (pulse).

6 Smart procurement initiative.

7 Symbolic pictorial indicator.

8 Software process improvement.

9 Surface-pressure integration.

**Spice** Smart precise-impact cost/effective.

**Spicsy** Standard protocols to support intra-centre communications between air-traffic management system components.

**spicules** Long, bright filaments briefly extended from chromosphere.

**spider** 1 Structural heart of propeller or helicopter rotor in form of hub integral with radial members which bear all stresses from attached blades.

2 Multi-finger plate securing structural members grouped at a common joint, each finger being aligned with and secured to one of members, all being in same plane.

**spider beam** Spaceframe-type rocket interstage structure.

**SPIE** 1 Society of Photo-optical Instrumentation Engineers (US).

2 Special insertion and extraction [of troops, usually by abseiling in, helo out].

**spigot** See *sprag*.

**spike** 1 Conical inlet centrebody of supersonic airbreathing engine, usually designed to translate.

2 Short-duration transient (in signal, current, radar display or any other oscillating variable) in which amplitude makes large excursion beyond normal.

3 Centrebody of \* nozzle.

4 As verb, to designate by laser.

5 Long tapered tube ahead of nose of SLBM to generate conical shock and reduce drag of bluff nose during climb up through atmosphere.

6 See *pressure* \*.

**Spikebuoy** Tactical warfare sensor dropped from air to land on spike (eg in jungle), thereafter transmitting on command ground tremors which can be attributed to human beings or vehicles.

**spike inlet** 2-D airbreathing inlet in form of body of revolution with central spike (1).

**spike nozzle** Rocket nozzle in which gas escapes through ring around centrebody in form of concave-profile cone.

**spill** To cause spilling.

**spillage** 1 Amount by which mass flow into airbreathing inlet is less than datum flow (in UK called intake flow).

2 The actual airflow [eg, spilt around nacelle] which fails to enter inlet.

3 Flow of air from below wing to above at tip.

**spillage drag** Difference between drag at given engine airflow and drag at datum flow.

**spill burner** Gas-turbine burner in which fuel is supplied at constant high pressure, giving good swirl and atomization, excess over requirement being 'spilt' back through second pipe for reuse.

**spill door** Auxiliary door usually spring-loaded to open outwards, through which excess engine airflow (spillage) escapes with minimum drag, eg in high-speed cruise or on letdown.

**spill effect** Loss of revenue, esp. pax, at certain times on highest-density routes because seats are not available; this offsets cost benefit of not using larger aircraft.

**spilling** Escape of air at one part of parachute canopy periphery, either through instability or for directional control of trajectory.

**spillover** Airflow deflected to pass outside airbreathing inlet in supersonic flight with detached shock.

**spill valve** 1 In early gas turbines, a manually opened valve to relieve pressure in the HP system.

2 In modern engines, part of the FMU which enables fuel to recirculate after engine shutdown.

**SPILS, Spils** Spin- [or stall-] prevention and incidence (AOA is meant) limiting system.

**spin** 1 Sustained spiral descent of fixed-wing aerodyne with AOA beyond stalling angle; in most cases a stable autorotation (see *flat* \*, *inverted* \*, *upward* \*).

2 To shape by spinning.

**spin avoidance system** Seldom seen as a separate system, detects AOA and possibly other factors such as airspeed and emits aural or visual warning.

**spin axis** Axis of rotation of gyro wheel.

**spin back** Incorporation in old programme of new technology developed for a successor.

**spin box** Primitive flight-test device comprising pen, paper-tape drive, altimeter and two stop-watches.

**spin chute** Anti-spin parachute.

**spin dimpling** Dimpling by coldworking tool (eg 60° cone) around hole for rivet or other fastener under pressure, without cutting.

**spindle** Structural frame in rigid airship to which mooring cone is attached.

**spindling** Generalized term for machining of wooden parts, esp. to effect particular desired uniform cross-section to spar, longeron or other structural member. \* machine basically resembles spar mill or router.

**spine** Non-structural fairing along dorsal centreline of aircraft or along outside of ballistic vehicle (occasionally in other locations but always parallel to longitudinal axis) covering pipes, controls or other services. In some cases merely drag-reducing fairing linking canopy to fin.

**spine hood** Hinged or removable cover over equipment in spine.

**spin forward** Incorporation in latest programme of technology already developed for predecessor.

**spin in** To continue a spin until ground impact.

**spin motor** Rocket(s) imparting spin (rotation about longitudinal axis) to missile or other vehicle.

**spinner** Streamlined fairing over propeller hub; not used for similar fairing over helicopter rotor hub.

**spinning** 1 Sheet-metal shaping by forcing against spinning die of desired profile (suitable only for bodies of revolution).

2 To engage in spin (1).

**spinning nose dive** Flight manoeuvre in which aeroplane or glider is rolled with ailerons while in steep unstalled dive (US usage).

**spinning test** 1 To explore spin characteristics of aircraft.

2 Basic strength test of propeller or helicopter rotor, or (often at very high speed in low-drag environment) other rotating assemblies, eg turbine or fan rotor.

**spinning tunnel** See *spin tunnel*.

**spin-off** 1 Predicted or unexpected advances in one technology caused by transfer of technical solutions from another. Also called fallout.

2 In particular, transfer from defence to civil.

**spin-on** Technology transfer from civil to defence.

**spin parachute** See *anti-spin parachute*.

**spin-recovery parachute** See *anti-spin parachute*.

**spin rocket** See *spin motor*.

**spin stabilized** Given gyroscopic directional pointing stability by high-speed rotation about longitudinal axis.

**spin table** Large disc on which objects, including human beings, can be rapidly rotated about vertical axis for various test and research purposes; \*\* in turn may be mounted on arm of centrifuge to give additional sustained unidirectional lateral acceleration.

**Spintcom** Special-intelligence communications.

**spintronics** Technology of devices whose operation depends on electron or nuclear spin.

**spin tunnel** Wind tunnel in which flow through working section is vertically upwards, thus free model supported by airflow can be examined for spinning characteristics.

**SPIO** Signal processor input/output.

**SPIP** Transponder identification pulse.

**SPIR** Single-pilot instrument rating.

**SP(IR)** Satellite picture, IR.

**spiral** 1 One of the five basic modes of aeroplane motion, slow divergence or convergence in level flight with gentle banks L/R persisting long enough for large heading changes.

2 Flight manoeuvre in which at least 360° change in heading is effected while in glide or shallow dive (chiefly US usage).

3 A new [2004] buzzword meaning subdivision or part (USAF).

**spiral aerial (antenna)** Aerial in form of single conductor wound as spiral on conical dielectric support; common as passive RWR receiver.

**spiral angle** Angle between pitch cone generator of bevel gear and tangent to tooth trace; positive for right-hand gear.

**spiral bevel gear** Crown gear has pitch curves inclined to pitch element and usually circular arcs.

**spiral dive** Extremely dangerous flight manoeuvre in which aircraft, invariably fixed-wing aerodyne, is unwittingly in spiral descent with neither turn nor slip indicating and in absence of external cues few indications other than horizon instrument if fitted.

**spiral divergence** Spiral dive with vertical acceleration  $\pm 1\text{ g}$ .

**spiral glide** Sustained gliding turn.

**spiral instability** Faulty aeroplane flight characteristic in which there is an inherent tendency to depart from straight and level flight into oscillating sideslip and bank, latter always being too great for tendency to turn. (Long-established UK definition unrelated to Dutch roll, which is a high-subsonic phenomenon; suggest arch.).

**spiral mode** An exponential manoeuvre mode involving pronounced roll and yaw, in some aircraft marginally unstable.

**Spiralok** Patented female thread in which base of normal 60° profile changes to 30°, forming tight clamp on all male crests.

**spiral scan** See *scan types*.

**spiral stability** Desired aeroplane characteristic in which, in co-ordinated turn, it automatically resumes straight and level flight on release of flight controls. Note that no slip is present to assist recovery, and that large fin (needed for other reasons) exerts adverse influence.

**Spirit** Spectral IR rocket-borne interferometer telescope.

**Spiritt** Spectral IR imaging technology testbed, also translated as spectral IR remote-imaging transit testbed.

**spiroid gear** Patented gear in which conical worm engages with many teeth simultaneously of face-type gear, possibly with exceptionally large reduction ratio.

**SPIT, Spit** Smart procurement implementation team.

**Spits** See SSPTS.

**spitting** Air intercept code: "I am about to lay sonobuoys and may be out of radio contact (because very low) for few minutes" (DoD).

**SPJ** Self-protection jammer.

**SPK** Synthetic paraffinic kerosene.

**SPKL** Sprinkle (rain).

**SPKR** Speaker.

**SPL** 1 Sound pressure level, see *noise*.

2 Standard parts list(ing).

3 Supplementary flightplan message.

4 Sun-pumped laser.

5 Signature and Propagation Laboratory (USA).

6 Special.

7 Student Pilot's Licence [in UK replaced by CAA medical certificate].

**splash** 1 Code word sent to observer 5 s before estimated impact of weapon(s).

2 Target destruction verified by visual or radar means.

3 Generalized term for action of destroying aerial target.

**splash code** Letter/number identity of navigation beacon (WW2).

**splash cooling strip** Welded around interior of flame tube of annular chamber so that cooling air entering through perforations is converted into thin sheet moving across inner surface.

**splash-detection radar** Pinpoints impact of vehicle with ocean to facilitate positive scoring and vehicle recovery (eg in Nike X ABM tests).

**splashdown** End of space mission in which spacecraft, capsule or other recoverable object impacts ocean surface; defined as either a time or a location.

**splashed** Air-intercept code: enemy aircraft shot down (followed by number and type) (DoD).

## splash lubrication

**splash lubrication** Use of small lips or vanes on connecting rods or crankpins to splash oil inside crankcase; rare in aviation.

**splatter** 1 Adjacent-channel interference in pulsed transmissions, measured as amount of spectrum energy that can appear in adjacent channel; varies greatly with different pulse waveforms.

2 Cloud of canopy fragments after MDC detonation.

**splice** Structural joint made by plate overlapping both members, plus doubler.

**spline** 1 Axial groove in shaft for meshing with driven member; hence splined shaft has entire periphery formed into splines, invariably of involute or even rectangular section.

2 Flexible non-structural strip (various materials) bent to required curvature in construction of fairing.

**splinter** Fragment of casing from exploded bomb or h.e. shell.

**split** Verb, to divide an engine into modules, notably into fan and core, hence \*-engine shipping, etc.

**split-altitude profile** Flight-profile has two main flight levels.

**split-axle gear** Landing gear on simple low-performance aircraft in which there is no axle or other linking transverse member. Also called divided gear.

**split basing** Division of tactical-aircraft unit's resources between two operating bases.

**split cameras** Two or more cameras fixed so that imagery of one overlaps that of neighbour(s) by selected amount.

**split charter** Commercial flight flown on charter to two companies, each providing part of payload.

**split-compressor engine** Gas turbine in which compression is performed by two separate rotating assemblies running at different speeds; can be axial + centrifugal, while term two-spool suggests axial + axial.

**split courses** See *multiple courses*.

**split distance** Two friendly fighters fly apart for mutual interception practice, usually head-on.

**split flap** Flap formed from only underside of aerofoil, depressed with plain hinge leaving upper surface unaltered; gives high drag but little extra lift.

**split-flow engine** Turbofan in which fan air is diverted to blow wing or flaps and core jet is used for propulsion (and, if vectoring is added, for lift).

**split gear** Landing-gear trucks (B-52) attempt to steer some left and some right simultaneously.

**split landing gear** See *split-axle gear*.

**split line** Small flash-projecting ridge round surface of die forging.

**split load** Drop of firefighting retardant at two locations in same mission.

**split mission** Several meanings, including (1) profile part hi and part lo, (2) task includes recon and attack, (3) task includes two surface targets, (4) transport flight carries loads for two destinations, and (5) part subsonic and part supersonic dash.

**split needles** Various flight-instrument indications for aeroplane (eg dual engine-speed indicator with one engine at flight idle) or helicopter [eg, gross disharmony between speeds of engine and rotor system].

**split pair** See *split vertical photography*.

**split patch** Patch for reinforcing end of surface (eg fabric air inlet) at junction with airship envelope.

## spoiler

**split-plane manoeuvring** Air-combat manoeuvring for mutual support following a defensive split.

**split-S** Flight manoeuvre comprising half flick (snap) roll followed by second half of loop, resulting in loss of height and 180° change in heading.

**split-surface control** Powered flight-control surface subdivided into two or three portions, each of same area and each driven by its own independent power unit (thus, VC10 has four elevators and three rudders).

**splitter** 1 Fixed or laterally movable surface dividing fluid flow in duct, eg to feed two engines, or to divide each flow element in a centrifugal compressor or to pass into bypass duct and compressor in a turbofan.

2 Machine which divides or apportions signals, shaft power or other services among selected recipients.

**splitter fairing** The streamlined fairing over a shaft taking the drive from inside a gas turbine to a unit mounted externally or on a fan case.

**splitter box** Divides one rotary input among two outputs in variable proportions, eg to control either or both of two-roll-control or DLC spoilers.

**splitter gearbox** 1 Splitter box.

2 Gearbox dividing input along two channels, eg from reverser PDU (3) to left/right half-rings of slave actuators.

**splitter panels** Sound-absorbing panels, usually radial struts or concentric rings, to reduce noise from jet-engine inlet.

**splitter plate** On centreline of single-surface rudder.

**split vertical photography** Simultaneously triggered reconnaissance cameras, each tilted same angle to left or right of centreline, with small centreline overlap.

**split wheel** Made in inner and outer halves to facilitate changing tyre.

**split-work blade** Gas-turbine fan blade comprising inner (compressor supercharging) portion separated from outer (fan) portion by part-span shroud.

**SPLR** Spoiler.

**SPM** 1 System planning manual.

2 Solar-proton (or particle) monitor.

3 Solid propellant motor.

4 Security protection module (networks).

5 Superalloy powder metallurgy.

6 Scanning-probe microscope, or microscopy.

7 Surface-position monitor.

8 Stabilizer position module[s].

9 Stochastic process model.

**spm** Shots per minute.

**SPMS** Special-purpose manipulator system.

**SPN/GEANS** Standard precision navigator, gimballed electrostatically, aircraft navigation system.

**SPO** 1 System program office.

2 Safety petty officer (carrier catapult).

3 Single-pilot operation.

4 Strategic plan of operation [see *SPT*].

**SPOC** Single point of contact (Sarsat).

**SPOH** Since part, or propeller, or partial, overhaul.

**spoil** To reduce, not necessarily to zero (eg lift or thrust).

**spoiler** 1 Hinged or otherwise movable surface on upper rear surface of wing which when open reduces lift, and usually also increases drag. Most are essentially flat plates hinged at or beyond leading edge and power-driven to open upwards, either symmetrically to incline flight path downwards or differentially to command or augment roll. Supersonic combat aircraft often have no other roll

## spoiler/elevator computer

## spotter

control, while others use \* only at low speeds or high speeds. \* operation on commercial transports is invariably linked with position of speed brakes, response depending on whether differential or not. DLC \* is primary flight control, esp. during landing. Many \* used as lift-dumpers after touchdown.

**2** Movable deflector used to kill most if not all residual thrust from engine or from turbofan core; much simpler and lighter than reverser.

**3** Comb, flap or other device extended on command to break up local airstream, eg ahead of open weapons bay.

**spoiler/elevator computer** Multiplexes input control signals to provide roll and speedbrake control and, if fitted, gust-alleviation; following failure of pitch computer also provides back-up main and trim control in pitch.

**spoiler initiation angle** Rotary deflection of pilot's roll control (spectacles, handwheel, etc) at which spoiler(s) start to open (from wings-level flight with speedbrake fully closed).

**spoiler-mode control system** Governs spoilers as DLC in flight and auto dumper and speedbrake on touchdown.

**spoileron** Small spoiler either augmenting ailerons with large input, or serving as primary control in roll.

**spoking** **1** Regular or erratic flashing of rotating time-base on PPI or other radial display.

**2** Any PPI display which radiates out from a central origin.

**SPOL** Solar-powered obstruction light[s].

**sponginess, spongy** Descriptive but vague term for flight controls where response appears unduly delayed or uncertain, usually due to cable stretch, play in pully supports and mechanical wear.

**sponsons** **1** Symmetric projections low on each side of flying-boat hull in form of short thick wings to provide stability on water in place of outer-wing floats.

**2** Projections from helicopter fuselage in form of short thick wings to provide attachment for main landing gear (and in some cases retraction stowage space).

**3** Short, thin wing-like structures projecting from aeroplane or helicopter fuselage to carry weapons, external tanks, guns and possibly other devices.

**spontaneous ignition point** Lowest temperature at which vapour spontaneously ignites without external ignition source [see *auto-ignition*].

**spoof** **1** To copy hostile IFF reply code.

**2** See spoofing.

**spoofe** Air-intercept code: contact is employing electronic or tactical deception measures (DoD).

**spoofing** Acting the part of hostile forces, especially in EW.

**spook** Adjective or noun: aircraft, manned or unmanned, flying EW missions, especially clandestine.

**spool** **1** One complete axial compressor rotor, in case of multi-shaft engine forming LP, IP or HP portion of complete compressor. Some authorities include the drive-shaft and turbine.

**2** Attachment anchor, usually one of L/R pair, for catapult bridle of carrier aircraft.

**3** To open throttles (colloq.). Increasingly, spooling = ground running.

**spool down** To allow gas-turbine engine rpm to decay to zero, eg after closing shut-off valve or HP cocks; normally

two words, or one as adjective, hence spooldown time. Also called *rundown*.

**spool duct** Joins engine to augmentor and UAA nozzle.

**spool up** To accelerate engine rpm, esp. to TO power or at least to much higher level than previously; normally turbofan or turbojet.

**spool valve** Fluid-flow control in which an external pressure-difference force moves an axially sliding valve in which two or more pistons close or open wall apertures [as in steam locomotive].

**sporadic E** Irregular radio-reception and disturbance caused by abnormal variation in E-layer.

**sportplane** No definition, but generally taken to mean small GA aircraft in which flight performance dominates other qualities.

**SPOT** **1** Spot wind (ICAO).

**2** Speed, position, track.

**3** Smart position-only tag.

**spot** **1** To form up aircraft in close ranks on carrier deck ready for free or catapult takeoffs.

**2** Designated place on airfield where landing is to be made.

**3** Bright region where electrons strike fluorescent tube face in CRT and many other displays or image converters.

**4** To determine, by observation, deviations of ordnance from target for purpose of supplying necessary information for adjustment of fire (DoD).

**5** To search from ground for hostile aircraft in own airspace (UK civilian usage, WW2; hence spotter, spotting).

**6** Code, spot wind.

**7** A hydraulic or pneumatic cylinder in a disc or plate-type wheel brake [thus, a nine-\* brake].

**spot annealing** Annealing local area of hard steel, eg to drill and tap fixing hole.

**spot beam** Electromagnetic beam made as parallel as possible to maximize power at great distance.

**spot elevation** See *spot height* (US usage).

**spot facing** Local surface-machining round hole or other point, to improve surface finish, adjust dimensions or provide square-on surface for bolt head.

**spot fuel** Uplifted and paid for on the spot, as distinct from part of ongoing contract.

**spot height** Height of point, esp. mountain peak or other high point, marked on map or chart.

**spot hover** Helicopter training manoeuvre in which machine is hovered at low level over point, turning through four successive headings 90° apart.

**spot jamming** Jamming of specific frequency or channel.

**spot landing** Aeroplane landing made from specified position and height AGL on to spot (2); form of accuracy landing.

**spotlight** **1** A DBS radar operating mode using very narrow beam with highest possible resolution, steered to dwell on targets of high interest so that numerous echoes can be integrated.

**2** Strongly directional light aimed at area of interest, e.g. part of airframe susceptible to icing.

**spot net** Com net used for spot (4) information.

**spot report** Sent from attack or reconnaissance aircraft stating passage overhead specific target.

**spot size** Diameter of spot (3).

**spotter** **1** Person assigned to task of watching for and identifying hostile aircraft; hence raid \*, official respon-

**spotting**

sible for immediate warning of imminent attack to high-priority establishment whose personnel would remain at work throughout air raids (UK civilian usage, WW2).

2 Crew member detailed to spot (4).

**spotting** Act of arranging aircraft on flight deck (see *spot* [1]).

**spotting factor** Ease with which particular aircraft type can be spot (1) positioned on deck; not quantified but takes into account overall folded dimensions and turn radius and possibly stability and laden weight.

**spot weld** Local, usually circular, weld quickly made by electrical resistance jaws working on sheet; tool can be point or roll electrodes.

**spot wind** Wind measured at one geographical location.

**spot wobble** Technique for imposing small SHM waveform on each line of TV or similar raster display to blur separate lines.

**SPPO** Short-period pitch oscillation.

**SPR** 1 Solid-propellant rocket.

2 A commercial rain-repellant for transparencies.

3 Secretarial program review (US).

4 Synchronization phase reversal [Mode-S xpdr].

5 Secure packet radio.

6 Semi-prepared [i.e., unpaved] runway.

7 Strategic petroleum reserve (US).

**SPRA** Special-purpose reconnaissance aircraft; one designed to cross hostile frontier covertly.

**Sprag** Water-spray type arresting gear.

**sprag** 1 Pivoting and lockable projection in cargo-floor guiderails to prevent movement of pallets or platforms. Occasionally (not DoD) called spigot.

2 Pawl or spigot-type mechanical lock for a rotary member, as in next two entries.

**sprag brake** Positive mechanical brake for locking wheels of helicopter parked in confined area on rolling deck.

**sprag clutch** Positive mechanical lock for failed engine and drive of helicopter, while permitting continued overrunning or autorotation of rotor system.

**splashpot** Sprag and dashpot in series.

**spray** To dispense liquid from aircraft for agricultural, defoliant or ECM purposes.

**spray bar** Bar for spraying, esp. for ag purposes, arranged spanwise below trailing edge and usually freely swinging to knock upward on impact with obstruction.

**spray dam** Strip projecting along forebody chine of marine aircraft, as far as possible following streamline in cruising flight, to deflect water spray downward.

**spray dome** Mound of water thrown into atmosphere when shockwave from underwater NW reaches surface.

**spray hood** Head covering attached to lifejacket.

**Spraymat** Patented (Napier, now Lucas) electrothermal anti-icing and de-icing mats featuring sprayed-on metallic layers.

**spray strip** See *spray dam*.

**SPRD** 1 Spread.

2 Solid-propellant rocket motor (R).

**spreader** 1 Agricultural aircraft rigged for solids.

2 Mechanical (usually centrifugal) dispenser of agricultural solids.

**spreader bar** 1 Horizontal member(s) separating and joining floats of twin-float seaplane.

2 Horizontal axle-like member joining left/right

landing gears of early or light aircraft, other than true live axle.

**spread spectrum** Vast and growing technology forming complete division of electronics, esp. military and avionics, fundamental of which is use of PN, FH, TH or any combination of these to modulate signal whose bandwidth is much wider than that of plain message. Latter is conventional (eg biphasic digital or PDM analog) and is merged digitally with \*\* modulation to generate emitted signal. Advantages are very great anti-jam capability, military security, multiple access, low detectability, Selcal capability and auto transmitter ident, multipath tolerance, and inherent precision-nav capability.

**springback** Angular distance through which metal bent to new shape springs back after bending force is removed; allowed for in making tooling or in hand operations.

**spring bow** Supports arrester wire above carrier deck.

**spring drive** Coupling inserted between piston-engine crankshaft and supercharger [rarely, propeller or reduction gear] to prevent transmission of cyclic vibrations. See Bibby.

**spring feel** Simplest form of artificial feel, in which force is applied to pilot's flight control (eg stick or yoke in pitch) by linear spring, thus within limits exactly proportional to deflection and unvarying with dynamic pressure.

**spring sheet-holder** Small lock in form of cylinder and spring-loaded rod with locking end inserted by pliers through holes in sheets to hold location during riveting.

**spring strut** Mechanical link imposing absolute limit on force transmitted.

**spring tab** Servo tab whose deflection relative to surface is resisted by spring, usually torsion bar, which is often preloaded so that at gentle inputs pilot moves surface and tab unaided; at higher input spring is overcome and tab deflected to assist.

**springy tab** Not same as previous entry, tab moved upwards only by spring, having powerful effect at low IAS, making pilot pull back on yoke giving stick-free stability. Also called Vee tab.

**Sprite** 1 Surveillance, patrol, reconnaissance, intelligence-gathering, target-designation and EW (UK).

2 Signal processing in the element.

**sprites** Transient visual phenomena, typically luminous streaks, seen in ionosphere above giant thunderstorms.

**SPRL** Spiral.

**SPRO** Semi-prepared runway operations.

**sprog** Totally inexperienced [noun and adjective] (RAF, WW2).

**SPS** 1 Secondary, or solar, power system.

2 Samples per second.

3 Blown flap (USSR, R).

4 Self-protection system, or subsystem.

5 Simplified processing station.

6 Service (module) propulsion system.

7 Standard position[ing] system, or service, part of GPS Navstar.

8 Signal, or sonobuoy, processing system.

9 Sensor processing subsystem.

10 Standard Procurement System (DoD).

11 Standard pressure setting.

**SPSS** Statistical package for social sciences (CAA).

**SPT** 1 Strategic Planning Team (FAA, NAS).

2 Shop processing time.

3 Simplified passenger travel.

## SPT-B

4 Signal-processing tools.

**SPT-B** Selectable-performance target, ballistic.

**SPU** 1 Short power-up (SAAHS self-test).

2 Intercom (USSR, R).

3 Subsystem power unit.

4 Signal processing unit.

5 Stores power unit.

**Spur** Space-power unit reactor.

**spur gear** Gearwheel with straight teeth round periphery; many dictionaries add ‘parallel to axis of rotation’, not so, most aero-engines contain *helical*\*.

**Sputnik** Russian word for ‘fellow traveller’, name of first artificial satellite, launched 4 October 1957; later colloq. for any satellite or even any spacecraft.

**sputtering** Ejection of metal atoms from cold cathode by evaporation or ion bombardment, either as nuisance, to form fine coating on substrate or to form colloidal metal solution.

**SPW** 1 Self-protection weapon (tactical attack aircraft AAM, not necessarily fired in forwards direction).

2 Secondary power.

**SQ** 1 Squall (ICAO).

2 Software, or service, quality.

3 Squelch, squawk.

4 Super-quick [fuze].

5 Square.

**SQA** 1 Software quality assurance; / CM adds /configuration management.

2 Service quality agreement.

**SQAL** Squall.

**SQAN** Squall line.

**SQB** Service-quality billing; P adds processor.

**SQC** Statistical quality control.

**SQD** Service-quality data.

**sq ft** Square feet.

**SQL** Structured query language.

**SQLN** Squall line.

**SQM** 1 Software quality metrics, quantified measures of SQ.

2 Software quality management.

**sq m** Square metres,  $m^2$  preferred.

**Sqn, sqn** Squadron.

**SQP** Sequential quadratic programming.

**squadron** Any of many types of military or naval unit, including common administrative unit of combat aircraft; according to many services ‘consisting of two or more flights’. Foreign-language equivalents include Staffel (G), escadron (F), escuadron (S), eskadrila (USSR, R).

**Squadron Uncle** Senior officer [e.g., Wg Cdr] who stays behind when the unit is posted to an overseas conflict (RAF).

**squall** Strong but intermittent wind; gust whose effect lasts minutes rather than seconds and extends a kilometre/mile or more horizontally.

**squall line** Line of established or developing thunderstorms.

**squarco** Radar beam squinting plus area coverage.

**square** 1 See *signal area*.

2 Large square marked on remote part of airfield, to be accurately flown by pupil helicopter pilot, especially in presence of wind.

3 Of an aeroplane [airplane], having length equal to span.

4 Of a piston engine, having bore equal to stroke.

**squawk normal**

**square bashing** Drill, esp. on barrack square (UK).

**square course** Airfield circuit (US usage); does not mean literally square.

**square/cube law** Basic geometric law: areas of similar-shaped solid bodies are proportional to squares of linear dimensions, and volumes (ie for equal densities, masses) to cubes. Thus if two aeroplanes are of same shape but one has twice linear dimensions, it will have four times wing area and eight times weight, hence W/S is doubled.

**square engine** Piston engine whose bore equals stroke.

**square foot**  $0.0929m^2$ , 92,903.04 mm<sup>2</sup>.

**square inch** 645.16 mm<sup>2</sup>.

**square mile** 2.5899 km<sup>2</sup>.

**square parachute** One whose canopy is approximately square when laid out flat.

**square search** Various standard air/surface search patterns in form of overlapping rectangles (usually squares or near-squares) so that after a period aircraft has examined a large strip or rectangle with minimal duplication.

**square stall** Stall with wings level throughout.

**square thread** Thread with vertical faces (unlike Acme) used for transmitting power as linear thrust in either direction.

**square wave** EM or other periodic wave which alternates between steady positive and steady negative values in time extremely brief by comparison with steady periods.

**square-wing biplane** Upper and lower spans equal; according to some authorities, also without stagger.

**squaring shears** Hand or power shears for cutting sheet positioned on marked-out platform.

**squash head** Warhead for use against hard targets, esp. those with single thick metallic armour layer; basic principle is transmission of intense shockwave through armour, causing transverse acceleration high enough to spall pieces off inside face.

**squat(ting)** Downward movement of marine aircraft c.g. (eg due to trough) in essentially level attitude while running on water.

**squat switch** Bistable switch triggered by sustained (usually 2.5 s) compression of main or nose landing-gear struts on touchdown, to operate lift dumpers, reversers and/or other devices. Term also applicable when input is rotation of MLG bogie beam.

**squawk** Generalized word for airborne transponder or IFF operation and keying; when used alone usually a ground-radar ATC command to switch to normal or to directed mode. Keying is usually a four-digit number. See following entries.

**squawk alt** Switch to active Mode C with auto altitude-reporting.

**squawk Charlie** See *squawk alt*.

**squawk flash** Operate IFF I/P switch.

**squawk ident** Engage ident feature; civil counterpart of flash.

**squawking** Air/ground code: showing IFF/transponder in mode/code indicated.

**squawk low** Switch to low sensitivity.

**squawk Mayday** Switch to emergency position; for civil transponder Mode A, Code 7700; for mil IFF Mode 3, Code 7700 plus emergency feature.

**squawk mike** Operate IFF MIC switch and key transmitter as directed.

**squawk normal** Switch to normal sensitivity.

**squawk (number)**

**squawk (number)** Operate in Mode A/3 on designated code.

**squawk (number) and ident** Operate on specified code in Mode A/3 and engage ident (mil IFF I/P).

**squawk standby** Switch to standby position.

**squeaker** 1 Fitted to friendly aircraft to warn of nearby balloon cables (WW2).

2 Perfect touchdown, synonymous with greaser.

**squeeze-film bearing** Provided with small annular space between outer track and housing filled with pressure-feed lube oil which cushions dynamic radial loads, thus reducing engine vibration and possible fatigue. It enables a shaft system to rotate about its true centre of mass. The oil film is often called a squeeze-film damper.

**squeeze riveting** Rivet closure by single sustained force instead of blows.

**squelch** 1 Subcircuit in communications receiver which holds down volume to reduce output noise until a signal is received.

2 Pilot control of volume or signal/noise ratio.

**squib** Any small pyrotechnic used as source of hot gas, eg to fire igniter of rocket or fuel in some (eg missile/RPV) gas turbines.

**squib valve** Ambiguous, has been used to mean (1) solenoid valve for controlling thrusters (Apollo RCS) or (2) squib-actuated valve.

**Squid** Trade name, see (1) next.

**squid** 1 Superconducting quantum interference device; pair of Josephson junctions.

2 Semi-stable part-opened regime of parachute canopy, normally encountered only at extreme airspeeds.

**squidding** Operation of parachute in squid position.

**squint** 1 Small angular error between actual and theoretical direction of main-lobe axis or direction of maximum radiation of radar or other directional emitter (see \* angle).

2 Operating mode of forward-looking radar or SAR in which beam is steered to image object obliquely, ahead of or behind platform.

**squint angle** 1 Maximum angle away from missile axis at which homing head (IR, radar, EO, etc) can acquire and lock on to normal emitting point target at significant distance.

2 Angle of squint.

**Squippers** Safety-equipment fitters (colloq.).

**squirrel cage** 1 Air-combat dogfight (colloq.).

2 Induction motor whose rotor comprises axial bars joined to rings at each end, pulled round by rotating field.

**squirt** Jet aircraft (colloq., c 1942-48).

**squitter** 1 Filler pulses transmitted by transponder between interrogations.

2 Spontaneous transmission generated once per second, without interrogation.

3 Random pulse pairs generated as fillers.

**SQL** Structured query language.

**Sql** Squelch.

**SQP** Signal-quality parameter.

**SR** 1 Short-range.

2 Search rate.

3 Sunlight-readable.

4 Special rules.

5 Single rotation.

6 Sortie rate.

7 Strategic reconnaissance, role designator (US), originally transposition of RS (recon/strike).

8 Sunrise.

9 Service report, or request.

10 Solid rocket.

11 Slow-speed route (FAA).

12 Switched reluctance (see SRMG, SRSG).

13 Shear rate.

14 Staff requirement [(A) adds Air].

15 Stopped-rotor [adjective].

16 Statistical reporting.

17 Spherical radius.

**sr** Steradian.

**SRA** 1 Special-rules area, or airspace.

2 Shop-replaceable, or repair, assemblies.

3 Surveillance radar approach (CAA).

4 Spin reference axis.

5 Specialized repair activity (DoD).

6 Surveillance and reconnaissance aircraft.

7 Strategic Research Agenda (Acare).

**SRAA** Short-range air-to-air, M adds missile, W warfare; but see next.

**SRAAW** Short-range anti-armour weapon (UAV).

**SRADD** Software requirements and design description.

**SRALT** Short-range air-launch target (USN).

**SRAM** 1 Short-range attack missile.

2 Static, or strategic, random-access memory.

**SRARM** Short-range anti-radiation (or radar) missile.

**SRB** Solid-rocket booster.

**SRBM** Short-range ballistic missile.

**SRBOC** Super-rapid-blooming offboard chaff.

**SRBS** Skeletal reference baseline simulator (SDI).

**SRC** 1 Science Research Council.

2 Secondary radar code.

3 Sample return container, or capsule [spaceflight].

4 Surveillance-radar computer.

5 Spoiler ratio changer.

**SRCC** 1 Structures Research Consultative Committee (SBAC).

2 Standard radar-control console (NATO).

**SRCU** Secure remote-control unit.

**SRD** 1 Short-range diversion.

2 Service-revealed difficulty.

3 Systems requirements document.

**SRDE** 1 Signals Research & Development Establishment [Christchurch, now closed] (UK).

2 Search-radar data extractor.

**SRDS** Systems Research and Development Service (FAA).

**SRE** Surveillance radar element; portion of GCA.

**Sref** Reference area.

**SREJ** Selective reject.

**SREM** Software requirements engineering methodology.

**SRF** 1 State-rate feedback [IMF adds implicit mode following].

2 Soft-copy reference folder.

**SRFCs** Self-repairing flight-control system.

**SRFP** Sunlight-readable flat panel; D adds display.

**SRFW** Schweizerische Rettungsflugwacht (= GASS) (Switzerland).

**SRG** 1 Safety Regulation Group (UK CAA).

2 Short-range.

**SRHit, SRHIT**

**SRHit, SRHIT** Short-range homing intercept technology (SDI).

**SRI** 1 Short-range insert.

2 Southwest Research Institute [San Antonio, TX78228-0510] (US).

**SRIMU** Small re-entry inertial measurement unit.

**SRINF** Short-range intermediate nuclear force[s].

**SRL** Società Responsabilità Limitata (I).

**SRLD** Small rocket lift device.

**SRM** 1 Solid-rocket motor [U adds upgrade].

2 Short-range missiles (HUD selection).

3 System resource manager (software).

4 Speech-recognition module.

5 Structural repair manual.

6 Selective-reject mode.

**SRMG** Switched-reluctance motor-generator.

**SR-30** 30 minutes before sunrise.

**SRO** 1 Station routine orders.

2 Senior ranking officer.

3 Space Research Organization (India), usually called ISRO.

4 Sensitive reconnaissance operation[s].

5 Superintendent of Range Operations.

**SROB** Short-range omnidirectional beacon.

**SRON** Space research organization [office, Utrecht] (Netherlands).

**SRP** 1 Steep rocket projectile (GGS selection, WW2).

2 Software rapid prototyping.

3 Slot [ATC] reference.

4 Computer (R).

5 Service resource planning.

6 Stabilization reference package; / PDS adds position-determining system.

7 Sustained readiness program.

8 Selected reference point.

9 Shared reconnaissance pod.

**SRPG** Strain-range pair counter.

**SRR** 1 Search/rescue region (ICAO).

2 System[s] requirements, or release, review.

3 Software requirements review.

4 Short-range recovery.

5 Strategic resources review (NASA).

6 Satellite recognition receiver.

**SRS** 1 Sonobuoy reference system.

2 Speed reference system.

3 Survival radio set.

4 Smoke-repellant system.

5 Strategic Reconnaissance Squadron (USAF).

**Srs** Series.

**SRSG** Switched-reluctance starter-generator.

**SRSK** Short-range station-keeping.

**SRSP** Space Radiation Shielding Program (MSFC).

**SR-SS** Sunrise to sunset.

**SRST** Sunlight-readable see-through; HW adds head-wearable.

**SRT** 1 System readiness test[s].

2 Syllabus for recurrent training.

3 Standard remote terminal.

4 Satellite receiver/transmitter.

**SRTM** Shuttle-radar topography mission.

**SRTO** Supervisory Resident Technical Officer.

**SRTS** Short-range thermal sight.

**SRU** 1 Shop-replaceable unit.

2 Scanner receiver unit.

**SRV** 1 Surveillance.

2 Surrogate research vehicle.

3 Schweizerische Raumfahrt-Vereinigung [astronautics federation, = ASA(12)] (Switzerland).

**SRVL** Shipboard rolling vertical landing.

**SRW** Strategic Reconnaissance Wing (USAF).

**SRWBR** Short-range wideband radio.

**SRY** Secondary.

**SRZ** 1 Special-rules zero.

2 Surveillance-radar zone.

**SS** 1 Sunset.

2 Spread spectrum.

3 Single-slot[ted].

4 Surface-to-surface.

5 Sandstorm (ICAO).

6 System status.

7 Sliding scale.

8 Source-substantiation.

9 System[s] simulation.

10 Sector search (MTI).

11 SAR (2) spotlight (radar mode).

12 Subsystem.

**S<sub>s</sub>** Torsional stress.

**SSA** 1 The Soaring Society of America, Inc. [office, Los Angeles, CA].

2 Self-Soar Association (US).

3 Static-stability augmentation.

4 Stick sensor assembly.

5 Supersonic adversary; A adds aircraft.

6 Special Security Agreement (US).

7 Safe sector altitude.

8 Soviet strategic aviation, transliteration of ADD.

9 Solid-state amplifier.

10 System safety analysis.

11 Space situational awareness.

**SSAC** 1 Source-Selection Advisory Council.

2 Solid-state aircooled.

**SSADP** System station annunciator display panel.

**SSAE** Society of Senior Aerospace Engineers (US).

**SSAI** Solid-state attitude indicator.

**SSAL** Simplified short approach lights; F adds sequence flashing lights, R adds RAIL, S system.

**SS-Anars** Space sextant autonomous navigation and reference system.

**SSAP** 1 Survival stabilator actuation package.

2 Strategic safety action plan. [Eurocontrol, now being replaced].

**SSAR** Spotlight SAR.

**SSAT** 1 Subsonic subscale aerial target.

2 Secure situation awareness tool.

**SSB** 1 Single-sideband.

2 Space Science Board (US, NAS).

3 Split system breaker[s].

4 Ballistic-missile-firing conventionally powered submarine.

5 Supersonic bomber.

6 Small smart bomb; REX adds range-extension.

7 Shaped sonic boom. See next.

**SSBD** Shaped sonic-boom demonstration, which see.

**SSBE** Shaped sonic-boom experiment (NASA).

**SSBJ** Supersonic business jet.

**SSBN** Ship, submersible, ballistic [missile], nuclear [powered] (USN).

**SSBS** Sol/sol balistique stratégique (=MRBM, F).

**SSC** 1 Short-service commission (RAF).  
 2 Sidestick controller.  
 3 Solid-state scanner, or scanning.  
 4 Stennis Space Center (NASA, St Louis, Mississippi).  
 5 Slot/spoiler control.  
 6 Strategic supply chain.  
 7 Small spacecraft.  
 8 Single [European] Sky Committee.

**SSCC** Safety Standards Consultative Committee (EASA).

**SSCM** French form of VSMI.

**SSCP** System services control point.

**SSCVFDR** Solid-state cockpit voice and flight-data recorder; SSCVDR omits flight-.

**SSCVR** Solid-state cockpit voice recorder.

**SSD** 1 Systems and Simulation Division (USAF).  
 2 Short-burst data subscriber device.

**SSDC** 1 Space and Strategic Defense Command (USAF).  
 2 Solid-state data-carrier.

**SSDS** Ship self-defence system against missiles.

**SSE** 1 Software support environment.  
 2 Site security enhancement.  
 3 Simulation/stimulation equipment (ASW).

**SSEB** Source-Selection Evaluation Board.

**SSEC** 1 Static-source error correction.  
 2 Systems and Software Engineering Centre (Qinetiq, Malvern).

**SSF** 1 Station Services Flight (RAF).  
 2 Special sensor laser threat detector.

**SSFDP** Solid-state floating-deck pulser.

**SSFDR** Solid-state flight-data recorder.

**SSFM** Steerable sensor-fuzed munition.

**SSG** Former USN code for cruise-missile submarine; N adds nuclear.

**SSGW** Surface-to-surface guided weapon.

**SSHCL** Solid-state heat [originally high] - capacity laser, sustained 100 kW.

**SSI** 1 Small-scale integration.  
 2 Silver-strip integrator.  
 3 Significant structural, or structurally significant, item[s].  
 4 Sandwich speckle interferometry.  
 5 Sensitive security information.  
 6 Single-system image.  
 7 Structural sampling inspection [airframe].

**SSIA** Service de Surveillance Industrielle de l'Armement (F).

**SSICA** Stick-sensor and interface control assembly.

**SSID** 1 Solid-state ice detector.  
 2 Supplementary structural-inspection document.

**SSIES** Special sensor ionospheric electron scintillation.

**SSIM** Standard schedules information manual, or manager.

**SSIP** 1 Supplemental structural inspection program.  
 2 SubSystems integration project (NICS).

**SSIIXS** Submarine satellite information-exchange system.

**SSJ** Serrated skin joint.

**SSJ5** Special sensor electron/ion spectrometer.

**SSK** Single-shot kill; P adds probability.

**SSL** 1 Speed select lever.  
 2 Single site location.  
 3 Solid-state laser.

**SSM** 1 Surface-to-surface missile.  
 2 Sea-skimming, or - skimmer, missile.  
 3 Seat statute-mile, non-SI traffic unit.  
 4 Special-shape market (advert-shape aerostats).  
 5 Standard schedule message.  
 6 Sign status matrix.  
 7 Software sizing model.  
 8 Sector search mode (J-Stars).  
 9 Stick-shaker margin.  
 10 Special-sensor magnetometer.  
 11 Stealth and signature management.  
 12 SafetySense Leaflet (CAA).

**SSMA** Spread-spectrum multiple access.

**SSMC** Single-source maintenance contract.

**SSME** Space Shuttle main engine.

**SSMI** Special sensor microwave imager; S adds sounder.

**SSMO** Summary of synoptic meteorological observations.

**SSMT** Simulated system maintenance trainer.

**SSN** 1 Attack submarine, nuclear powered.  
 2 Specification serial number.

**SSNR** Mobile missile guidance station (USSR, R).

**SSO** 1 Sun-synchronous orbit.  
 2 Special-service officer (Australia).  
 3 Special-systems operator.  
 4 Surveillance-sensor operator.

**SSP** 1 Sensor select panel.  
 2 Source selection panel (or procedure) (NATO).  
 3 Second-source producer.  
 4 Solid [unpierced] steel planking.  
 5 Surface-science package.  
 6 Space solar power.  
 7 Stockpile stewardship program (NW, see SSSP).  
 8 Structural sampling plan.

**SSPA** Solid-state phased array, or power amplifier.

**SSPAR** Solid-state phased-array radar [S adds system].

**SSPC** Solid-state power controller.

**SSPI** Sighting system passive/IR.

**SS+30** 30 minutes after sunset.

**SSPM** Space-station propulsion module.

**SSPS** Satellite solar power system (or station).

**SSPTS** Station to Shuttle power transfer system [pronounced spits].

**SSQ** 1 Station sick quarters.  
 2 Designation prefix for sonobuoy (USN).

**SSQAR** Solid-state quick-access recorder.

**SSR** 1 Secondary surveillance radar (/ RPG adds Regional Planning Group).  
 2 Solid-state relay, or recorder.  
 3 Standard stall recovery.  
 4 Software Specification Review.

**SSRD** Solid-state recording device.

**SSRF** Shell/shield replacement fabric.

**SSRMS** Space-station remote manipulator system.

**SSRT** Mobile detection and designation radar (USSR, R).

**SSR video** Video (raw radar) signal processed in SSR computer to exclude unwanted information and leave graphical display of targets, data and other displayed information in correct display positions.

**SSS** 1 Space surveillance system (USN).  
 2 Small scientific satellite.

## SSSAR

3 Strategic satellite system; also survivable strategic satellite.

4 Stick-shaker speed.

5 Simulator-specific software.

6 System support segment [JSIPS].

**SSSAR** Spot/swath synthetic-aperture radar.

**SSSC** Single-sideband suppressed carrier.

**SSSP** Science-based stockpile stewardship program (1991, NASA).

**SS-SR** Sunset to sunrise.

**SSST** 1 Solid-state star tracker.

2 Supersonic sea-skimming target.

**SST** 1 Supersonic transport.

2 Static-strength test(ing).

3 Static storage tank.

4 Standard serviceability test.

5 Single-subscriber terminal.

6 Solid-state transmitter [also SSTX].

7 Sidestick transducer.

8 Stores systems tester.

**SSTD** Solid-state towed decoy.

**SSTDMA** Satellite system TDMA.

**SSTI** Stabilized steerable thermal imaging.

**SSTO** Single stage to orbit.

**S-stoff** RFNA (G).

**SSTOL** Super-short, or supersonic and short, takeoff and landing.

**SSTS** Space-based surveillance and tracking system, to acquire and track PBVs, RVs and ASATs (SDI).

**SSU** 1 Signal summing unit.

2 Semiconductor storage unit.

3 Sensor surveying unit.

4 Subsequent signal unit.

**SSULI** Special sensor UV limb-imager.

**SSUP** Space station users panel (Int.).

**SSUS** Spinning solid upper stage.

**SSUSI** Special sensor UV spectrographic imager.

**SSV** Standard service volume (radio).

**SSVT** Satcom secure voice terminal.

**SSW** Swept square wave (ECM).

**ST** 1 Standard time.

2 Stairway (passenger, not powered).

3 Sharp-transition (VASI).

4 Single tandem [landing gear, eg C-130].

5 Strategic transport, air.

6 Static thrust; st is preferred.

7 Statistics.

**St** 1 Area of horizontal tail.

2 Distance between centres of contact areas of tandem wheels.

**St** 1 Stratus.

2 Stokes.

3 Stanton number.

4 Strouhal number (also S).

5 Static thrust.

**St** Unit tensile stress.

**st** 1 Static thrust.

2 Stone.

**STA** 1 Service des Transports Aériens (F).

2 Station (also Sta), eg fuselage STA 307.8.

3 Supersonic transport aircraft (duplicates SST).

4 Static test article.

5 Straight-in approach (ICAO).

## stability loop

6 Shuttle Training Aircraft, STA prefix for other acronyms.

7 Structural test airframe (or article).

8 Section Technique de l'Armée.

9 Scheduled time of arrival.

10 Surveillance and target acquisition.

11 Satcom terminal assemblage.

12 Shuttle tile ablator; see \*54.

**Sta** Station.

**STAARTE** Scientific training and access to aircraft for atmospheric research throughout Europe.

**STAB** Stabilizer.

**Stab** 1 Staff, especially staff flight of four aircraft (G).

2 Steered agile beam.

**stabbing** Assembly process in which finished gas-turbine stator blade (IGV) is fired at high speed through unbroken ring to form tight-gripping joint.

**stabbing band** Narrow projecting band around rotating part, eg turbine disc, from which metal can be removed for dynamic balancing (now generally superseded).

**STABE** Second-time-around beacon echo.

**stabilator** Slab horizontal tail used as single primary control (stabilizer/elevator). Normally pitch axis only, but occasionally used to mean taileron (US usage).

**stability** Generally, quality of resisting disturbance from existing condition and tendency to restore or return to that condition when disturbance is removed. For aircraft, meaning is confined to basic flight control and defined as tendency to resume original (normally straight/level but not necessarily) attitude after upset (rotation about any axis); qualified according to axis and whether stick-fixed or stick-free. See *motion*. For atmosphere, temperature distribution such that particle tends to stay at original level. For structure, ability to develop internal forces resisting those externally applied. For materials other than structural, usually ability to withstand harsh environment (eg high temperature) without even gradual physical or chemical change.

**stability augmentation** 1 Various species of auxiliary subsystem added to primary flight-control system (usually of helicopter, advanced aeroplane or spacecraft) to achieve desired vehicle characteristics by selection of variable gains in feedback loops from surfaces. In some forms surfaces are commanded, eg yaw damper. Modern fighters with relaxed longitudinal stability would be dangerously unstable without \*\*. Usually has limited authority and does not move pilot's controls.

2 Some authorities insist \*\* artificially improves stability while retaining control in the hands of the human pilot.

**stability axes** Introduced c 1939 to simplify calculation, X-axis aligned with relative wind and remaining axes fixed relative to body throughout subsequent disturbance. Made redundant by computers.

**stability derivatives** See *derivatives*.

**stability factor** Ratio of change in transistor collector current to change in  $I_{C0}$  (DC collector current for zero emitted current).

**stability limits** 1 Forward and aft c.g. limits.

2 Extreme angles of incidence to which taxiing seaplane can be trimmed without porpoising.

**stability line** Surge line.

**stability loop** Plot of limits of gas-turbine combustion,

## stability margin

one too fuel-rich and the other too weak, on ordinate air/fuel ratio and abscissa mass flow.

**stability margin** See *static margin*.

**stabilization** 1 Positive action to maintain stability, esp. of spacecraft or payload, when term invariably refers to attitude. Passive \* is any method requiring no sensing, logic or power, eg gravity-gradient, spin and solar-wind/aerodynamic pressure. Semi-passive requires stored momentum, eg gravity-gradient plus CMG. Semi-active introduces limited thrust/torqueing, eg on one axis. Active features sensing, logic and control about all axes. Hybrid are systems with more than three degrees of freedom, eg to control despun/gimballed/independent secondary devices such as aerials or telescopes.

2 On starting engines of multi-engined aircraft, attainment of steady rpm, EGT and other parameters on all engines, usually prior to taxi.

**stabilized approach** On glidepath at correct airspeed, correctly configured, all checklists and paperwork complete.

**stabilized gyro** Usually means aligned with a desired direction, eg Earth centre, true N or magnetic meridian.

**stabilized platform** Invariably, platform maintained always horizontal at any place on or near Earth, ie perpendicular to local vertical.

**stabilizer** 1 Tailplane or slab horizontal tail (US).

2 Loosely, any fixed tail surface, including pressure-inflated fins of non-rigid airship or kite balloon Fin normally prefaced by 'vertical' (US).

3 Low-density core (eg foamed-in-place plastics, balsa, honeycomb) filling interior of secondary structure, control surface, flap, door or similar structure.

4 Additives to retard chemical reactions.

5 Gyro subsystem to stabilize pivoted or gimballed device, eg radar aerial.

6 Flame \*.

**stabilizing altitude** Altitude at which actual rate of climb is zero.

**stabilizing floats** Small seaplane-type floats mounted well outboard under wing of flying boat or three-float seaplane to provide roll stability when afloat.

**stabilizing gears** Small landing gear carried well outboard (eg near or at tips of wing) of landplane with centreline main gears to provide lateral stability on ground, esp. when turning. Also called outriggers.

**stabilizing parachute** Used to stabilize fall of otherwise unstable pardropped load.

**Stabimatic** Simple modular autopilot for GA, buildable from wing-leveller using vacuum aileron input to fully coupled 3-axis system capable of capturing desired FL.

**stable** An air force's total front-line inventory of one aircraft type [rarely, entire available inventory of all types].

**stable aerofoil** Complete wing whose CP travel is very small.

**stable air** Air mass in which actual lapse rate is less than adiabatic lapse rate (dry or saturated, depending on humidity), in extreme cases becoming negative (ie inversion).

**stable-base film** Reconnaissance or scientific film of extremely high dimensional stability.

**stable equilibrium** Body returns to original location after being displaced.

## stage

**stable oscillation** 1 Oscillation whose amplitude is constant.

2 Oscillation whose amplitude decreases (BS).

**stable platform** See *stabilized platform*.

**stable spread** Standard attitude for minimum rate of descent in sport parachuting: face-down, arms and legs spread widely.

**Stabo** Anti-runway munition (G).

**STAC** Supersonic Transport Aircraft Committee (UK, 1956-62).

**stack** 1 Superimposed series of holding patterns, each at assigned FL.

2 To assign to hold in \*.

3 Piston-engine exhaust pipe, of any length or configuration (US).

4 To assemble multi-stage launch vehicle (colloq.), and vehicle thus assembled.

**Staco** Standing Committee for the Study of principles of Standardization (ISO).

**STacSAR** Small tactical SAR (2).

**Stadan** Space tracking and data network. Previously called Minitrack, there are fixed linear aerials at College, AK; St John's, Newfoundland; Goldstone, CA; E Grand Forks, MN; Blossom Pt, MD; Ft Myers, FL; Quito, Ecuador; Lima, Peru; Santiago, Chile; Winkfield, England; Johannesburg, S Africa; and Woomera, Australia. Large dishes are located at Fairbanks, AK; Rosman, NC; and Canberra, Australia.

**stadiametric aiming** Optical aiming using lead angle calculated from apparent size of target and aspect, using various methods including subjective judgement (suggest arch.).

**stadiametric ranging** Estimating target range from knowledge of its true size.

**stadiametric warning** Based on range-closure derived from apparent size of other body.

**S-Tadil-J** Satellite tactical digital intelligence link, joint.

**STAé** Service Technique Aéronautique (F).

**Staff, STAFF** 1 Smart target-activated fire-and-forget.

2 Spatio-temporal analysis of field fluctuation.

**Staffel** Squadron (G).

**Staff-Pak** Four interlinked laboratory modules designed for installation in transport (C-130) to provide electrically noise-free environment.

**staff pilot** Experienced military pilot assigned to special duties, ie not with operational or training unit.

**STA-54** Shuttle tile ablator, 54 lb/cu ft.

**Stag** Simultaneous telemetry and graphics.

**stag** Stagnation.

**stage** 1 One complete element of propulsion, jettisoned (staged) when propellants are consumed (normally applied to rocket). In a multi-\* vehicle each \* fires in sequence following separation of predecessor to reduce mass remaining.

2 One complete element of multi-\* process, normally compression or expansion, through which fluid is passed. Passage through a single long diffuser, venturi or other tapering duct is not \* but use of several in succession causes each to become one \*.

3 One complete element of fluid-flow compressing or expanding (eg power-extracting) device; eg one planar assembly of compressor rotor blades and associated ring of stator blades.

4 Sector (4) or, military, portion of air route between

## stage cost

two staging units; sometimes, for flight planning, one point on route.

**5** Various meanings in electronics, EDP (1) and other disciplines.

**stage cost** Direct operating cost of flying one (mean, or one specific) stage (4).

**stage count** Simple list of total number of stages of blading in fan, compressors and turbines, thus GP7200 \* reads 1-5-9-2-6.

**staged combustion** Or \* combustor, fuel is supplied to groups of burners arranged in rings of different radius or in axially spaced rings or radial arms, ignited successively.

**staged crew** Prepositioned at staging unit to take over incoming flight.

**stage flight** One flight forming part of longer multi-stage journey.

**stage fuel** Fuel burned in flying one stage (4); hence \*\* carpet, plot of variables for flight-planning purposes.

**stage length** Air-route distance between two staging points; in commercial use normally synonymous with sector distance.

**stage sheet** Completed for each stage of maintenance listing all configuration changes and parts replaced.

**stage time** 1 Planned or actual time at which stage (1) takes place.

2 Sector time.

**Stagg** Small turbine advanced gas-generator.

**stagger** 1 Distance measured parallel to aircraft longitudinal axis between biplane lower-wing leading edge and vertical projection on to lower-wing extended chord line of upper-wing leading edge at same spanwise station (UK). Negative when upper plane is aft of lower.

2 Acute angle measured in vertical plane parallel to aircraft longitudinal axis between leading edges of lower and upper planes at same spanwise location (US). Negative when upper plane is aft of lower.

3 PRF variation by various means involving inter-leaving trains separated by offset interval; alternative EW technique to PRF jitter.

**stagger angle** 1 In a biplane, the acute angle in plane parallel to aircraft longitudinal axis between line joining points equidistant from centreline on upper and lower LE (see *stagger* [1]) and local vertical.

2 In a rotor blade of a gas-turbine axial compressor or turbine rotor, the angle between the principal chord at any radius and [usually] the plane through the axis of rotation; the chord line may be drawn as tangent to the LE/TE, or even through the front of the aerofoil only.

**stagger tuning** Increasing pass-bandwidth of RF receiver by tuning different output stages (one meaning of stage [5]) slightly above or below central frequency.

**stagger-wing** Biplane of any make with negative stagger.

**stagger wire** Diagonal wire joining lower and upper wings of biplane and lying approximately in plane parallel to axis of symmetry. (US term; UK = incidence wire).

**staging** 1 Separation of one stage (1) from next.

2 Time at which \* (1) is scheduled or actually occurs.

3 Flying by separate stages (4), with or without changes of crew.

**staging area** Geographical area between mounting area of exercise and objective, esp. for airborne or amphibious operation.

**staging base** Landing and takeoff area with minimum servicing, supply and shelter provided for temporary

## stall

occupancy of military aircraft during course of movement from one location to another (DoD).

**staging point, unit** Place or organization linking two stages (4).

**stagnant** In fluid flow, locally at rest with respect to solid containment. Avoided in most aerodynamics, and especially in fuel flow in gas-turbine injectors.

**stagnation line** Locus joining stagnation points, eg boundary between radial-wall jets under hovering VTOL.

**stagnation point** Point on surface of body in viscous fluid flow (one facing upstream and one down) where fluid is at rest with respect to body, flow in boundary layer on each side of \*\* being in opposite directions.

**stagnation pressure** Pressure at stagnation point, normally same as total head, total pressure or pitot pressure, = sum of local atmospheric plus dynamic pressures.

**stagnation region** Region close to upstream stagnation point.

**stagnation stall** 1 Several related afflictions of after-burning turbofans normally occurring on afterburner light-up at high altitude at modest airspeed, in most cases with rapid pressure pulses (say, seven per second) in fan duct causing oscillating stall of fan and then core engine.

2 In flight of aircraft, any stall that is not self-correcting.

**stagnation streamline** That which in any representation of 2D flow passes through front and rear stagnation points on immersed body.

**stagnation temperature** That at stagnation point, when all relative kinetic energy has been converted isentropically to heat.

**stainless steel** Generally, steels with 12-20 per cent chromium. Most common is 18-8, these being % chromium and nickel.

**Stairs** Sensor technology for affordable IR systems.

**stair-stepped** Jetpipe whose walls form a precisely calculated zigzag to minimise radar cross-section.

**stair-stepping** Step cruising.

**STAJ** Short-term anti-jam.

**stake** Anvil-type bench tool for sheet.

**stakeholder** A person or organization having a professional interest in a programme. Examples include: the customer, the customer's advisors, and everyone concerned with the programme in the prime contractor and his suppliers and subcontractors.

**stake out** To picket aircraft.

**staking** Swageing terminal on to electrical conductor.

**Stalag Luft** Prison camp for captured aircrew (G, WW2).

**STALD** Standoff tactical air-launched decoy.

**stale track** Shown on radar display at last known position, even though it has not appeared on subsequent updates.

**stall** 1 Gross change in fluid flow around aerofoil, usually occurring suddenly at any 2-D section aligned with flow, at AOA just beyond limit for attached flow (at which lift coefficient is maximum); characterized by complete separation of boundary layer from upper surface and large reduction in lift. Traditional wings normally \* at AOA near 16°-18°, which can be attained at any airspeed depending on applied vertical acceleration. AOA for \* is increased by slat, and some highly swept

## stalled pressure

(variable-sweep at max. sweep) wings exhibit no \* even at AOA beyond 60°.

2 Sudden breakdown in fluid flow previously attached to solid surface, caused by changed angle of either surface or flow, violent pressure pulse in flow (esp. travelling upstream) or other severe disturbance, eg flutter.

3 Point at which opposing linear force or torque overcomes that of driving member (eg PFCU, hydraulic motor, airbrake or tailplane actuator), causing a commanded movement to be arrested.

**stalled pressure** Delivery pressure at which delivery from variable-stroke fluid pump, centrifugal compressor or certain other pumps falls to zero; also called reacted pressure.

**stall fence** Fence whose purpose is primarily to improve behaviour at stall.

**stalling angle** AOA at which flow suddenly separates from upper surface; probably that at which  $C_L$  is a maximum

**stalling flutter** 1 Flutter in one or more degrees of freedom near angle of stall (1).

2 In particular, flutter of any stalled aerofoil [eg, compressor blade] drawing energy from surrounding flow.

**stalling speed** Any speed at which stalling AOA is reached, esp. that at 1 g when \*\* is at lowest value (when depends on aircraft weight, aircraft configuration and air density, among other variables). Usually assumptions include SL ISA, gear/flaps down, power off.

**stall-limited bank angle** Maximum angle at which a co-ordinated turn can be sustained at maximum power,  $\phi = \cos^{-1} M/C_{L_{max}} S_w^{1/2} p V^2$ .

**stall line** Boundary between acceptable operating conditions for gas turbine and stall zone for any given altitude as plotted on compressor map.

**stall margin** Difference, normally expressed as available spread of rpm, between gas-turbine operating line (at any altitude and for transient slam accelerations, etc) and stall line.

**stall out** To stall as result of attempting too steep a climb or for any other reason, esp. when chasing opponent, thus leaving manoeuvre incomplete or failing to get into firing position.

**stall protection system** Aeroplane flight-control subsystem sensitive to AOA (sometimes sensed at points on either side of centreline to cater for rapid-roll AOAs) which at given value triggers positive action to prevent stall; obvious example is stick-pusher, but stick-shaker is sometimes considered for inclusion.

**stall quality** Pilot's subjective opinion of behaviour of aircraft (normally fixed-wing aerodyne) at stall, assessed for all types of stall (eg accelerated) and configurations (eg dirty).

**stall recovery** Urgent action to restore normal airflow over the wings. The objective is to reduce angle of attack as rapidly as possible, with minimum loss of height. Astonishingly, different methods of Standard Stall Recovery have been taught. Many authorities still insist on: Stick – Power – Pedal – Rudder if required. Today's RAF teach: Power – Stick – forget rudder.

**stall strip** Transverse ridge or other projection added to skin of aeroplane, usually in spanwise direction along leading edge, to serve as stall-promoter, create warning buffet and ensure stall (1) occurs first at that point.

## standard atmosphere

**stall tolerance** Generally non-quantified quality of gas-turbine fan and/or compressor to accept distorted airflow or other disturbance (eg gun gas, ingested jet gas, birds, hail or pressure pulses moving upstream) without stalling.

**stall turn** Flight manoeuvre in which aircraft (aeroplane or glider) is pulled up into very steep climb, usually with engine cut well back, until on point of stall full rudder is applied to cause rapid rotation in yaw, with wings rotating in near-vertical plane; ends in dive and pullout on to desired heading (generally on to reciprocal). In US hammerhead stall (also see *wingover*).

**stall warning** Anything giving pilot warning of impending stall, eg natural buffet, inbuilt \*\* system sensing AOA and giving visible or aural warning, or stick-shaker with or without knocker.

**stall warning and identification system** SWIS, system commanded by AOA vane (12) whose signals are analysed for AOA and rate; because of natural lag or hysteresis in system, trigger is fired progressively earlier as rate is increased by building in a phase advance giving protection at all rates.

**stall zone** Region beyond stall line of gas turbine at any altitude where attempted pressure ratio is too great for rpm and airflow.

**stalo** Stabilized local oscillator.

**Staloc** Self-tracking automatic lock-on circuit.

**stamo** Stabilized master oscillator.

**Stamp** 1 Small tactical aerial mobility platform (USMC).

2 Single-tube auto multipoint.

3 Also written STAMP, Strike Air Management Programme [RN] (UK).

4 Stabilized miniature payload (UAV).

**STAN** Sum total and nose gear.

**Stanag, STANAG** Standard NATO, or Standardization, agreement. There are hundreds, e.g., \*3838 repeats MIL-STD-1553B.

**stand** 1 Place for parking one aircraft, especially at airport terminal.

2 Fixed or mobile mounting for item undergoing inspection, test, maintenance or repair.

**stand-alone** Generalized term meaning equipment, eg radar, is not integrated directly into existing system of radars or other sensors, computers and com. network. Increasingly being used for fixed-based weapon systems and even vehicle-mounted (eg airborne) equipments. Thus \* ASW helicopter operates autonomously, without needing senors or other platforms.

**standard acceleration due to gravity** See *gravity*.

**standard aerodrome** "An aerodrome suitable for the operation of regular day and night services" [BS.1940]. Now arch.

**standard air munitions package** Conventional air/ground munitions required for 30-day support of one aircraft of specific type, air-transportable in three equal increments.

**standard atmosphere** Model atmosphere defined in terms of pressure, density and temperature for all heights, assuming perfect gas, devoid of any form of water or suspended matter; approximates to real atmosphere and taken as reference for aircraft performance and all other quantitative measures. First NACA 1925 (see *model atmosphere*), later refined 12 times, current 1980 ICAO Doc 7488. Physical constants;  $P_0$  10,132.5 Pa;  $T_0$

## Standard Beam Approach

$288.15^\circ\text{K}$ ;  $M_0 2.89644 \times 10^{-4} \text{ kg/mole}$ ;  $\rho_0 1.2250 \text{ kg/m}^3$ ;  $R * 8.31432 \text{ J k-mol}^{-1} \text{ K}^{-1}$ ; temperature gradient from -5,000 m (5 km below SL) to altitude (11,000 m) at which T is  $-56.5^\circ\text{C}$  is  $-0.0065^\circ\text{C}$  per standard geopotential metre; from 11 to 20 km temperature gradient is zero; from 20 to 32 km temperature gradient is  $+0.0010^\circ\text{C}$  per standard geopotential metre.

**Standard Beam Approach** Pioneer landing aid providing lateral guidance and series of marker beacons.

**standard bird** Two (occasionally three) specifications for birds used as inert (sometimes frozen) bodies fired into gas turbine in ingestion testing.

**standard body** Not wide-body, ie width in region of 3 m. Loosely synonymous with narrow-body, slim jet, single-aisle.

**Standard Class** Sailplane competition class limiting span to 15 m and prohibiting high-lift flaps and certain other features.

**standard conditions** Standard temperature and pressure.

**standard data message** NATO message format for digital communications between national or international units or facilities; an example of a Stanag result.

**Standard Day** At ISA pressure and temperature.

**standard day of supply** Total amount of supplies needed for average day as defined by NATO Standing Group rates.

**standard design memo, SDM** International standardized proforma for hard-copy communication of information affecting hardware design, often as computer printout.

**standard deviation** Quantification of dispersion of data points about mean value: square root of average of all squares of variances (amount by which each point differs from mean); symbol  $\sigma$ .

**standard DME arrival** Arrival routes based on DME distances.

**standard electronic module** See *ATR* or *MCU*.

**standard empty weight** No longer definable, most precise equivalent is APS.

**standard gravity** See *gravity*.

**standard industry fare level** Hypothetical revenue rate per mile invented by CAB as guide to IRS in taxing GA aircraft on non-company business (US).

**standard instrument departure** Preplanned, coded ATC IFR departure routing, preprinted for pilot use in textual form often (at major traffic points) supplemented by graphics; abb. SID.

**standardization** Objective of achieving interoperability through use of either uniform or at least compatible hardware; significant that definition of word by DoD, NATO, SEATO, CENTO and IADB is in each case different, while definition ‘standardization agreement’ differs for NATO, SEATO and CENTO.

**standardized product** One conforming to specifications resulting from same technical requirements (NATO, CENTO, IADB).

**standard load** One preplanned as to dimensions, weight and balance, and designated by a number or other classification (NATO).

**standard mean chord** Gross wing area divided by span; position defined by co-ordinates of quarter-chord point and an inclination found by integrating (three methods). Also called geometric mean chord, symbol  $\bar{c}$ . Numerically equal to chord of rectangular wing of same span and gross area.

## standby, stand-by

**standard NPL tunnel** Closed-jet, no return flow.

**standard of build** Precise description of which of various options were followed in construction and equipment of aircraft, esp. of prototype or development aircraft where \*\*\* changes between one aircraft and next.

**standard of preparation** Defines list of equipment installed.

**standard operating platform** An agreed build-standard for newly constructed airfields, mainly in Western Germany (NATO 1951-54).

**standard option** Choice of build standard, engine, avionics, finish colours, furnishing or other variables offered to all customers (eg improved stopping on Advanced 727).

**standard parallel** Parallel on map or chart along which scale is as stated.

**standard pitch** See *propeller* \*.

**standard pressure** 1 Standard SL atmospheric pressure of 10,132.5 Pa.

2 In meteorology, usually  $1,000 \text{ mb} = 10^5 \text{ Pa}$ .

**standard propagation** Assumes smooth spherical Earth of uniform dielectric constant and conductivity under standard atmospheric refraction decreasing uniformly with height.

**standard radio atmosphere** One having excess modified refractive index (also see *standard refraction*).

**standard-rate turn** Usually heading changes  $3^\circ/\text{s}$  or 2 min for  $360^\circ$ .

**standard refraction** Idealized ratio refraction decreasing uniformly with height at  $39 \times 10^{-6}$  units per km; included in groundwave calculations by enlarging Earth radius to  $8.5 \times 10^6 \text{ m}$ .

**standard stall recovery** *Stall recovery*.

**standard structure** Not normally used in aerospace; elsewhere often structure whose dimensions are everywhere mid-way between tolerance limits.

**standard temperature** Value upon which a temperature scale is based, in physics normally  $273.15^\circ\text{K}$  ( $0^\circ\text{C}$ ), but for practical (eg gas-turbine rating) purposes normally that at zero height in standard atmosphere,  $288.15^\circ\text{K}$ .

**standard terminal arrival route** Preplanned coded ATC IFR arrival routing, preprinted for pilot use in textual form often (at major traffic points) supplemented by graphics; abb. Star.

**standard time, ST** Universally adopted time for all countries, based on zone time but modified to suit country’s longitude span and if necessary zoned such that difference between ST and GMT is always divisible exactly by 0.5 h.

**standard turn** See *standard-rate turn*.

**standard weight** 1 Term formerly used in FAA certification as being certificated gross weight.

2 Also used to mean assumed mass of such loads as adult passenger, parachute, and unit volumes (eg litre or US gal) of fluids.

**standby, stand-by** 1 Generalized term for being available at short notice, in some cases (eg redundant flight-control channel) instantaneous and in others (interceptor on \*) at minutes.

2 R/T code: “I must pause for a few seconds”; if followed by “out” means pause may be much longer but channel must be kept clear for resumption, the meaning becoming “other stations please do not transmit on this frequency”.

## standby item

3 Able to board flight if seat available.

**standby item** One duplicating another in function and used following failure of that normally operative.

**standby lane** In a flight-control system, this remains "switched on" throughout flight, ready to take over instantly should a command lane fail.

**standby mode** One of several basic operating modes for equipment, eg radar, normally characterized by receivers shut down but transmitters warmed and ready for immediate power, or DME powered up but not transmitting.

**standby pilot** Not defined, but often used to describe *second pilot* 2.

**standby redundancy** System design such that redundant duplicative channels do not normally operate (as in parallel) but are switched on following failure of those normally operative.

**stand-down** 1 Particular aircraft, though serviceable, remains for long period on ground, for whatever reason.

2 Base or unit is deactivated.

**stand fix** Most accurate of all fixes, obtained with aircraft parked on surveyed location.

**standing detachment** Semi-permanent deployment (RAF).

**Standing Group** The permanent body of NATO.

**standing patrol** *Patrol*.

**standing water** Defined as mean depth exceeding 12.7 mm (0.5 in).

**standing wave** 1 Oscillatory motion in vertical plane of air downwind of steep hill or mountain face in which troughs and peaks (latter usually marked by cloud at various levels) remain roughly stationary; at lowest level cloud often rotor, high levels usually lenticular. Strong \*\* often associated with jetsream.

2 Stationary wave formed in transmission line by superposition of travelling wave reflected back from point of impedance-change of forward wave.

3 Stationary wave or wave-pattern formed in vibrating body, eg turbine disc, by reflection.

**standing wire** That length of cable consumed in making splice.

**stand-off** 1 Distance from target surface to reference point on hollow-charge warhead (usually apex of cone).

2 To remain outside airfield circuit or pattern, normally following command or positive decision to do so, eg following landing-gear failure or obstruction on runway.

3 To have to park too far from terminal to use airbridges.

4 To remain outside effective range of enemy defences, esp. when making an attack with \* missile.

**stand-off ability** Capability of forcing, eg by out-gunning, similar enemy vehicles to remain beyond their own firing range.

**stand-off armour** Armour fixed on outside of existing armour with sufficient spacing to protect against hollow-charge piercing weapons. Unlike spaced armour, normally only two layers in all.

**stand-off bomb** ASM (1) launched beyond enemy defence perimeter. Odd UK term of 1950s usually synonymous with cruise missile.

**stand-off flare** 1 IRCM payload dispensed at sufficient distance to protect against enemy heat-homing missiles.

2 Rarely, illuminating flare dropped on parachute

## staring focal-plane array

beside rather than over surface target, usually in helicopter ASV attack.

**stand-off missile** One which may be launched at a distance (from target) sufficient to allow attacking personnel to evade defensive fire from target area (USAF).

**stand-off steps** Passenger/crew stairways kept at terminal equipped with loading bridges at gates to cater for overflow traffic that has to stand-off (3).

**stand up** To become operational at commissioning ceremony of new squadron or other unit (US).

**Staneval** Standards, or standardization, evaluation.

**stang fairing** Fairing on sides of jet engine installation, especially pod, covering reverser bucket hinges and rams.

**Stanly** Statistics and analysis, of ATC data.

**Stano** Surveillance, target acquisition and night observation; C adds counter-intelligence center.

**Stansit** Statistics on non-scheduled air transport (ECAC).

**Stanton number** Non-dimensional number defining heat transfer through surface;  $St = -q/\rho VC_p dT$  where  $q$  is total quantity of heat,  $\rho$  is density of fluid (eg air),  $V$  is relative velocity,  $C_p$  is specific heat at constant pressure and  $dT$  is recovery temperature minus wall temperature.

**Stanyl** Trade name (DSM) for aliphatic polyamide nylon-type fluoropolymers.

**STAP** 1 Statistics panel (ICAO).

2 Space/time adaptive processor, or processing.

**STAPL** Ship-tethered aerial platform (Kaman).

**STAR, Star** 1 Standard terminal arrival [some authorities prefer approach] route[s].

2 Ship tactical airborne RPV.

3 Surface-to-air recovery (or, USAF, retrieval[s]).

4 Satellite de télécommunications, d'applications et de recherche (F) [see *Star* (2)].

5 Space thermionic advanced reactor.

6 Strategic and tactical airborne reconnaissance (Thomson-CSF), or recovery.

7 Star tracking using ambient radio.

8 Supersonic tailless-aircraft research.

9 System-threat assessment report.

10 Subsonic-transport acoustic research.

11 Studies, tests and applied research (Eurocontrol).

12 Strategic-arms reduction.

13 Signal threat analysis and recording.

14 Simulation trainer for ATC and radar.

15 Surveillance and threat-alert radar.

16 Structural augmentation roadmap.

**Star** 1 Starboard.

2 Satellite for telecom, applications and research.

**star** 1 Star-shaped empty space along centre of solid rocket propellant grain.

2 Formation formed all on same level by wrist-linked team of free-fall parachutists.

3 Helicopter main-rotor control radial arms, located under hub; one fixed, one rotating.

**Staran** Association processor in ARTS-II (FAR).

**starboard** Naval-derived term for right, right-hand or towards right, seen from behind. Thus, from front, \* is on left.

**STAR-C** STAR (5)-compact.

**star-centred** Cast or extruded with star (1).

**stardust** Air-impingement haze in acrylic finish.

**staring focal-plane array** Important class of sensors

## STAR-M

which operate like human eye, with focal plane of input optics covered with dense micro-mosaic of 2-D receptors which 'look' continuously, direction of target being determined from knowledge of which detector(s) see it.

**STAR-M** STAR (5)-mid range (over 30 kW).

**starplates** Upper and lower spiders each formed from one piece of composite material or metal (titanium) forging and forming structural basis of modern non-articulated helicopter rotor hub. Not to be confused with star (3).

**Stars** 1 Silent tactical-attack/reconnaissance system.

2 Plural of STAR, Star (1).

3 Standard terminal and arrival reporting system (CAA).

4 Small transportable (or tethered) aerostat relocatable system.

5 Surveillance and, or stand-off, target-attack radar system (USAF).

6 Standard terminal automation-replacement system (FAA, on-going).

7 Software technology for adaptable reliable system.

8 Space-based telemetry and range safety.

**START** Strategic Arms Reduction Treaty; \*1, 31 July 1991; \*2, 3 January 1993; \*3, not yet ratified 2003; \*4, being discussed.

**Start** 1 Spacecraft technology and advanced re-entry test.

2 Solid-state angular rate transducer.

3 Shf tri-band advanced range-extension terminal.

4 Special threat-awareness receiver/transmitter.

**starter** Device for cranking any prime mover of rotary type during starting: 14 basic species.

**starter exhaust** Overboard discharge of exhaust from starter of cartridge, monofuel, fuel/air, bipropellant or air-bleed types; potentially dangerous.

**starter gearbox** Box containing gear train through which starter cranks engine; may be reduction or step-up gears.

**starter/generator** Single electrical machine, usually DC, serving both as electrical starter and electrical generator (see *CSDS*).

**starter magneto** Various forms of magneto designed to provide powerful spark during start, eg hand-cranked, impulse starter and LT boosting energy transfer.

**Startex** Start of exercise (UK).

**starting chamber** 1 Combustion chamber in multi-chamber (multi-can) gas turbine in which igniter is fitted, flame thereafter being carried round by inter-chamber pipes.

2 Liquid-rocket precombustion chamber.

**starting coil** Auxiliary induction coil used as HT booster when starting piston engine; alternatively used as energy-transfer LT booster.

**starting envelope** A plot of flight conditions within which a [usually gas-turbine] engine can be started, usually pressure altitude against dynamic pressure or Mach number.

**starting pressure** Minimum rocket combustion pressure at which nozzle exit plane is shock-free.

**starting transients** Temporary variations in pressures, flows, velocities and temperatures during complete start sequence of rocket.

**starting vortex** Transverse vortex left by lifting wing at start of motion providing essential link behind subsequent

## static cable

vortices from wingtips (part theoretical concept, since at start wing may not be lifting and \*\* has zero strength, but necessary because trailing tip vortices cannot have free ends).

**star tracker** Optical or opto-electronic sensor which automatically locks on to preselected celestial body or bodies to provide input to astro or astro-inertial nav system.

**Starts** Strategic arms reduction treaties.

**startup** Launch of new OEM.

**start-up airline** Commonly taken to mean first six months' operations.

**start-up costs** Those incurred in launching new type of aircraft. Precise definition lacking; general opinion is that it covers all costs up to certification, excluding related engine and systems.

**Star-21** Strategic aerospace review for 21st Century (EU).

**star washer** Hard steel washer with multiple twisted radial projections which bite into superimposed nut and prevent it becoming loose.

**STAS** Space transportation architecture studies.

**STAT** 1 Statistical.

2 Statute (US).

**state** 1 Readiness condition of combat aircraft, from cockpit-alert to unserviceable (different national subdivisions).

2 In connection with runway, condition of surface or traffic occupancy.

3 For rotorcraft main rotor, usually three subdivisions: propeller \*, vortex ring \* and windmill-brake \*.

4 Amount of main propulsion fuel remaining, esp. when running low.

**State chicken** Air-intercept code: fuel state requires recovery, tanker or diversion (DoD).

**State lamb** Air-intercept code: "I do not have enough fuel for intercept plus reserve required for carrier recovery".

**state of occurrence** State in which an incident, such as an accident, takes place.

**state of the art** Level to which technology and science have at any designated cut-off time been developed in any given industry or group of industries (USAF).

**State tiger** Air-intercept code: "I have fuel for completion of mission".

**Statfor, STATFOR** Panel on Statistics and Forecasts (Eurocontrol).

**static** 1 At rest, or at rest relative to solid surface or local atmosphere [ram pressure zero].

2 Structural test with application of single increasing load.

3 Radio and other com. interference, esp. that due to discharge of \* electricity.

**static air temperature** Static temperature.

**static balance** 1 Aircraft condition in which there is no resulting moment about any axis.

2 Control-surface condition in which in absence of any applied torque surface is freely balanced about hinge axis, either because c.g. lies on that axis or because mass balance has been added.

3 Propeller condition in which when supported on rod on knife-edge it rests in any position.

**static bomb** Tube-mounted instrument outputting TAS.

**static cable** Longitudinal cable supported at each end

## static ceiling

along interior of transport to which parachute strops of troops and airdropped loads are attached. Also called strap line, anchor cable.

**static ceiling** Altitude at which airship in ISA (in some definitions, without forward speed) neither gains nor loses altitude after all ballast has been dumped.

**static characteristic** Basic plot of thermionic valve, grid volts against anode current.

**static clash detection** Use of detailed 3-D computer simulation in the design process to confirm that an assembly can actually be assembled without conflict.

**static coefficients** Those obtained from a static body, e.g., in a wind tunnel.

**static conversion** Conversion of energy from one form to another without use of moving parts; common example is solid-state AC/DC converter.

**static discharger** Device for harmless distribution of static electricity, static wick.

**static electricity** Electric charge built up on non-conductive surface or insulated body by deposition of electrons or positive charges, eg by friction between air and aircraft or between fuel and hose, ultimately reaching very large potential difference.

**static firing** Firing test of rocket motor, engine or vehicle while attached to test stand.

**static flux** Magnetic field through magneto frame and inductor with latter stationary.

**static friction** Force required to initiate relative movement between surfaces in contact.

**static gearing ratio** Ratio of angular deflection of vehicle (esp. missile or RPV) control surface to rotation of vehicle axis which caused surface to deflect.

**static ground line** Connection of aircraft earthing (grounding) system to earth.

**static head** Pitot head measuring ambient static pressure.

**static instability** Unlikely design fault in which aircraft, once disturbed from straight/level flight, suffers increasing upset in absence of aerodynamic inputs, eg due to high c.g.

**static inverter** Non-rotating device for converting a.c. to d.c.: two forms, either transistor or gas tube [eg thyratron].

**static lift** Difference in mass between gas contained in aerostat at rest and air displaced by whole aerostat.

**static line** 1 Links parachute with static cable so that as parachute leaves aircraft it is opened automatically. Hence \*\* jump.

2 Line of parked aircraft on static display at airshow.

**static load** Applied force is unidirectional, either held constant or increasing in programmed way from zero to maximum.

**static longitudinal stability** Static stability (1).

**static margin** Basic measure of aeroplane static stability (primarily in pitch), normally defined as distance of c.g. ahead of neutral point expressed as %MAC. Measured stick-fixed or stick-free; former is %MAC proportional to stick displacement with percentage change of speed from trimmed value, called positive when direction backward for lower speed; stick-free is %MAC proportional to rate of change of applied stick force with percentage change of speed from trimmed speed, positive when pull needed by lower speed. Often written  $L_{np}$  or  $l_{np}$ ; in US often  $h_{np} - h_{cm}$ .

## static temperature

**static marking** Flaws on imagery caused by static-electricity discharge.

**static moment** Product of area and its distance (measured from centroid) from reference axis.

**Staticon** Photoconductive type of TV camera tube.

**static pin** Wire fitting, usually multi-pin, pulled from parachute by static line.

**static port** See *static vent*.

**static positioning** GPS output made possible by fact receiver is fixed relative to Earth.

**static power installation** Electrical ring mains on airfield.

**static pressure** That exerted by fluid on surface of body moving with it; alternatively on a surface exactly parallel to local free-stream velocity vector and which does not affect local flow.

**static pressure gradient** Possible progressive increase in static pressure along constant-section duct, eg tunnel working section, resulting from progressive thickening of boundary layer.

**static pressure head** See *static head*.

**static probe** See *static head*.

**static propeller thrust** That generated by propeller restrained against movement.

**static radar** One whose scanning is electronic, not mechanical.

**static radial** Normal radial engine, as contrasted with rotary.

**static rail** Rigid form of static cable.

**static RAM** Constructed of bistable transistor elements, not needing refreshing.

**static sag** Angular or vertical-linear distance through which a structure sags at rest compared with some other reference condition, esp. wingtip at rest compared with 1 g flight.

**static seal** Seal [of any kind] between two components between which there is only microscopic movement, even though both may be in high-speed motion together.

**static soaring** Soaring (US term, now arch., contrasting normal soaring with so-called dynamic soaring).

**static-source error** Correction applied to measured static pressure [of particular aircraft] to give correct reading over range of altitudes and Mach numbers.

**static-source selector** Pilot switch connecting static system with chosen sensor.

**static stability** 1 Measure of tendency of aeroplane to return to or diverge from initial trimmed condition following upset, with throttle[s] fixed.

2 Study of applied moments imposed on aeroplane following upset of AOA or speed from initial trimmed condition.

3 Quality of having positive static margin.

4 Stability attained by action of weight, esp. by having low c.g. (common US definition entirely unrelated to normal meanings).

**static-stability compensator** Limited-authority subsystem which ensures aeroplane has stick-free static stability by applying small nose-down trim force immediately before stalling AOA is reached, esp. to avoid self-stall; in UK called static-stability augmenter.

**static system** Barometric-ASI plumbing incorporating pitot/static head of static vent and connections to ASI, VSI and possibly other devices; usually includes alternative sources.

**static temperature**  $T_s$ , temperature measured by

thermometer moving with fluid [or measured after airspeed is reduced to zero] and thus measuring true temperature due to random motion of fluid molecules. Numerically equal to total air temperature corrected for Mach effect.

**static test** For aeroplane or other structure, test under static loads; hence constructor may build \*\* specimen as well as fatigue specimen. For some vehicles, usually means test while fixed in one place.

**static 3-D radar** Large surface radar with fixed aerial scanned electronically.

**static thrust** Thrust of jet engine restrained against forward motion, especially measured under ISA sea-level conditions.

**static tube** That transmitting pressure from static head.

**static turn indicator** Rare instrument driven by pressure difference from two modified static heads mounted transversely at wingtips.

**static vent** Carefully designed opening in plate aligned with skin of aircraft which under most flight conditions senses true static pressure.

**static wedge** Shallow eminence surrounding static vent to ensure that the hole is not in the boundary layer.

**static wick** Device for discharging static electricity from fine (very small radius) tips of thousands of conductive wires, braid or graphite particles built into flexible wick projecting behind trailing edge.

**statimeter** Instrument for measuring static thrust.

**station** 1 Dimension measured from \* origin locating all planes along fuselage normal to longitudinal axis, or along wing normal to transverse axis. Every structural part, bolt hole, equipment item, door frame and every other dimensional reference is in form of \* number (in US in inches, elsewhere in mm). Corresponding term for vertical distances is WL, waterlevel.

2 Fixed base for military, naval, air or research operations.

3 Airport (esp. staff, facilities and costs); airline usage, usually adjective only.

4 Planned or actual position of geostationary satellite.

5 Position relative to other vehicles of one vehicle in group (esp. of aircraft and ships).

6 Location of radio transmitter.

7 Location in gas turbine engine. There is no standard system. Pratt & Whitney uses AM [ambient] followed by 1 [entry to fan] leading to [eg] 4 for HPT inlet and 4.5 for HPT exit.

**stationary front** Front without significant motion over Earth's surface.

**stationary orbit** See *geostationary*.

**stationary reservation** Altitude reservation over a fixed area.

**stationary shockwave** Shockwave at rest relative to solid surface.

**station box** Human interface with intercom and/or remote radio transmitter/receiver, comprising jack socket, tuning and other controls; in large aircraft links up to 12 audio (crew) inputs to intercom and com. systems.

**station capacity** Maximum number of aircraft that can be handled simultaneously by radio (esp. DME) station.

**station costs** Airline costs attributed to staff and facilities at airports.

**station ident** Ident feature keyed into ILS localizer trans-

mission at regular intervals, either three (military, two ) letter code or voice.

**stationkeeping** Ability of vehicle, esp. satellite, to maintain prescribed orbit or station (most geosynchronous satellites follow small figure-eight shapes).

**station-keeping equipment** Small 360° radar scanning horizontally and used to assist several aircraft to hold exact formation up to several miles apart (eg for precisely sequenced air-drops).

**stationmaster** CO of station, from railway usage, usually Grp Capt (RAF, colloq.).

**station passage** Flight directly overhead a station (6), esp. a point navaid, eg VOR, when 'to' becomes 'from' and bearings become reciprocals.

**station set** Selected items of mission-support equipment prepositioned at designated locations for support of war or emergency ops (USAF).

**station time** Time at which crews, pax and cargo are to be on board military transport ready for take-off (DoD).

**station zero** Origin of aircraft measurement system [station (1) along each axis; for longitudinal axis may be at or in front of nose.

**statistical accelerometer** Instrument recording number of times particular acceleration is exceeded; apparently synonymous with recording accelerometer.

**statistical energy analysis** A powerful tool for modelling the transmission of vibrations, particularly within the aural range, through complex structures.

**stator** Fixed part of rotary machine, eg electrical generator or motor, hydraulic pump, gas turbine compressor or turbine, RC engine casing or brake discs keyed to landing-gear axle.

**stator blade** Fixed (except for variable incidence) blade attached to axial compressor stator casing in radial row between each stage of rotor blades. US = stator vane.

**stator casing** That enclosing axial compressor.

**stator outlet temperature** In most gas turbines gas path expands through turbine[s] and SOT is higher than TET. See *turbine temperatures*.

**statorless turbine** Designs in which contra-rotating rotors eliminate need for stators.

**stator vane** Stator blade, usually abbreviated to vane (US).

**statoscope** Instrument (now arch.) for detecting small excursions from preset pressure altitude. Comprised sealed U-tube containing drop of red liquid reposing normally at centre, connected to thermos flask. With a small bleed, led to VSI.

**Status** MFD key which returns pilot to basic menu for complete change of function.

**status** Assessment of target, esp. one seen only on radar, as friend, foe or unknown.

**statute mile** Non-SI unit of length = 1609.344 m.

**Stavka** Supreme-command staff (USSR).

**stay** Lateral strut or bracing member, esp. for landing gear.

**STB** 1 Stop bars.

2 Systems testbed.

**STBA** Service Technique des Bases Aériennes (F).

**STBL** Stable.

**STBY** Standby, standby instruments.

**STC** 1 Sensitivity, sensitive, or swept, time constant, or control.

2 Self-test capability.

- 3 Supplemental Type Certificate (US).  
 4 Satellite test centre.  
 5 Short-term conflict (A adds alert).  
 6 Strike Command (RAF).  
**STCA** 1 Short-term collision-avoidance.  
 2 Short-term conflict-alert.  
**STCICS** Strike Command integrated communications system (RAF).  
**STCM** Stabilizer-trim control module.  
**STCR** System test and checkout report.  
**STD** 1 System technology demonstration, or description.  
 2 Scheduled time of departure.  
 3 Standard, as in next.  
**STD bus** Traditional US-developed 8-bit bus for computers and related EDP.  
**STDBY** Standby (alternative).  
**STDMA** Space, or synchronized, time-division multiple access.  
**STDN** Space- [flight] tracking and data network.  
**STDY** Steady.  
**STE** 1 Sun-tracking error.  
 2 Synthetic training equipment.  
 3 Scheduled time en-route.  
 4 Send, then encrypt.  
**STEADES, Steades** Safety trend evaluation analysis and data-exchange system (IATA).  
**Steady** Air-intercept code: "I am on prescribed heading", or "Straighten out on present heading".  
**steady flow** See *time-invariant flow*.  
**steady initial-climb speed** See  $V_4$ .  
**steady-state condition** One that is time-invariant, as applied to signal or flutter amplitude, physical or chemical properties or any other variable.  
**stealth** Technology for making tangible objects, initially aircraft, as invisible and undetectable as possible. It covers all EM wavelengths as well as sound, and is increasingly essential for survival in defended airspace. Also adjective.  
**steam bombing** Visual manual attack on target of opportunity using free-fall bombs, especially by advanced automated aircraft (colloq.).  
**steam catapult** *Catapult*.  
**steam cooling** Cooling piston engine by allowing slightly pressurized water to boil in cooling jackets, to be condensed in dragless double-skin radiator. Also called evaporative cooling.  
**steam gauge** Traditional dial instrument, especially one in a modern cockpit (colloq.).  
**steam(ing) fog** Forms when supersaturated freezing air with inversion moves over warm water; also called Arctic smoke or sea smoke.  
**Stearns** Stand-off tactical electronic airborne reconnaissance system.  
**STE bus** New international standard 8-bit computer bus originally developed for Eurocards which has rendered STD obsolete.  
**STEC** Solar/thermal energy conversion.  
**STED** Space Test and Evaluation Directorate (USAF).  
**steel drag chute** Reverser (colloq.).  
**steep approach** 1 That adopted by helicopter pilot descending into obstructed, eg urban, heliport, begun at 9 m/200 ft above selected landing spot and made straight-in at close to 50° from downwind.  
 2 For aeroplanes with limited STOL capability, on an individual airport basis; usually 5.5°. To achieve this certification it is usually necessary to demonstrate 7.5°.  
**steepest-descent method** Basic method of optimization in which all contour lines (each representing a plotted variable) are crossed perpendicularly.  
**steep gliding turn** Steep turn performed in glide, if continued resulting in tight spiral (more common in US).  
**steep turn** Various definitions with bank angles: over 50°; 45°-70°; over 60°.  
**steerable nosewheel[s]** Self-explanatory, a nose landing gear which can be steered from the cockpit, as distinct from castoring.  
**Stefan-Boltzmann constant** That in Stefan-Boltzmann law,  $\sigma = 5.66961$  [some authorities cite 5.67051]  $\times 10^{-8} \text{W/m}^2\text{K}^4$ .  
**Stefan-Boltzmann law** Basic law of thermal radiation: total radiation from black body is proportional to 4th power of absolute temperature,  $E = \sigma T^4$ .  
**STEI** Service Technique de l'Electronique et de l'Informatique (F).  
**stellar guidance** See *astronavigation*.  
**stellar/inertial guidance** Inertial navigation intermittently updated and refined by astro.  
**Stellite** Large family of hard alloys of Co (30-80%), Cr (10-40%), W (0.25-14%) and Mo (0.1-5%), and in one case with 30% Ni and 5% Fe. Some cannot be machined; common use is piston-engine valve heads and seats.  
**St Elmo's fire** See *corona discharge*.  
**stem** 1 Shaped-tube electrolytic machining, see \*drilling.  
 2 System (or spaceflight) trainer and exercise module.  
 3 Space-to-Earth missile concept.  
**stem** Strong quasi-vertical member at bow of marine aircraft.  
**stem drilling** Use of titanium tool [cathode] feeding 20% HNO<sub>3</sub> into workpiece; can produce holes  $\geq 0.5$  mm, 0.02 in, diameter and length 120 mm, 4.7 in, see *capillary*.  
**Step, STEP** 1 Software test and evaluation project, concerned with entire software life cycle.  
 2 Standard equipment package.  
 3 MFD key which pages through all available formats, usually at 1 Hz.  
 4 Standard for the exchange of product model data.  
**step** 1 Segment of climb from one FL to next, each normally begun either on ATC clearance or upon arriving at suitable gross weight from burning fuel.  
 2 Sharp or angled discontinuity in planing bottom (float or hull) to improve planing characteristics and ease takeoff.  
 3 Stage (1), latter being preferable.  
**step-aside gearbox** One in which input and output shafts are not co-axial. In particular, a gearbox inserted on the compressor casing of a large turbofan to transmit the drive from the 90° radial shaft inside the core diagonally to the external gearbox on the fan case.  
**step climb** Gaining altitude in a series of steps, each accurately flown to minimize fuel burn and comply with ATC Abb. STEPCLB.  
**step cruise** Protracted stepped climb covering most of flight.  
**step pad** Secondary structure built externally on top of fuselage, esp. of helicopter, for ground crew or other persons.

## stepped climb

## stick shaker

**stepped climb** Climb in series of steps (1), separated by slow (drift-up) climb or level flight.

**stepped formation** One in which successive aircraft or elements are at higher or lower level.

**stepped solvents** Solvents in liquid (eg aircraft finish) which evaporate at very different rates.

**step taxi** To taxi marine aircraft fast enough to ride on step (2).

**step-up gear** One in which output shaft speed is higher than input, torque being reduced in same ratio; opposite of reduction gear.

**steradian** SI unit of solid angle, abb. sr: that solid angle which, having as its vertex centre of sphere, cuts off area equal to that of square whose sides are equal to radius of sphere.

**stereogram** Stereoscopic set of graphics or imagery arranged for viewing.

**stereographic** See *polar stereographic*.

**stereographic coverage** Air reconnaissance cover by overlapping imagery to provide 3-D picture; 53% overlap is minimum and 60% normal.

**stereoscopic cover** NATO term for stereographic cover.

**stereoscopic pair** Two images for stereographic (stereoscopic) viewing of same scene.

**sterile areas** Parts of airfield between aircraft manoeuvring areas.

**sterilization-proof** Solid rocket propellants (fuels and, esp., binders) are often degraded by sterilization (4) heating, and \* binders have had to be developed.

**sterilize** 1 To mark off portion of runway as unusable, for any reason.

2 To blank off portion of instrument panel, eg for equipment not yet available.

3 To prohibit unauthorized access, esp. to entire airside of civil airport for security reasons.

4 Normal meaning for spacecraft either departing for or arriving from other planet.

5 To deactivate device, eg mine, eg after preset period.

6 To render unusable or unavailable; eg F-111 MLG \* underside of fuselage for weapon carriage.

**stern attack** Air-intercept attack which terminates with crossing angle of 45° or less (DoD).

**stern-droop** Structural sag of rear end of airship.

**sternheaviness** Tailheaviness of airship.

**sternpost** Single vertical member marking rear termination of fuselage, hull or float (BS adds 'not to be confused with rudder post', but often same member).

**sternpost angle** Acute angle between horizontal (usually same as longitudinal axis or underside of keel ahead of step) and line joining top of step on centreline and after-body terminator, bottom of sternpost or rearstep (heel) of flying-boat hull.

**stern wave** Formed at low speeds as swell ahead of stern of taxiing marine aircraft.

**stero route** Named and established, in most respects synonymous with Airway.

**Stevenson screen** Standard Meteorological Office slatted box for ground instruments.

**Stevi** Sperry turbine-engine vibration indicator.

**STEW, Stew** 1 Surface-threat electronic warfare [S adds system].

2 Stewardess [confusing, now rare].

**Stex** Space technology experiment satellite.

**STF** 1 Self-test facility.

2 Special trials flight.

**StF** Stratiform cloud.

**StFra** Stratus fractus.

**STFRCO** Squadron terrain-following-radar checking officer (RAF).

**StFrm** Stratiform.

**STFV** Sensor total field of view.

**STG** 1 Strong.

2 See *stg*.

3 Special tactics Group (USAF).

**StG** Stukageschwader, dive-bomber group (US wing) (G, WW2).

**stg** Stage.

**STGR** Search, track and guidance radar.

**sthène** Non-SI unit of force formerly standard in French legal system, that giving 1 tonne acceleration of 1 m/s<sup>2</sup>; sn = 1,000 N = 1 kN.

**S<sup>3</sup>AR** See *SSSAR*.

**S<sup>3</sup>T** See *SSST* (2).

**STI** Standard (or special) technical instruction.

**stick** 1 Control column (colloq.).

2 Any primary pilot input in pitch, in figurative sense, eg \*-free static stability.

3 Succession of missiles (ordnance items would be better) fired or released separately at predetermined intervals from single aircraft (ASCC).

4 Number of parachutists who jump from one aperture of aircraft during one run over DZ.

5 A pilot, especially fighter or aerobatic (colloq.).

**stick and string** Generalized term for construction of pre-WW1 aeroplanes (colloq.).

**stick-canceller** Electronic box in FCS whose output is a stick movement, eg in ASW hover.

**sticker** Usually on windscreen, displays selling price [GA aircraft, usually used].

**stick-fixed** With elevator or tailplane trimmed to hold level flight and thereafter held in this position. For \* neutral point, see *neutral point*.

**stick-fixed static stability** See *static margin*.

**stick force per g** Pilot's applied force in direct fore/aft movement divided by vertical acceleration resulting.

**stick-free** With elevator or tailplane trimmed to hold level flight and thereafter left free (not applicable with irreversible flight controls).

**stick-free manoeuvre point** The c.g. position that results in stick force per g being zero.

**stick-free neutral point** The location of the aerodynamic centre or e.g. position with the elevator free to float without friction.

**sticking** Tendency of planing bottom of marine aircraft to adhere to water on takeoff.

**stick knocker** Stall-warning device added to stick shaker to give loud knocking aural warning.

**stick movement per g** Linear fore/aft movement measured at top of stick divided by resulting vertical acceleration.

**stick pusher** Positive stall-prevention system which when triggered (by sensed AOA or AOA factored by a rate-of-increase term) forces stick forward, commanding aircraft to rotate from climb to shallow dive.

**stick shaker** Stall-warning system which when triggered by AOA passing preset value (occasionally factored to allow for high rate of increase) applies large oscillating

## **stick-shaker speed**

force which shakes stick (2) (normally a large yoke) rapidly through small angle in fore/aft plane.

**stick-shaker speed** SSS or S-cubed, really a misnomer as system is triggered by AOA, not a particular speed.

**stick spacing** Linear distance on ground between ordnance items dropped in a stick (3).

**stick time** Logged pilot time, esp. as PIC.

**stick travel** Total range of travel of stick in either fore/aft or side-to-side direction, normally measured not as angle but as linear distance.

**stick travel per g** See *stick movement per g*.

**stiction** See *static friction*.

**stiffener** Normally a strip or beam attached to sheet to resist load normal to surface. An integral \* is formed in skin itself, usually as pressed channel parallel to relative wind.

**stiffening bead** Integral stiffener (see above).

**stiffness** Ability of system to resist a prescribed deviation. In structural member within elastic limit, ratio of steady applied force to resulting displacement or ratio of applied torque to resulting angular deflection. For many dynamic parts such as servo-actuators there is static \* and dynamic \*. Static \* is stiffness characteristic exhibited in steady-state condition, normally trying to approach infinity (discounting compliance within actuator and deflection of surrounding structure) up to stall thrust. Dynamic \* is an apparent value dependent on ability of flow power of servo valve to hold output against oscillating load, up to critical frequency (varying with magnitude of applied load) at which servo contribution becomes negligible to give a degraded ‘infinite-frequency \*’.

**stiffness criterion** Relationship between stiffness and other properties of structure which when satisfied ensures prevention of flutter or other type of instability or loss of control (BS).

**stiff nut** Nut provided with means for gripping male thread to provide sustained torque resisting rotation once tightened.

**stiff pavement** One able to accept any input aircraft bending moment; stiffness measure is tonnes vertical load to produce 1 cm deflection under point of application.

**stiff wing** Fixed-wing, ie not helicopter (colloq.).

**stilb** Non-Si unit of luminance, sb =  $10^4$  cd/m<sup>2</sup>; plural stilbs, sb.

**Stile** Sensor technologies integrated laboratory environment.

**Stiletto** Becoming generalized term for anti-radar D/F and passive-ranging systems.

**stiletto criterion** Basic design case for passenger floors: intensity of \* heel loading of 100 kg/cm<sup>2</sup>, or over 100 times limit for distributed heavy cargo.

**stiletto weld** One whose cross-section resembles exclamation mark without stop.

**stillage** A specific meaning in aerospace is small wheeled dolly for ground movement of external store, eg bomb. Usual meaning is static warehouse storage.

**still-air range** Not a normal performance or flight manual figure; in general a vague estimate of distance under ideal still-air cruise conditions aircraft could fly without air refuelling, ignoring ATC constraints, reserves or any other factor. Unlike ferry range, usually assumes some (occasionally maximum) payload.

**stilling chamber** Large volume in which fluid flow eddies

## **Stobal**

and gross turbulence are brought to rest; generally synonymous with settling chamber.

**ST-IN** Straight in.

**Stinfo** Scientific and technical information (data management).

**sting** 1 Long cantilever tube projecting upstream in tunnel to which model is attached with minimum interference from mount.

2 Long cantilever tube projecting directly ahead of nose of aircraft to carry instrumentation with minimum interference from mount or following aircraft; also called probe, instrumentation boom.

**sting hook** Normal form of arrester hook in form of single strong tube (term introduced WW2 to distinguish from A-frame).

**Stings** Stellar-inertial guidance system.

**sting switch** Activated by springy rod projecting below RPV (or other aircraft), triggered on landing.

**Stir** 1 Surveillance target-indicating radar.

2 Separate tracking and illuminating radar[s].

**Stirs** Strapdown inertial reference system.

**Stirling cycle** Heat-engine cycle in which heat is added at CV followed by isothermal expansion with heat addition, heat is then rejected at CV followed by isothermal compression with heat rejection; very efficient, esp. with regenerator, but mechanical problems (Philips use patented Rollsock to seal reciprocating parts). So far used in aerospace mainly for space power generation or cryogenic cooling.

**STIS** 1 Stabilized thermal-imaging sight [S adds system].

2 Space telescope imaging spectrograph.

**STIU** Satellite telephone [or telecoms] intermediate unit.

**STLCS** Simulation training life-cycle support.

**STK** Satellite toolkit, for software analysis.

**STLO** 1 Science and technology (or scientific and technical) liaison office.

2 Simulation and Training Liaison Officer (RAF).

**STM** 1 Short-term memory.

2 Supersonic tactical missile.

3 Significant technical milestone(s).

4 Storm.

5 Serial transition module.

**STMP** Special Traffic Management Program (NAS).

**STN, Stn** Station.

**STNA** Service Technique de la Navigation Aérienne (F).

**STLCS** Simulation training life-cycle support.

**Stn No** Stanton number (or St).

**STNPA** Système technique de neutralisation des pirates de l'air (F).

**STNR** Stationary.

**STO** 1 Short take-off.

2 System test objective.

3 Station telecom officer.

4 Council (Soviet) for labour and defence (USSR).

5 Science and technology objective.

6 Signature technology office (USAF).

7 Space tasking order.

8 Survive to operate (RAF Regiment).

**S/TO** Search/track operator.

**STOAL** Short takeoff and arrested landing.

**Stobal** Short takeoff but arrested landing.

## **Stobar**

**Stobar** Short takeoff but arrested recovery.

**STOC** Special Tactical Operations Center (US NMCC).

**STOCC** Space Telescope Operations Control Center.

**stochastic** Implying presence of unknown or random variable; thus, \* process is ordered set of observations, each a sample from a probability distribution.

**stock** 1 Raw material preformed to standard dimensions as sheet, strip, tube etc.  
2 Material surplus to a part's finished dimensions, to be removed during manufacture.

**stockpile/target sequence, STS** Order of events in removing NW from storage and assembling, testing, transporting and delivering to target (DoD).

**stocks** Shaped supports on which flying-boat hull is built, but in no sense tooling.

**stock template, ST** One developed by trial and error, esp. for parts undergoing severe deformation.

**Stoddard** Common naphtha-like hydrocarbon solvent.

**STOGW** Short takeoff gross weight.

**STOH** Total time since top overhaul.

**stoichiometric** Provided in exact proportions required for complete chemical combination, esp. of fuel/air mixtures.

**stoke** Non-SI unit of kinematic viscosity, 1 St =  $10^{-4}$  m<sup>2</sup>/s.

**Stokes law** Terminal velocity of sphere [density  $\rho$ , radius  $r$ ] falling through fluid [density  $\rho_0$ , dynamic viscosity  $\eta$ ] is  $V = \frac{2gr}{9\eta} (\rho - \rho_0)$ .

**Stokes litter** Litter [UK = stretcher] designed for helicopter recovery of injured casualty.

**Stol, STOL** Short [rarely, slow] take-off and landing.

**Stoland** Digital system permitting fully automatic landings into STOL airfield (NASA).

**Stolport** Airport, esp. urban (metropolitan), configured and designated for Stol operations.

**Stol runway** Runway, normally 900 m (2,000 ft), specifically designated and marked for Stol operations (FAA). Letters STOL at threshold and a TDAP.

**STOM** Ship-to-objective manoeuvre.

**stone** Non-SI unit of weight, usually applied to humans, = 14 lb = 6.3503 kg.

**stoneguards** Various mesh screens or deflectors; undefined.

**Stoner Mudge** Patented technique of coating integral tanks with rubbery sealant.

**stonk** To destroy a surface target [verb or noun], (colloq.).

**stooge** To fly aimlessly in order to stay in particular area (eg awaiting orders, or in hope of encountering enemy).

**stooping** Atmospheric refractive phenomenon in which image (mirage) of distant object is vertically foreshortened.

**STOP** Structural/thermal/optical program.

**stop(s)** Mechanical limiter(s) to permissible travel of flying-control or other mechanism.

**stop alt squawk** Turn off altitude-reporting switch and continue Mode C framing pulses.

**stop-and-go** See *circuit*.

**stop countersink** Fitted with collar to limit penetration.

**stop drill** 1 See *stop hole*.  
2 Drill with collar to limit penetration.

**stop gap** A quick, temporary solution.

## **Storm**

**stop hole** Hole drilled in end of fatigue crack to provide larger radius and halt further spread.

**stop nut** Nut which stops in place without further action (such as wiring or bending up tabs).

**stopover** 1 Stop by pax at intermediate airport authorized by ticket for prescribed period.  
2 One-night stay away from base by slip crew (civil or military).

**stopped-rotor aircraft** See *stowed rotor aircraft*.

**stopping** Loosely, sealer for cracks, esp. in pressurized riveted joint.

**stop squawk** Switch off transponder, or a particular mode.

**stopway** 1 Defined rectangular area on ground at end of runway in direction of takeoff (ie beyond upwind end, symmetrical about extended CL) prepared as a suitable area in which aircraft can be stopped in case of abandoned takeoff (ICAO).  
2 Area beyond takeoff runway, no less wide and centred upon extended CL, able to support aircraft during aborted takeoff without causing structural damage to it and thus designated for use (FAA).

**stop weld, stop-weld** Material, usually in form of paint, which has so high a melting point that it is not fused by any conventional welding process. Inserted as applied layer along line followed in seam-welding, results in treated area remaining unwelded.

**storage** Generalized term for any kind of memory in EDP (1), display technology, EW and similar disciplines. Not normally used in aircraft for fuel or other consumables, ordnance and ammunition or cargo/baggage.

**storage CRT** Various families able to write information into a storage surface by adding/subtracting from an initial potential; most configurations have symmetrical layout with write gun at one end and read gun at other.

**storage oil** Intended as corrosion preventative, for engines [especially piston engines], usually mineral or other oil plus corrosion inhibitor.

**storage system** In electronics and displays, basically comprising direct-view storage tubes and those in which storage is entirely separate; invariably concerned with vector inputs, converted into analog (beam-deflection) signals and varying luminance.

**storage tube** See *storage CRT*.

**Storc** Satellite tracking of RV convoys.

**store** 1 Basic element of EDP (1) storage; normally a bistable device accommodating one bit.  
2 Generalized adjective for storage, hence \* address, etc.  
3 To place information in memory for future reading.  
4 Generalized term for any mission-related payload carried by combat aircraft in form of discrete streamlined device either carried externally or released from internal bay; anything that occupies a pylon or ERU, whether intended for air-dropping or not.

**stores** Domestic supplies and consumables for large aircraft on long flight.

**stores inventory display** Cockpit readout, often illuminated on command, showing locations and identities of all stores (4) remaining on board.

**stores pylon** Pylon for carrying, and if necessary releasing, a store or stores (4).

**Storm** 1 Sensor tactical-operations range module[s].  
2 Standard stores management [S adds system].

## storm cell

**storm cell** Central region of most intense turbulence, indicated in cockpit radar display by black hole or red colour.

**Stormfest** Stormscale operational research meteorological fronts experimental systems test (FAA 1992).

**Storms** Stores management system.

**storm scope** Weather radar.

**storm-warning radar** See *airborne weather radar*.

**Stosi** Scientific, or science, technological, or technology, and operational, or operating, support information.

**stovepipe** Ramjet (colloq.).

**Stovie** Pilot of Stovl aircraft (colloq.).

**Stovl, STOVL** Short take-off, vertical landing; common operating mode of Harrier family and F-35B.

**STOW** Synthetic theatre of war.

**Stow** System for takeoff weight and c.g., also called IWBS, with display readout driven by sensors on all landing gears.

**stowed-rotor aircraft** Rotorcraft, normally helicopter in vertical mode, whose lifting rotor(s) can be stopped and retracted in wingborne cruising flight. Not yet achieved.

**stow position** Travelling or inoperative az/el attitude of large radar or other steerable aerial, normally pointing to zenith.

**STP** 1 Standard temperature and pressure.

2 Space-test Program (DoD).

3 Space Technology Program (Darpa).

4 Systems Technology Program (DoD).

5 Short-term planning.

6 Status test panel.

7 Sensor track processor.

8 Standard training package.

9 System-test package procedure.

10 Solar terrestrial probe[s], or physics.

**STPAé** Service Technique des Programmes Aéronautiques (F).

**STPD** Standard temperature and pressure, dry.

**STPE** Service Technique des Poudres et Explosifs (F).

**STR** 1 Service trials report.

2 Sidetone ranging modulation; EW (spread-spectrum) acquisition assistance technique.

3 Sustained turn rate (usually means maximum).

4 Software trouble report.

5 Systems technology radar.

6 Standard test rack.

7 Same type rating.

8 Sonar transmitter/receiver.

9 Satellite transceiver.

10 Solar terrestrial receiver.

**STRA** Simultaneous turnaround actions.

**straddle-mounted** Mounted at front and rear [applies particularly to multi-stage compressor].

**Stradographe** Runway friction measurer with braked or toed-in wheels and EDP (1) for nine variables.

**strafe** To rake with fire, eg from automatic guns; spelt as shown (not straff) and rhyming with chafe. US usage is in favour of 'straff', rhyming with chaff, and 'straffing' is becoming predominant.

**straight** Applied to fuel, lubricant, etc, = without additives.

**straighteners** Vanes, cascades, or, in tunnel, transverse flat-plate honeycomb, to remove swirl or turbulence from flow.

**straight-flow** Gas turbine of normal, ie not reverse-flow, layout.

## Strap, STRAP

**straight-in approach** In IFR, an instrument approach wherein final approach is begun without a prior procedure turn. In VFR, entry of traffic pattern by interception of extended runway CL without executing any other portion of traffic pattern (FAA).

**straight leading edge** Having no taper; likewise for trailing edge.

**straight-pass attack** One using on-board weapon-aiming system to hit point surface target without search or visual acquisition, thus in straight run at highest speed at lo level.

**straight roller bearing** Not tapered, thus no axial load experienced.

**straight-run** Hydrocarbon distillate, eg from original crude, representing all products separating out between specified upper/lower temperature limits; not normally used as aviation fuel.

**straight spur gear** Straight teeth parallel to shaft.

**straight stall** One performed with minimal yaw, using rudder if necessary to hold heading.

**straight-through duct** Inlet duct to trijet centre engine in which flow from inlet to nozzle is essentially straight, as distinct from S-duct.

**straight wing** Of traditional planform, specif. not swept.

**strain** Deformation under stress expressed as a percentage of an original dimension; length, area or volume.

**strained silicon** Perfect lattices which permit electrons either to move faster or to travel with less power.

**strain energy** Elastic energy recovered from body by removing stress.

**straingauge** Device for transducing strain into electrical signal, usually by extremely accurate measurement of change of resistance of conductor.

**strain hardening** Increase in hardness and reduction in ductility caused by strain, esp. by cold-working (eg rolling); the only way to harden some wrought light alloys. Introduces a strain exponent (expressed as n) into stress/strain equations.

**strain rate** Strain per unit time, normally under uniform stress and often synonymous with creep.

**strain viewer** Instrument giving pictorial strain pattern using polarized light.

**stroke** 1 Long but shallow surface normal to skin and aligned with local airflow; extremely low-aspect-ratio fin.

2 Fin[s] mounted on upper part of underwing engine pod, normal to surface, to generate vortex passing over wing.

3 One row from stem to stern of single plates cladding marine aircraft.

**stranded conductor** Electric cable containing numerous conductive wires twisted together within single insulating sheath.

**Stranger** Air-intercept code: unidentified target. Normally ground/air message followed by bearing, distance, altitude, in that order.

**strangle** General term meaning please switch off a particular emitter (military usage).

**Strangle Parrot** Ground/air code: switch off IFF.

**Strap, STRAP** 1 Sonobuoy thinned random-array project. Acoustic process or in aircraft correlates signals from 15 to 20 buoys, four of which emit low-power signals to fix precise position of each buoy.

2 Straight-through repeater antenna program, or performance.

**strap** Usual term for a doubler strip or plate added as a modification at a place subject to high stress and possible fatigue damage.

**strapdown** Generalized adjective for device mounted so that its attitude changes with that of aircraft or spacecraft; specif., one not gimballed about three axes.

**strapdown INS** Simplified INS using strapdown platform.

**strapdown platform** Platform for INS on which sensing gyros and accelerometers are fastened without relative motion; usually there are three mutually perpendicular gyro/accelerometer units, and in some cases an element of redundancy from a fourth mounted at 45° to all three others.

**strap-on boost** Rocket boost motors attached around sides of vehicle, jettisoned after burnout [suggest = wrap-round].

**strapping** 1 Interconnection of resonant chambers of cavity magnetron or related oscillator give one stable preferred mode.

2 Calibration of storage tank so that measurement of contents depth can be related to actual volume.

3 Metal or other straps, wire or other ties around palletized, igloo or other loose cargo.

**Strata** Simulated training research advanced testbed for avionics.

**Stratcom** Strategic Command (USAF).

**strategic** Concerned with broad politico-military objectives and enemy's warmaking potential.

**strategic aeromedical evacuation** Airlift of patients out of theatre of operations to main support area.

**strategic air bridge** Semi-permanent service by troop-carrier aircraft between home base[s] and distant area of operations.

**strategic airlift** In support of all arms between area commands or between home state and overseas area.

**strategic air transport** According to DoD, one in accord with strategic plan; according to NATO, movement between theatres by scheduled service, special flight, air logistic support or medevac.

**strategic air warfare** Air operations designed to effect progressive destruction and disintegration of enemy's warmaking capacity (NATO; DoD is much longer definition which adds nothing).

**strategic attack** Aerospace attack on selected vital targets of enemy nation to destroy warmaking capacity or will to fight.

**strategic bomber** Delivery-system aeroplane for strategic attack.

**Strategic Defense Initiative** Plan by Reagan administration to enhance US ability to conduct warfare in space, eg by using direct-impact missiles or super-power lasers to incapacitate satellites.

**Strategic lateral offset provision[s]** Dispensation on filed flight plan allowing a pilot to displace laterally in order to get out of wake turbulence.

**strategic plan** Plan for overall conduct of war.

**Strategic Planning Team** Focal point for development of future NAS (FAA).

**strategic psywar** Actions designed to undermine enemy's will to fight.

**strategic transport** Aircraft for transport between theatres.

**strategic UAV** UK term for UCAV.

**strategic warning** Notification that enemy-initiated

hostilities may be imminent. Hence \*\* lead-time, time elapsing between \*\* receipt and beginning of hostilities. May include two action periods, \*\* predecision time and \*\* postdecision time in which national commander takes a decision to respond positively to \*\*.

**stratified-charge engine** Piston engine in which mixture strength is varied in controlled manner during induction stroke, with minimum turbulence, if possible to leave layered charge in cylinder with highest density near source of ignition. Now especially important in RC (1) engines.

**stratiform cloud** Sheets in stable thin layers.

**stratocumulus, Sc** Layer of connected cloudlets at low-cloud level often arranged in aligned rows.

**stratopause** Atmospheric layer at top of stratosphere where inversion ceases at 270.65°K [though such accuracy is pointless].

**stratosphere** Atmospheric region between tropopause and stratopause within which temperature remains essentially constant and then, at upper level, rises with altitude.

**stratus** Uniform layer of low (usually grey) cloud, well clear of surface.

**straw man** Pilot of well below average competence.

**straw qualities** Possessed by aircraft safe enough to be routinely flown by straw man.

**stray** 1 Naturally occurring EM signals, eg static.

2 Errant marker or TI put in wrong place.

**STRC** Strategic training route complex.

**streak** 1 Horizontal smear, usually white, following moving image on TV or other raster display.

2 Long flame in airbreathing engine normally denoting abnormal combustion at one point.

**streak camera** Family of cameras for ultrafast photography in which changing scene is viewed through slit perpendicular to main image variation and optics sweep image along fixed arc of film. Basic type has rotating mirror, normally projecting through array of biconvex lenses.

**streaking** 1 Unwanted manifestation of streak (1).

2 Unwanted manifestation of streak (2) in gas turbine, usually resulting in reduced life or damage to NGVs.

**stream** 1 To release parachute retarding horizontal motion, eg braking parachute.

2 To dispense chaff as solid, at random intervals or as bursts (DoD).

3 Jet stream (colloq.).

4 Shower of meteoroids with similar orbits and timing.

5 Closely-spaced procession of strategic night bombers (RAF 1943–45).

**streamer** Anything that follows or indicates streamlines, in particular *windsock*.

**streamering** 1 Visible brush discharge.

2 Unreefed parachute canopy opens but fails to deploy fully; hence streamered.

**stream function** Basic parameter of 2-D non-divergent fluid flow with value (symbol  $\psi$ ) constant along each streamline related to velocities along each axis by  $u = d\psi/dy$ ,  $v = d\psi/dx$ .

**stream landing** Landings by group of aircraft in quick succession.

**streamline** Line marking path of particle of fluid in homogenous flow; esp. in streamline flow; line whose tangent is everywhere parallel to instantaneous velocity at that point.

## streamlined

**streamlined** 3-D body shaped such that fluid drag is a minimum.

**streamline flow** Fluid flow that is laminar and time-invariant, and in which each streamline is devoid of a closed curve or sudden change in direction.

**streamline position** That in which a hinged or pivoted body, eg control surface or pylon on a variable-sweep wing, is aligned with relative wind.

**streamline wire** One whose section is streamlined, though seldom optimum (usually two intersecting circular arcs).

**Streams** Surface-traffic enhancement and automation support system.

**stream surface** 2-D sheet made up of streamlines.

**stream take-off** Take-off by group of aircraft in quick succession with departure in trail formation.

**stream thrust** Total of pressure force and time rate of momentum flow across any cross-section in fluid flow,  $F = PA + \rho AV^2$ .

**stream tube** In a laminar fluid flow, volume of flow enclosed by streamlines passing through upstream and downstream closed loops (not necessarily circular) placed normal to flow. At any point velocity is inversely proportional to \*\* cross-section area.

**streamwise tip** Wingtip of high-subsonic or transonic aeroplane in which leading edge is curved progressively back parallel to local airflow to eliminate outward sweep of isobars; one form is *Küchemann tip*.

**street** Regular procession of straightline vortices shed alternately from above and below body, eg naturally oscillating cylinder or wire, each vortex following same path as next-but-one predecessor. Normally if D is body diameter, two half-streets are separated by 1.2-D and spacing between vortices in each half-street is 4.3 D. Also called Kármán \* or von Kármán \*.

**streetcar** STCR (colloq.).

**strength** 1 Physical \* is ability to withstand stress without rupture; normally subdivided into compressive, shear and tensile, the latter usually being stress at the yield point.

2 In radio and related fields, signal amplitude in W or dB.

3 Dielectric \* is maximum potential gradient in V/mm.

**strength deployment inventory** Assesses individual's strengths/weaknesses when dealing with others (RAF).

**strength test** See *static test*.

**strength/weight ratio** For material, ultimate tensile strength/density; for a structural member, breaking stress/weight.

**stress** 1 Condition within elastic material caused by applied load, temperature gradient or any other force-producing mechanism, measured as force divided by area. Unit \* is force per unit area normal to direction of force. It is this force that resists externally applied loads. Common units are  $\text{MNm}^{-2} = 0.06475 \text{ UK tons/in}^2$ ;  $\text{kNm}^{-2} = 0.14504 \text{ lb/in}^2$ ;  $\text{kg mm}^{-2} = 0.63497 \text{ UK tons/in}^2$ .

2 Generalized term for psychological, physiological or mental load on organism, esp. human, which reduces proficiency.

3 Measure of resistance of viscous fluid to shear between adjacent layers (see *viscosity*, *Newton's laws*).

**stress analysis** Determination of all loads borne by all elements of structure in all flight conditions, external reaction points of application and direction, and allowable and actual stresses in each member.

**stress-bearing** Required to resist applied load(s).

**stress concentration** Localized region of increased stress

## stretch point

caused by sudden changes in section, poor design and manufacturing imperfections, eg tooling marks (see *stress raiser*).

**stress concentration factor** Peak actual local stress divided by stress for member calculated by any standard method without presence of stress raisers, such as sharp-corner apertures or external surfaces. Neutral-hole \* is unity.

**stress corrosion** 1 Metal cracking due to residual stress from manufacturing processes or concentrated stresses caused by flight loads and/or poor design.

2 Exfoliation corrosion.

**stress cycle** Complete cycle of variation of stress with time, repeated more or less identically (very numerous for piston-engine conrod, less for wing LCF).

**stress distribution** Variation of stress across cross-section of member.

**stressed skin** Form of semi-monocoque construction in which skin, nearly always metal, bears significant proportion of flight loads, and makes principal contribution to stiffness.

**stress-free stock** Selection of stock material for primary structure in which presence of residual internal stress results in rejection or return for further treatment; important in heavy plate for wing skins, etc.

**stressing** Stress analysis of structural members, usually while altering their design to attain optimized structure.

**Stresskin** Patented metal (esp. stainless) sandwich panels requiring no supporting structure over surface.

**stress raiser** Local abrupt change in section resulting in stress concentration; severity varies inversely with radius, so that a single scratch (eg from emery particle) can over a period initiate a fatigue crack that will eventually prove catastrophic.

**stress ratio** Maximum to minimum ratio in one stress cycle.

**stress-relief annealing** Heating to beyond critical temperature, and slow cooling to relieve internal stress, eg after cold working or welding.

**stress/strain curve** Plot of strain resulting from all stresses from zero to yield point and on to rupture. Normally linear over most of plot to yield point (limit of proportionality where elastic deformation gives way to plastic).

**stress wave** Sonic pulse propagated through various devices, eg magnetostrictive-tablet display; also called strain wave.

**stress wrinkle** Visible wrinkling of skin caused by applied load, esp. in secondary structure, eg sagging of rear fuselage of B-52.

**stretch** 1 Increase in capacity of transport by adding plugs to fuselage, normally both in front of and behind wing. Noun and verb.

2 To apply tensile stress exceeding elastic limit.

**stretchability** Potential for stretch (1).

**stretching** 1 Process of introducing a stretch (1).

2 See *stretch-wrap forming*.

**stretching press** See *stretch press*.

**stretch-levelling** Stretching sheet or plate just beyond elastic limit (typically 1.5% elongation) to remove all irregularities; also called stress-levelling.

**stretchout** Agreement, initiated by contractor or customer, to reduce rate of production without altering quantity to be built.

**stretch point** Fuselage station at which plug is to be added

## stretch press

for stretch (1). Possibly allowed for in original design for stretch planned far in future.

**stretch press** Any of several families of press, mainly hydraulic (eg Hufford, Sheridan), in which sheet is pulled beyond elastic limit over a 3-D die or tool of correct profile; invariably both ends are pulled equally over die at centre.

**stretch-wrap forming** Use of stretch press of various types (eg Hufford) in which, as rams operate, their axes simultaneously rotate to wrap workpiece around tool.

**Streuwaffen** Cluster bomblets or scatter weapons (G).

**strew** To lay down sonobuoys in prescribed sonar pattern.

**STRI** Simulation, training and instrumentation (USA).

**stricam** Structure-integrated camouflage.

**stricken** Subjected to strike (5). Normally applied to military aircraft which are reduced to produce.

**Stricom** Simulation, Training and Instrumentation Command (USA).

**Strict** Structurally integrated inlet control technology, uses air jets to keep engine airflow attached to duct wall.

**Strida** Système de Traitement et de Représentations des Informations de Défense Aérienne (air-defence system, now \* II, F).

**strike** 1 An attack designed to inflict damage on, seize or destroy an objective (DoD, NATO).

2 As (1) is suggestive of target within reach of surface forces, better definition is a tactical close-support or interdiction attack on surface target, with conventional or nuclear weapons.

3 Significant impact(s) with foreign objects, esp. with bird(s) while on takeoff run or airborne.

4 Verb, from above.

5 Verb, to remove aircraft from active inventory.

6 From 5, an aircraft thus removed, esp. because of *BER* damage.

7 Verb, to fold wings of carrier-based aircraft and move down to hangar [also \* down].

**strike aircraft** Aircraft, normally aeroplane, for carrying out strike (2); definition which restricts term to naval carrier-based aircraft is obsolete, though such aircraft are not excluded.

**strike camera** Camera, usually optical wavelengths but can include radar and/or IR, operated automatically or on command during process of carrying out strike to record fall of ordnance and give preliminary indication of likely results.

**strike-CAP** Fighter role in which strike task is predominant; offensive ordnance is jettisoned only under direct attack.

**strike control and reconnaissance** Mission flown for primary purpose of acquiring and reporting air-interdiction targets and controlling air strikes against such targets (USAF).

**strike down** To fold aircraft on deck and transfer to hangar(s) aboard carrier; term comes from traditional verb to secure items so that they cannot move relative to deck.

**strike force** Composed of units capable of conducting strikes (1), attack or assault operations (DoD); not necessarily aviation.

**strike photography** Imagery secured during air strike.

**striker** Various meanings in connection with firing ammunition and ordnance devices by impact on percussion cap, in some cases synonymous with firing pin, and in

## strobe

others a hammer for hitting firing pin or intermediate between pin and percussion device. Hence \* pin.

**striking voltage** Critical potential difference across gas-discharge tube and certain other devices at which discharge occurs and current flows.

**string** 1 Generalized term for assembly of devices in essentially linear sequence through which signal or object passes.

2 Literally piece of string or wool used as crude indication of relative wind, esp. of yaw (probably obsolete).

3 In modern usage, operating channel in electronic device, such as autopilot.

**stringer** Longitudinal member (ie in fuselage more or less aligned with longitudinal axis and in wing and tail surfaces more or less perpendicular to this axis) which gives airframe its shape and provides basis for skin. In fuselage they link frames and in aerofoils they link ribs. Most existing definitions are obsolete, describing \* as light auxiliary or fill-in member; modern transport fuselage has no other longitudinals apart from possible underfloor keel on centreline. Integral skin removes need for \* except in some structures where integral stiffeners are used plus \* at 90° different orientation.

**strip** 1 To dismantle, also called teardown.

2 See *strip stock*.

3 See *stripping*.

4 Farm strip; loosely, any private airfield.

**strip and digit** Instrument based on roller-blind tape (usually with variable indices) plus alphanumeric window.

**strip antenna** One or more laminate dipoles flush with skin surface.

**strip examination** Dismantling an item prior to inspection.

**Stripline** Microwave transmission line formed from two close strip conductors face-to-face or single strip close to conductive surface; also called Microstrip and other registered names.

**strip map** Various forms (eg folded paper or film for projection) of topographical map in strip form, either covering entire flightplan track or sector(s) between WPs or other intermediate points.

**stripper** 1 Regular user of unlicensed airfield, such as a farmer's own land.

2 Material, usually liquid, used for *stripping*.

**stripping** One meaning is controlled removal of paint, transfers (decals) and other layers from aircraft skin. Wet \* employs various solvents, which can combine with the removed materials. Dry \* uses high-velocity blast from air at 0.5-5 bars to direct non-aggressive abrasive such as various plastics, starches or sodium bicarbonate; often a magnetic screen is used to collect ferrous dust and paint particles.

**strip plot** Portion of map or overlay upon which is delineated coverage of air-reconnaissance imagery without indicating outlines of individual prints.

**strip stock** Standard forms of metallic raw material in long, narrow strips, often coiled; suggest term confined to flat sections, only.

**strobe** 1 Originally abb. of stroboscope, high-intensity flashing light source.

2 Continuous high-intensity light source rotating about vertical axis to point repeatedly to each azimuth.

3 See *strobe marker*.

4 See *strobe unit*.

5 To select particular portion of waveform timebase or other time subdivision in cyclic phenomenon.

6 Stroboscope.

**strobe marker** Small bright spot, short gap or other discontinuity on radar timebase or other portion of cyclically scanned display to indicate portion receiving special attention.

**strobe pulse** See *strobe marker*.

**strobe timebase** Small section of timebase containing target blip, Loran signal or other object of interest which is extracted by strobe marker and expanded to fill original timebase width. In some cases process can be repeated, giving expanded \*\*.

**strobe unit** In missile guidance system, generates strobing pulses which search and lock-on to target reflections and supply target range and relative velocity to guidance computer.

**Strobokerr** Camera for ultrafast photography in which incoming scene passes through Kerr cell, which divides it into pulses of light so brief that clear non-smeared images are projected on to film revolving at high speed inside drum.

**stroboscope** Instrument for apparently bringing rotating or oscillating objects to rest by intermittent phased illumination, eg for inspection of deflection under high-speed operation or to determine rpm or Hz.

**stroke** 1 Linear distance moved by piston of piston engine from TDC to BDC or vice versa.

2 One complete translation of piston from TDC to BDC or vice versa, performing particular operation; thus inlet or induction \*, compression \*, power \* and exhaust \*.

3 Linear or angular distance travelled by electron or other beam forming timebase or any other electronic display.

4 Linear or angular distance travelled by output of actuator.

5 One major 'flash' making up flash of lightning, normally repeated every 38-45 ms until discharge complete.

6 Basic element of \*-generated writing.

**stroke font** Total repertoire of alphanumeric characters possible with particular stroke-generated writing system.

**stroke-generated writing** Major branch of alphanumerics for electronic displays in which each character is assembled from one or more straight-line strokes. Simplest format is 7-segment, also called DHW (double-hung window), all segments of which are used in figure 8 (this is common in LED and LCD displays for minimum cost, eg watches); another common system is 14 or 16-bit starburst, and best results are yielded by multi-stroke systems using five lengths and up to 40 orientations.

**stroking** Correct cycling of pump plungers over full stroke, eg in variable-displacement pump with swash drive from one end.

**strongback** Structural member added over large surface to provide rigidity in bending and torsion, eg across large rotodomes.

**strongpoint** See *hardpoint*.

**strontium** Sr, soft, reactive, silvery metal, many uses as element and compounds, Sr-90 dangerously radioactive. Density 2.5, MPt 769°C.

**strop** 1 Flexible loop connecting deck accelerator (catalpult) to aircraft not fitted with nose towbar.

2 Length of webbing connecting static line of airdrop load to anchor cable (DoD).

3 Also see *suspension* \*.

**Strouhal number** Constant for particular bodies in fluid flows giving rise to street of vortices and from which frequency of shedding can be derived;  $S = fD/V$  where  $f$  is frequency,  $D$  is diameter of cylinder or wire and  $V$  is velocity; for regular cylinder  $S$  is 0.2 for  $R$  between  $10^3$  and  $2 \times 10^5$ .

**structural aspect ratio** See *aspect ratio*.

**structural augmentation roadmap** Schedules for strengthening tired airframes (USAF, ANG).

**structural damping** Total damping of assembled structure.

**structural design** Total task of designing structure.

**structural element** Subdivisions of structure such as a spar, rib or frame, which may themselves be assembled from smaller structural members.

**structural factor** Seldom used ratio of structure mass to sum of structural plus propellant mass for rocket vehicle; mass ratio more common.

**structural failure** Breakage under load.

**structural limit** Greatest weight (mass) at which aircraft can show compliance with structural requirements, usually MRW.

**structural machine screw** HT-steel machine screw (term often synonymous with bolt) with unthreaded shank portion below head.

**structural member** Portion of structure, esp. any part important in bearing loads; can be single piece of material or assembly, and demarcation with structural element is blurred.

**structural merit index** Ratio  $E/\rho$ , modulus divided by density.

**structural-mode control system** Flight-control subsystem whose purpose is to reduce stresses in structure during flight through gusts and other turbulence, esp. in dense air, or to reduce vertical accelerations experienced by crew compartment. Requires vertical-acceleration sensor and separate horizontal (occasionally inclined or vertical) surfaces to apply required counteracting forces to airframe, usually symmetric about c.g. to avoid applying pitch moment. Often similar in principle to active controls.

**structural placard** Structurally significant airspeeds, eg maximum gear-down or flap-extension IAS, displayed in cockpit.

**structural RAM** RAM (2) material, often of hybrid types such as CA overlying magnetic RAM, bearing some or all of local skin structural loads.

**structural section** Cross-section not necessarily unvarying, of structural materials or finished parts of high fineness ratio, produced mainly by extrusion or rolling between shaped dies but often machined to incorporate tapers or discontinuities. Standard \* appear in priced catalogues.

**strut** 1 Externally mounted structural member intended to bear compressive loads, and usually of streamline section.

2 Ambiguously, stub wing or pylon \* attaching engine pod to fuselage or wing (loads mainly tensile and bending).

3 Loosely, any major bracing member or portion of truss even if load is tensile (suggest incorrect usage), thus a lift \* on braced highwing monoplane is a misnomer [it is a tie].

4 A structural member extending across the gas path of a gas-turbine engine to transmit loads from a shaft bearing without diverting the flow [see *vane*].

**strutjet** RBCC engine using multiple struts in air inlet.

**strut skin**

**strut skin** Load-bearing additional skin, eg bonded reinforcement.

**STRV** Space technology research vehicle.

**STS** 1 Space transportation system; usually means Shuttle.

2 Space Tourism Society.

3 Stockpile to target sequence.

4 Stable time subfield.

5 Status.

6 Support and test station.

7 SAR (2) transit stripmap (radar mode).

8 Sensor to shooter (usually S2S).

**sts** Stones (non-SI unit of weight).

**STSA** Short-term strategic aircraft (UK).

**STSC** Sequentially triggered shaped charge [=BWA].

**STSMT** Service Technique des Systèmes de Missiles Tactiques (F).

**STSP** Solar Terrestrial Science Program[me] (NASA/ESA).

**STSS** Space tracking and surveillance system [formerly SBIRS-Low].

**STSSS** ST3S.

**STST** 1 Strategic transportable satellite terminal.

2 Sensor-to-shooter time.

**STT** 1 Solution-treatment temperature.

2 Single-target track[ing].

**STTA** Service Technique des Télécommunications de l'Air (F).

**STTE** 1 Special-to-type test equipment.

2 Alternative to STTEA.

**STTEA** Service Technique des Télécommunications et des Equipements de l'Aéronautique (F).

**STTEM** Final tactical technical economical requirement, follows PTTEM and leads to series production (Sweden).

**ST3S** Service Technique des Systèmes Stratégiques et Spatiaux (F).

**STTI** Single-target track and identification.

**STU** 1 Service trials unit (UK).

2 Sensor transmitter unit.

3 Satellite terminal unit.

4 Secure terminal, or telephone, unit.

5 Service transport unit.

**stub** 1 Portion of transmission line up to  $\frac{1}{4}$ -wavelength long connected in shunt with dipole feeder to match impedances. In particular the link between a data bus and a terminal.

2 Short straight exhaust stack carrying gas from one piston-engine cylinder direct to atmosphere just clear of cowl or any downstream structure.

3 Short projection from aircraft, though sponson has its own term.

**stub antenna/aerial** Stub (1), usually for DME, IFF and beacon transponders.

**stub exhaust** See *stub* (2).

**stub float** See *sponsor*.

**stub plane** Short length of wing projecting from fuselage or hull to which main wings and/or main landing gear are attached (BS). See *stub wing*.

**stub power** Net power available for propulsion.

**stub runway** Short section of runway projecting on far side of an intersection which may be specifically designated for STOL takeoffs which avoid all conflicts with CTOLS on ground and in air. Not normally used for landings.

**stub shaft** 1 Projects from driving or driven item just far enough for gearwheel and bearing.

2 Short shaft running in its own bearings with bevel drive to an accessory [demanding longitudinal location] driven by splines [permitting axial movement by driver].

3 Short shaft attached to the end of another [e.g., to the face of a rotor disc] to enable it to run in a bearing.

**stub thrust** Net thrust available for propulsion.

**stub wing** Short aerofoil projecting approximately horizontally from fuselage serving either as a structural bracing member (eg linking lift struts and main gears) or as a beam supporting external stores racks or other loads.

**stub-wing stabilizer** See *sponsor*.

**stud** 1 Headless bolt threaded at both ends but not in mid-portion used for attaching items to threaded hole in casting or forging.

2 Projecting pin used as fulcrum, pivot, locating dowel or for other purpose.

3 Projecting push-button human interface.

**student pilot** Person authorized and licensed to receive flying instruction from rated flight instructor but who has not yet attained any licence.

**study** Formal investigation, with or without research or any kind of testing, of possible solutions to a stated future requirement; hence \* phase, \* program, \* contract.

**stuffed** Large component, eg wing panel or section of fuselage, manufactured complete with internal systems and equipment. In case of transport fuselage, not necessarily furnished. In case of nacelle, contains equipped engine.

**Stuka** Dive bomber (G).

**stunting** Performing aerobatics (colloq., becoming obs.).

**S-turn** Flight manoeuvre in form of S in horizontal plane, often carried out across road, railway, fence or similar axis.

**STV** 1 Structural, or systems, or supersonic, or separation, test vehicle.

2 Satellite transfer vehicle.

**STVA** Self-tuning vibration analyser.

**STVF** System test and validation facility.

**STVS** Small-tower voice switch.

**STW** Special-to-weapon equipment, eg in WAS.

**STWA** Short(er) trailing-wire antenna.

**STW&ARS** Satellite threat warning and attack reporting system (USAF).

**STWL** Stopway lights.

**S2AT** See SSAT second definition.

**S2S** Sensor to shooter.

**STX** Start of text.

**STY** Standby.

**styrene** Liquid hydrocarbon ( $C_6H_5CH:CH_2$ ) polymerised into polystyrene for use as basis of important resins, low-density foams (expanded polystyrene) and many other products.

**Styrofoam** Most widely used of the styrene-based foams, used as sandwich structure filler.

**SU** 1 Signal[s] unit.

2 Submersible unit (sonar).

3 Servicing unit.

4 Foreign trade association [FIN-00101 Helsinki] (Finland).

**su** Spin-up of wheels on touchdown, hence  $K_{su}$ .

**SUA** Special-use airspace.

**SUAV** Small, or strategic, unmanned [or unit] air vehicle; E adds experient.

**Suave** 1 Small UAV engine.

**2 Strategic UAV experiment (UK).**

**SUAVS** Small unmanned aerial vehicle system (USA).

**sub** Smaller contractor, partner chosen in *teaming down*; can be thought of as short for subordinate or subcontractor.

**subassembly** Assembly (eg structural, electronic or for some other system) forming part of a larger item.

**subcarrier** Subsidiary modulated carrier which in turn modulates primary RF.

**subchannel** Intermittent fraction of telemetry channel conveying one repeatedly sensed measurement.

**sub-cloud car** Car suspended below above-cloud aerostat giving view of ground.

**subcommutation** Commutation of additional telemetry channels, output of which is fed to primary commutator; called synchronous if commutation frequency is multiple of that of primary (which it usually is).

**subcontract** Agreement other than prime contract to perform work on same programme. Normally between subcontractor and prime contractor for work assisting latter to complete task. Does not necessarily confer design authority or responsibility.

**subcritical mass** Mass of fissile material inadequate in magnitude or configuration to sustain chain reaction.

**subcritical rotor** Rotor, esp. main lifting rotor of helicopter, whose fundamental flapping, lag-plane or other resonant frequency is less than normal operating frequency, latter being frequency with which one blade passes given angular position.

**subcritical wing** Wing designed not to exceed  $M_{crit}$  at any point.

**subgrade** Soil underlying airport pavement.

**subgrade code** ICAO coding for strength of subgrade: A, 150 MN m<sup>-3</sup>; B, 80; C, 40; D, 20.

**subgravity** Condition in which apparent vertical acceleration is between zero and + 1 g.

**subharmonic** SHM or other sinusoidal waveform whose frequency is exact multiple of related fundamental waveform.

**sub-idle** Operating speed or control selection below idling, occasionally provided with main engines for ground operation.

**SUBJ** Subject [to . . . ].

**subjective** Dependent upon personal opinion; in such fields as aircraft noise and visible smoke unquantified \* measures play a major role, usually as the result of seeking views of statistically significant population.

**sub-kiloton weapon** NW whose yield is below 1 kT.

**sublimation** Direct transition, in either direction, between solid and vapour state.

**sublimator** Solid material designed to reject waste heat by sublimation to space environment, usually a porous plate and in some cases not a true \* but medium for evaporating liquid heat-transfer medium.

**submarine** Verb, to slide down out of seat harness in violent deceleration [impossible with 5-point harness].

**submarine missile** Missile launched by submarine, eg against distant city target.

**submarine rocket** Submarine-launched rocket (Subroc) weapon for use against other submarines.

**submarine striking force** Force of submarines having guided or ballistic missile capabilities and formed to launch offensive nuclear strike (DoD).

**submodulator** AF power amplifier preceding main RF modulator.

**submunition** Self-contained warhead carried in multiple (tens or hundreds) inside single delivery vehicle, eg air/ground store.

**subprogram** See *subroutine*.

**Subroc** Submarine-launched [guided, nuclear-warhead] rocket.

**subroutine** Set of instructions necessary to enable EDP(1) computer to carry out well defined mathematical or logical operation, forming part of complete program; unit of routine for specific sub-task, usually written in relative or symbolic coding even if full routine is not, and in closed \* entered by jump path from main routine and reverting to main routine at completion (one sequence of instructions can be \* and at same time a main routine with respect to its own \*).

**subsatellite** Satellite of Moon.

**subsatellite point** Point on Earth's surface directly below Earth satellite, ie on local vertical through satellite at any time.

**subscale prototyping** Not defined. The A380 conceivably might be assisted by a balsa chuck-glider.

**subsidence** 1 Extensive sinking of air mass, eg in polar high, in which air forced to descend is warmed by compression, increasing stability.

2 Disturbance to aircraft flight which dies away without oscillation (UK usage only and unusual).

**subsidy** US term for an interest-bearing loan to a competitor.

**subsonic** Slower than speed of sound in surrounding medium. According to one lexicographer, Mach numbers less than 0.7.

**subsonic flow** Flow whose velocity is less than speed of sound within it; in contracting duct accelerates and rarefies slightly and in expanding duct decelerates and compresses slightly.

**substantiation** Formal demonstration of compliance, eg with design fatigue-life requirement.

**substrate** In various kinds of planar technology, structural layer upon which operative layers and/or devices are formed; in most microelectronics has low resistance, while in solid-state circuitry and solar cells \* is normally an insulator.

**substratosphere** Imprecise, generally taken to mean upper layer of troposphere.

**subsystem** There is no clear demarcation between system and \* though it is simple to give examples of dynamic organized groupings of devices that can be seen to be one or other. It could be argued, eg, that because it is part of a flight-control system a stability-augmentation system is a subsystem. Again, a BITE can be considered an integral part of a system or as a \*.

**suckdown** Downwards pull on jet-lift aircraft when hovering in ground effect, usually caused by upward flow around fuselage from fountain.

**suck-in** Traditional verbal command in hand-starting piston engine, meaning 'Do not energize ignition (cylinders are being filled with mixture)'.

**suck-out** Deliberate or undesired characteristic of some vertically translating airbrakes, esp. on sailplanes, of being pulled open by local depression under certain flight conditions.

**Sucsede** Successful user-centered systems engineering development and environment (software tools).

**suction** Withdrawal of fluid through a region of local depression.

**suction-cup gun** Spraygun using ejector effect to withdraw medium.

**suction face** That side of propeller blade, normally facing forward, formed from upper surface of its aerofoil. See *suction surface*.

**suction flap** Not normal term; in some cases means blown flap.

**suction gauge** Instrument measuring pressure below atmospheric, usually by aneroid or bourdon tube.

**suction gyro** Gyro whose rotor is driven by atmospheric air jets trying to fill evacuated case.

**suction line** The pipe upstream of a fluid-system pump.

**suction stroke** Induction or inlet stroke.

**suction surface** The convex face of a gas-turbine rotor blade or propeller.

**suction wing** 1 One whose boundary layer is continually sucked away by powered suction system.

2 Wing of deep section with upper rear discontinuity from which large airflow is removed by suction to maintain attached flow (rare after 1949).

**SUD** Stretched upper deck.

**sudden ionospheric disturbance** Abnormal behaviour of ionosphere following passage of radiation travelling at speed of light from source of solar flare, affecting Earth's sunlit face. Gradual return over following hour or more.

**sudden pull-up** Basic stressing case in which severe positive g is applied by violent nose-up elevator command (US term).

**sudden stoppage** Inflight stoppage of piston engine apparently within about one turn of propeller, or of turbine within about one second; indicative of severe internal damage.

**Sudec** Supervisory digital electronic control, less authority than Fadec.

**SUEM** Spin-up and ejection mechanism (Mars lander).

**suite** Aggregate of all equipments, not necessarily integrated or forming a common system, of similar general type carried in vehicle. Especially favoured in connection with ECM, for which as many as 14 separate electronic equipments may be carried (and in theory operated simultaneously) though most are linked only through common power supplies and possibly cockpit displays. For GA avionics \* is supplanting 'fit'.

**SUL** Yaw-damper servo-actuator.

**sulfate** Salt or ester of sulfuric acid.

**sulfated** Condition of lead/acid battery after prolonged discharge; lead sulfate plates cannot be restored by charging.

**sulfidation corrosion** Accelerated metallic corrosion due to sea salts in atmosphere.

**sulfide** Compound of sulfur with element or radical.

**sulfur** S, former UK names brimstone and then sulphur, important in many kinds of compound in several forms, commonest being yellow crystalline, density 2.1, MPt 113°C.

**SUM** 1 Surface-to-underwater missile.

2 Structural-usage monitor.

3 System user module.

4 Scheduled unit maintenance (DARA).

**sumerian cobalt** One of many cobalt-steel materials used for permanent magnets.

**summer solstice** Point on ecliptic, or time thereof, at which Sun reaches maximum N declination; about 21 June.

**summing gear** Differential gears which add or subtract motions of two members.

**summing unit** Device whose output is sum of inputs; can be mechanical, fluid flow (including pneumatic logic) or electronic.

**sump** Low region of fluid (liquid) system where liquid tends to collect by gravity. In piston engine bottom of crankcase, which in wet-\* engine also serves as oil tank. In fuel tank lowest point with tank in normal attitude, where water collects and may be drained.

**sump jar** Container in vent line from battery box in which alkaline chemicals neutralize battery-charging gas.

**Sums, SUMS** 1 Shallow underwater missile system.

2 Structural-usage monitoring system.

**SUMT** Sequential unconstrained minimization technique.

**Sun** Apparent diameter (optical)  $13.92 \times 10^8$  m, mean density  $1.41 \text{ g/cm}^3$ , mass  $c 1.99 \times 10^{30}$  kg, surface gravity  $274 \text{ ms}^{-2}$  (26.9g), rotational period c 25.4 days at Equator (33 at 75°N/S lat), radiating surface temperature 5,800K, chromosphere up to c  $10^6$ K, emits various corpuscular and EM radiation at total energy c  $3.39 \times 10^{26} \text{ Js}^{-1}$ ; moving with solar system through interstellar medium in local arm of galaxy at c  $20 \text{ km s}^{-1}$ . See *solar wind*.

**Sun compass** Compass based on az/el of Sun, formerly used near magnetic poles where magnetic compass unreliable.

**Sundstrand drive** Infinitely variable hydraulic CSD.

**sun gear** Central gearwheel in planetary reduction gear.

**sunk costs** Costs incurred in development which are paid off in another programme.

**sunlight-readable** Readable in illumination (illuminance) of  $10^4$  lx; basic requirement of military cockpit warning panels and displays.

**SunRez** Proprietary resin activated [set hard] by UV light.

**Sun-synchronous** See heliosynchronous.

**SUO** 1 Small unit operations.

2 Aileron/elevator/rudder servoactuator.

**SUP** 1 Smart upgrade procurement.

2 Supplement to publication.

3 Suspected unapproved part[s] (FAA).

**Supaéro** Ecole National Supérieure de l'Aéronautique et de l'Espace [Toulouse F-31055] (F).

**Suparco** Space and Upper-Atmosphere Research Commission (Pakistan).

**superadiabatic lapse rate** Greater than DALR, such that potential temperature decreases with height.

**superaerodynamics** Aerodynamics involving such high relative velocities and such low densities that body has passed before air molecules can collide with others and exchange energy; also called free-molecule flow and Newtonian aerodynamics, and akin to MHD flow.

**superalloy** Any alloy designed for extremely severe conditions, esp. at very high temperatures.

**superaugmentation** Either of two methods of achieving gains in flight performance by imparting artificially stable flight characteristics to aeroplanes that are inherently unstable.

**superblock** Major section (20%) of CVF, each assigned to

## **superboom**

different yard because of lack of national capability to construct large ship (UK).

**superboom** Boom from SST or other aircraft which, because of reflection and/or refraction in atmosphere, is heard up to 250 km from flightpath.

**supercharged core engine** Turbofan in which fan is regarded as 'supercharger' for core; no need for this concept.

**supercharged harness** Pressurized harness to reduce ignition arcing.

**supercharged turboprop** Powerful turboprop derated and matched with lower-capacity gearbox and propeller, thus giving same power at all airfield heights and temperatures; essentially synonymous with flat-rated.

**supercharger** Compressor driven by crankshaft step-up gears or by exhaust turbine which increases density of air or mixture supplied to cylinders of piston engine, either to boost power or, more often, to assist in maintaining power at high altitudes. Virtually all are single-stage centrifugal, in some cases with choice of gear ratios and formerly (WW2) with two consecutive stages and intercooler. Term also (suggest formerly) used for cabin blower.

**supercirculation** Increase of wing lift by increasing circulation by positive power-consuming means; secondary gains include postponement of stall, reduction of drag (both by improving flow and by enabling wing and other aerofoils to be smaller) and as means towards realizing laminar flow. Commonest form is blown flap, with more ambitious schemes discharging supersonic bleed air along upper part of leading edge or other places; used facing to rear to accelerate boundary layer and as by-product to impart thrust.

**supercompression** Piston engine with such a high compression ratio that it must not be operated at full throttle below a given height (today unusual).

**superconductivity** Near-zero electrical resistance exhibited by some metals, esp. particular mixtures, as 0°K is approached. Extremely powerful currents and magnetic fields are possible eg making possible frictionless gyroscope. One branch of cryogenics.

**supercooled** Vapour and finely dispersed water droplets can exist as vapour and liquid at below 0°C, freezing immediately on contact with solid object.

**supercooled large droplet** Diameter  $\geq 300 \mu\text{m}$ .

**supercritical** Loosely, any flow involving regions where  $M > 1$ .

**supercritical shaft** A [normally high-speed] drive shaft whose ratio of length to diameter is so great that it would quickly fail from whirl; i.e. the whirl margin would be negative.

**supercritical wing** Aerofoil designed to cruise at above  $M_{\text{crit}}$ , characterized by bluff leading edge, flattish top, bulged underside and downcurved trailing edge; by reducing peak suction maximum acceleration and shock formation are delayed and wing can be deeper, have less sweep, house more fuel and weigh less than conventional wing for same cruise  $M$ .

**supercruise** Sustained flight at supersonic speed with engine[s] in dry thrust, without afterburner.

**supercruiser** Aircraft designed to cruise at supersonic speed, usually Mach 1.5 to 2.

**superheat** 1 Temperature difference between aerostat gas or hot air and surrounding atmosphere; called positive if gas is warmer than atmosphere.

## **supersonic dash capability**

2 Heat energy added to gas or vapour after evaporation has been completed.

**superheated vapour** Vapour heated above its boiling point for given pressure.

**superheterodyne** Radio receiver in which received signal is mixed (heterodyned) with local oscillatory frequency to give intermediate frequency which is then amplified with various advantages.

**superhigh frequency** See *frequency, radio*.

**superior planets** Those further out than Earth, ie Mars to Pluto.

**superluminal** Velocity greater than that of light, by expansion/contraction of spacetime.

**supermanoeuvrability** Ability to perform controlled supermanoeuvres.

**supermanoeuvrable fighter** The accepted definition is ability to fly under sustained positive control at AOA of 70°, and of flying for brief periods at 100°–120° without departure.

**supermanoeuvre** 1 A sustained manoeuvre which increases AOA beyond the 1-g stall.

2 A sustained manoeuvre which increases AOA beyond the actual accelerated stall.

3 A dynamic manoeuvre in which angular momentum in the pitching plane momentarily increases AOA to a peak beyond stall.

**superplasticity** Property of flowing like hot glass at elevated temperatures under modest applied pressures with no tendency to necking or fracture; possessed by many alloys, eg Prestal at 250°–260°C.

**superposition** 1 Principle in stress analysis that aggregate of all strains caused by a load system may be considered to be the sum of all individual strains experienced by each member taken in isolation.

2 Identical principle for algebraic sum of currents or voltages in linear network.

3 Ability of subatomic particle [many] to exist in more than one place, or one state, at same time.

**superpressure** Pressure difference between gas in aerostat at any point and surrounding atmosphere at same height; called positive if gas pressure is greater (as it usually is).

**superpressure balloon** Unvented envelope strong enough not to burst in long-duration voyage at constant pressure height.

**superrefraction** Warm air over cold sea, extends radio/radar ranges.

**super search mode** Radar scans entire HUD field of view.

**supersonic** 1 Faster than speed of sound in surrounding medium. One lexicographer says Mach 1.2+, 1.19 being deemed transonic.

2 R/T callsign, suffix when actually cruising at \* speed.

**supersonic-combustion ramjet** Ramjet whose combustion system is (very unusually) designed to function at supersonic speed; abb. SCRJ or scramjet (even Mach-6 ramjet vehicles invariably burn fuel in subsonic airflow).

**supersonic compressor** Axial compressor in which fluid velocity is supersonic relative to whole length of rotor blades, stator blades or both, with oblique shocks giving greatest possible pressure rise per stage. (Some axial and centrifugal compressors not classed as \* do in fact have local flow over Mach 1 at periphery at maximum rpm).

**supersonic dash capability** Ability to fly safely at over Mach 1. Originally this was to enable a high-subsonic attack aircraft to exceed Mach 1 for brief period to escape

## supersonic diffuser

## surface

defences. Now it is seen as a possibility for Sonic Cruise type aircraft to exceed Mach 1 in recovering from upsets.

**supersonic diffuser** Contracting duct (see *supersonic flow*).

**supersonic flow** Flow which relative to immersed body or surrounding walls is supersonic. In contracting duct decelerates and compresses; in expanding duct accelerates and rarefies.

**supersonic inlet** Air inlet designed for supersonic flow both past and through it for at least part of flight; ideally has centrebody or side wedge to create attached oblique shock and various forms of variable geometry and auxiliary doors.

**supersonic jet** 1 Propulsive jet from rocket, ramjet or afterburner whose velocity relative to source is supersonic.

2 Supersonic aeroplane (colloq.).

**supersonic nozzle** Propulsive or wind-tunnel nozzle through which relative flow velocity is supersonic. Ideally of con/di form with variable profile and area.

**supersonic propeller** Propeller whose blades are designed to operate with supersonic relative velocity over major portion of surface. Noise problem appears insoluble.

**supersonic tunnel** Wind tunnel capable of supersonic speed in working section (either brief or sustained).

**supersonic turbine** Turbine of any kind designed to operate with flow velocity relative to rotor blades supersonic (rare).

**superstall** Progressive stall attainable by certain aeroplanes, eg T-tail with rear-mounted engines, in which (partly because at low speeds drag increases faster than lift when pilot pulls nose up) decay of speed and increasing AOA leads to stable condition in which aeroplane descends in approximately constant attitude (not far removed from level flight) but with decaying speed and AOA increasing continuously so that after long period it approaches 90°. Root cause is combination of nose-up pitching moment plus immersion of horizontal tail in wing wake, destroying effectiveness. If not recoverable, called locked-in stall.

**superstandard propagation** Propagation with superrefraction.

**superstructure** 1 Secondary structure built above main fuselage or other part of aircraft (rare; eg not used for AWACS radar aerial).

2 Secondary fairing structure to streamline box-like truss.

**supervised operator experience** Total of 25 hours flown with a type-rated pilot, required before a pilot can have SOE restriction removed from logbook and fly VLJ solo [intended FAA/JAA, 2005–] (Int.).

**SUPP** Supplemental.

**supplemental carrier** US air carrier operating under supplemental certificate, normally authorizing services of various kinds other than scheduled.

**Supplemental Type Certificate, STC** Authorizes alteration to aircraft, engine or other item operating under approved type certificate (US).

**supplementary aerodrome** One designated for use by aircraft unable to reach its regular or alternate aerodrome (BS, suggest arch.).

**supply balloon** Flexible container for storing gas at low pressure ready for aerostats; normally too heavy to fly even if free. Hence supply main, supply tube, links \* with aerostat needing supply of gas.

**supply chain** The complete network of subcontractors to

a major company or programme, especially arranged hierarchically.

**support** 1 All services and material needed or provided to assist operator after delivery (see \* items).

2 Action taken to assist friendly unit in battle.

3 Part of force or unit held back at start of action as reserve.

4 Underpinning of new programme by R&D effort to ensure answers are available to technical problems.

**supporting aircraft** All active aircraft other than unit aircraft (DoD).

**supporting surfaces** Those aerofoil surfaces whose chief function is to provide lift for aerodyne; can be fixed or rotating.

**support items** For support (1) typically publications, training, simulator and instructional rigs, auxiliary ground equipment, spare parts, testing, warranty provisions and field modification kits.

**support zone** Designated surface area for airlanding or other operations in direct support of battle (no longer used DoD, NATO).

**suppressant** Active ingredient for suppressing an action, normally fire, esp. one automatically released by sensitive pressure sensors in fuel tanks or similar regions; passive suppressing methods, eg reticulated foam, are not \*.

**suppressed** 1 Installed so that item does not project beyond skin of aircraft; thus \* aerial is synonymous with flush aerial.

2 Emitter, especially engine(s), designed or installed to minimize emissions; for civil aircraft noise predominates, for military aircraft IR radiation.

**suppressive** Intended to suppress hostile defensive fire by offensive action, eg direct attack with weapons and offensive ECM; hence \* attack, \* support, \* weapons (eg ARMs).

**suppressor** 1 Jet-engine nozzle either configured for minimum noise or shielded by additional surrounding duct.

2 Various additions to electrical or electronic devices or circuits to reduce unwanted leakages, emissions or other phenomena, eg extra grids in thermionic valves (tubes) to stop secondary emission and large series resistors in HT circuits to eliminate sparking.

**suppressor pulse** Sent out to disable L-band [original meaning, 0.39–1.55 GHz] avionics during transmitting period of other equipment on similar wavelength, to prevent interference or damage.

**SUPPS** Regional supplementary procedures.

**Supra** Support for the use of presently unserved airspace (Euret).

**supra-aural** Fitting over the ear.

**Supral** Superplastic aluminium alloy marketed for SPFDB applications (British Alcan).

**suprathermal ion detector** One of ALSEP experiments left on Moon; measures energetic ions impacting surface to determine solar-wind energies.

**SUPT** Specialized undergraduate pilot training.

**SURE, Sure** Sensor update and refurbishment effort (USN).

**surf** Verb, see *surfing*.

**surface** 1 Aerofoil, esp. large, eg wing (not small rotating, eg compressor blade).

2 Exterior of aircraft, eg \* friction drag.

3 2-D layer corresponding to particular pressure altitude.

## surface acoustic wave

## surge line

4 2-D layer in any plane corresponding to particular electronic radiation pattern or time difference.

5 Hinged or extendable area for flight control, lift augmentation or drag augmentation.

6 Generalized term for Earth's \*, hence \* target = one on land or water.

**surface acoustic wave** Travelling across polished piezoelectric substrate at controllable microwave frequencies.

**surface actuator** Device which physically moves a surface, eg control surface; need not embody any form of control function.

**surface boundary layer** Atmosphere in contact with Earth's surface, extending up to base of Ekman layer (anemometer level).

**surface burning** Combustion of fuel for propulsion on outside of aeroplane, proposed for variable-geometry aircraft for Mach numbers of about 5, using variable body profile for ramjet effect.

**surface cooler** See *surface radiator*.

**surface corrosion** Galvanic (non-mechanical) attack on surface, eg by salt spray, often under paint film.

**surface discharge** Most common type of gas-turbine igniter, in which semiconductor [usually SiC] permits leak from tungsten electrode to body, ionizing path for main high-energy flashover.

**surface effect** Effects on air-supported vehicle of close horizontal surface beneath (synonymous with helicopter ground effect), hence \*\* vehicle (= air-cushion vehicle), \*\* ship (US usage in latter cases).

**surface-friction drag** Drag due to all forces tangential to surface, notably shearing of boundary layer; added to form drag makes profile drag; added to pressure drag makes total drag.

**surface gauge** Gauge (US, gage) in form of precision stand moved about on surface plate carrying adjustable scriber for transfer of exact height measures, eg in marking out or in checking finished workpieces.

**surface inversion** Atmospheric inversion with base at Earth's surface.

**surface loading** Mean normal force per unit area carried by a particular aerofoil under specified aerodynamic conditions (BS); in case of wing term is wing loading; suggest few cases where \*\* needed.

**surface management system** Looks into near future to manage departures and avoid congestion or other problems.

**surface movement** One vehicle (eg aircraft, or even bicycle), in motion on airfield movement area. Hence \*\* indicator, usually a PPI radar.

**surface of discontinuity** Sloping demarcation between warm and cold air masses.

**surface operations** In the US civil community, any movement on airport/airfield surface.

**surface plate** Steel table with extremely flat and smooth surface.

**surface power unit** Surface actuator embodying control functions, eg control valves, feedback inputs, summing units and possibly redundancy provisions.

**surface radiator** Mounted to form integral part of external surface of vehicle, with no change in profile.

**surface sampler** Device for scooping up specimen of planetary or other surface for analysis or other study (eg to investigate for presence of life).

**surface tape** Pinned-edge strips of fabric doped over all

seams, rib-stitching and edges of fabric covering. Also called finishing tape.

**surface target** One on land or sea.

**surface tension** Tendency of a liquid/gas surface to minimize its area [because all the attractive liquid molecules are on one side of the surface], symbol  $\gamma$ .

**surface-to-air missile** Missile launched from surface (6) against target above surface (DoD). Hence \*\* envelope, that airspace within kill capabilities of particular SAM system; \*\* installation, a \*\* site with system installed; \*\* site, prepared plot of ground designated for but not occupied by SAM system.

**surface-to-surface missile** Surface (6)-launched missile designed to operate against target on surface (6), including those underground.

**surface visibility** At eye level.

**surface wave** 1 Radio wave travelling round surface (6); most effective propagation mode of LW/LF.

2 Acoustic wave in surface-wave device.

**surface-wave device** New family of electronic devices based on surface acoustic waves sent across piezoelectric slab or other substrate; originally (1970s) used for delay lines and now for complex signal processing.

**surface wind** Generalized term for wind measured at surface (6); in US gradually switching from 20 ft (6.5 m) anemometer level to ICAO 10 m (32.8 ft) level.

**surface zero** See *ground zero*.

**surfacing** Improving low-drag quality of vehicle surface (in general task called stopping and \*), eg by perfecting flatness and smoothness.

**surfactant** Surface active agent, material (usually liquid or particulate) which alters surface tension and/or performs other tasks at boundaries between dissimilar materials, eg detergent.

**surfing** Riding with enhanced L/D ratio on the field of increased pressure created by a hypersonic vehicle's own shockwaves.

**surge** 1 Gross breakdown of airflow through compressor, normally of axial type, resulting from local stall and usually characterized by muffled bang and sudden increase in turbine temperature; hence \* line, \* point. Often used synonymously with stall.

2 Various abnormally large currents, signal amplitudes or voltages in electrics or radio, eg on first switching on or caused by lightning or static discharge.

3 Planned large increase in flying rate of military unit, eg to explore ultimate potential of personnel and hardware over short or longer term under crisis conditions.

4 Unplanned transient increase in flow of fuel in aerial refuelling, sometimes causing a disconnect.

5 General change in atmospheric pressure at surface apparently superimposed on predicted diurnal or cyclonic change.

6 Fore/aft linear motion (simulator).

**surge box** Term used for various kinds of device in aircraft fuel system to reduce pressure/flow excursions caused by fuel momentum either in tanks (sloshing) or in pipelines, esp. during high-rate refuelling.

**surge diverter** Protective semiconductor device having negative resistance/temperature coefficient to earth voltage surges.

**surge line** Boundary between gas-turbine operating region and region where surge of compressor is certain. In

**surge point**

a plot of pressure ratio against mass flow, the locus of all surge points. Generally same as stall line, stability line.

**surge point** Any combination of airflow and pressure ratio for gas turbine at which surge occurs.

**surging** 1 Occurrence of surge (1).

2 Fault in wind tunnel characterized by erratic or low-frequency pulsations in velocity, flow and pressure.

3 See *sloshing*.

**surpic** Surface picture.

**surrogate factory** One engaged in assembly of kit-built aircraft.

**surrogate tanker** An aircraft acting the part of an air-refuelling tanker; hence surrogate receiver.

**Surtass** Surveillance towed-array sonar system.

**surveillance** Systematic observation of aerospace, surface or subsurface objects by any kind(s) of sensor.

**surveillance approach** Instrument approach conducted in accordance with directions issued by ground controller referring to a surveillance radar display (DoD).

**surveillance radar** 1 Primary radar scanning in azimuth, often through 360°, supplying P-type display (PPI). Not normally giving elevation or height of aerial targets.

2 Specif., primary radar whose purpose is to determine az/el position, track and (with SSR) identity of all aerial targets, and to provide radar separation, navigational assistance, storm warning and vectoring for final approach (but not normally to handle complete radar approach).

**surveillance radar element, SRE** Portion of GCA system which vectors incoming traffic until established on ILS and handover to PAR.

**surveillance system** Any means of surveillance not contained wholly in one vehicle or site, eg RPV, electronic communications and guidance, digital sensor data-link, and control/receive ground station.

**survey** 1 To examine damaged vehicle, eg crashed aircraft, often on behalf of insurers or underwriters, to establish damage, possibility of salvage (eg to fly out from crash site) and best course of action.

2 Normal meaning in photogrammetry and mapping.

3 Examination by surveyor (see below).

**surveyor** Technically qualified and designated official empowered to collaborate with aerospace design staff on behalf of national certification authority and examine subsequent hardware and design software to establish compliance with airworthiness requirements; usually concerned with particular design aspect, eg fluid systems, or with particular class of aircraft.

**Surviac** Survivability/vulnerability information analysis center.

**survivability** Capability of a system to withstand a man-made hostile environment without suffering an abortive impairment of its ability to perform its designated mission (USAF). Refers specif. to various effects of NW attack, eg degradation of volatile memory.

**survivability planner and associated re-router** Automatically responds to battlefield threats to friendly aircraft.

**survival capsule** Detachable crew compartment, normally of military aircraft, capable of separation in emergency and soft landing on land or water, thereafter serving as shelter.

**survival kit** Man-portable package containing items to help sustain life remote from other human beings.

**survival radio** Self-contained, portable, shockproof,

floating radio emitting homing (and possibly voice) signals on 121.5 and 243 MHz.

**Survsat** Survivable sat-com system.

**SUS** 1 Saybolt universal second[s].

2 Signal, underwater sound.

**susceptance** Reciprocal of reactance, defined as ratio of current quadrature component to voltage for same frequency,  $B = 1/x$ , unit siemens.

**susceptibility** Degree to which any hardware is open to an attack as a result of inherent weakness (DoD).

**suspended underwing unit** Dispenser.

**suspension** 1 Linkage between aerostat and load, hence \* band (fabric band linking envelope to \* lines), \* bar connecting suspension lines to basket ropes in balloon, \* line, main connections between envelope and basket or suspended car, and \* winch connecting kite balloon to surface (6).

2 System of particles dispersed through fluid, including atmosphere.

**suspension strop** Webbing or wire rope connecting helicopter and cargo sling.

**sustained flight** Time-invariant flight, ie steady lift and airspeed.

**sustained readiness program** Keeping fleet operational by replacing structural parts damaged by fatigue or corrosion.

**sustainer** Propulsion, either rocket or airbreathing, that provides power for sustained flight following short high-thrust acceleration period under power of boost motor(s). Not normally applied to any stage of large or small multi-stage vehicle; must be long-duration propulsion system handling entire mission after separation or burnout of booster (in ramrockets and many related systems may in fact use booster case for combustion).

**SUT** 1 Autothrottle servo.

2 Tailplane [stabilizer] trim servo.

3 Surface and underwater target.

4 System under test.

**Sutherland law** Gives temperature variation for viscosity of air.

**Sutton harness** Traditional (WW1) personal seat harness with two lapstraps, two shoulder straps and central pinned clip passing through all four.

**SUU** 1 Suspended underwing unit (US).

2 Secondary user unit.

**SVOS** Semiconductor UV optical source[s].

**SWU** Surface warfare.

**SV** 1 Satellite, or space, vehicle.

2 State vector.

3 Static vent.

4 Simulation validation.

5 Shop visit.

6 Synthetic vision [S adds system].

7 Singular value.

8 Solenoid [-driven] valve.

9 Servo valve.

**Sv** Abb. for *sievert*.

**SVA** Security violation alert.

**SVAS** Shuttleworth Veteran Aeroplane Society (UK).

**SVC** 1 Service, service message.

2 Switched virtual circuit.

**SVCBL** Serviceable (ICAO).

**svce, SVCE** Service.

**SVCS** Secure-voice communications system.

**SVD** 1 System verification diagram (software).

- 2** Space Vehicles Directorate (USAF).
- 3** Singular-value decomposition.
- SVF** Schweizerische Vereinigung für Flugwissenschaften (Switzerland).
- SVFR** Special VFR.
- SVGA** Superior video-graphics array, 800×600 pixels.
- SVI** Smoke volatility index.
- SVIS** Synthetic vision information system[s].
- SVLR** Schweizerische Vereinigung für Luft- und Raumrecht (Switzerland).
- SVM** Support vector machine.
- SVMS** Space-vehicle motor simulator.
- SVN** Satellite vehicle number.
- SVO** Servo.
- SVP** **1** Static-vent plate.  
**2** Senior vice-president.
- SVR** **1** Slant visual range; attempt to give pilot on final approach idea of when he will acquire approach lighting, reported as either nominal contact height at which 150 m (500 ft) segment of one crossbar will become visible, or at top of shallow fog layer as minimum visible length of lighting.  
**2** Shop-visit rate.  
**3** Severe.  
**4** Service of external intelligence (R).
- SVRL** Several.
- SVRR** Service readiness review.
- SVS** **1** Synthetic-vision system.  
**2** Secure voice switch; E adds equipment.
- SVSG** Silicon vibrating-structure gyro.
- SV-stoff** Rocket propellant, typically 85% RFNA, 15% sulfuric acid (G).
- SVT** Servo throttle.
- SVU** Satellite voice unit.
- SVUOM** State institute for protection of materials (Czech Rep.).
- SVVT** VTOL (R).
- SVWT** Schweizerische Vereinigung für Weltraumtechnik (Switzerland).
- SW** **1** Single wheel (MLG).  
**2** Short-wave.  
**3** Surface wave.  
**4** Strategic Wing (USAF).  
**5** Space Wing (USAF).  
**6** Secretary of War (US).  
**7** Skin waviness.  
**8** Single-wedge (aerofoil).  
**9** Snow shower.  
**10** Software.  
**11** Switch [also often Sw].
- S/W** **1** Software.  
**2** Surface wind.
- Sw** Common for wing area.
- Swaarm** Smart weapon, anti-armour.
- Swafrap** Swedish air force rapid-reaction force.
- swageing** Joining by cold-squeezing one member around another, eg electrical or control-cable terminal or end-fitting on to end of cable [US, swaging].
- SWALAS** Shallow-water ASW localization and attack system.
- swallowed shock** Position of shockwave across airbreathing engine or other inlet inside duct, when mass flow is  $\rho V_A$  but internal pressure is low (normally equated with zero thrust). Can be feature of plain pitot inlet or any other type. Resumption of correct engine operation restores shock to normal position at inlet.
- swallowing capacity** Ability of inlet to handle large airflow, esp. over wide range of air densities and Mach numbers.
- swan-neck** Section of gas-turbine engine joining tandem axial compressors in which diameter is reduced.
- SWAP** **1** Severe-weather avoidance plan, or program (US).  
**2** System-worthiness analysis program (FAA 1966).  
**3** Society of World Aircargo Professionals [office, Darien, CT] (US).
- Swaps** Standing-wave acoustic parametric source.
- SWarF** Pronounced swarf, Senior Warfighter Forum [all combat commands, Pentagon Joint Staff; June 2004–] (US).
- Swarm** **1** Stabilized weapon and reconnaissance mount.  
**2** Small warfighter array of reconfigurable modules. See next.
- swarming** Warfighting concept in which dozens to hundreds of small networked warfighting units stealthily coalesce to attack a target and then disperse, ready for the next ‘pulse’.
- swashplate** Disc rigidly or pivotally mounted on shaft as drive mechanism for plungers or rams arranged parallel to shaft; when disc is normal to shaft, plunger stroke is zero, increasing to maximum at maximum \* obliquity. In hydraulic motor \* is driven, not driving, member.
- swashplate plane** The rotor control plane in a helicopter.
- SWAT** Special weapons and tactics team (US police forces).
- Swat, SWaT** **1** Slotted-waveguide technology.  
**2** Stolv weight-attack team.
- swath, swathe** The preferred spelling is the former, universal in the US. Among aerospace meanings are:  
**1** Area treated in each pass over field by AG-aircraft, usually without deliberate overlap.  
**2** Area covered in one pass over target by SAR, camera or similar sensor, invariably with overlap.
- sway** Lateral movement without rotation (simulator).
- sway braces, swaybraces** **1** See *crutches*.  
**2** Additional struts, not normally part of aircraft, required to brace particular large or winged store.
- sway space** Clear space left around any shock-mounted item.
- SWC** **1** Special Weapons Center (Kirtland AFB, NM; USAF).  
**2** Sky wave correction (Loran).  
**3** Solar wind composition.  
**4** Space Warfare Center; in March 2006 renamed SIDC.  
**5** Strategic Warfare Center.  
**6** Spot-wind chart.
- SWCL** Short-wavelength chemical laser.
- SWD** Surface-wave device.
- SWE** **1** Stress wave emission.  
**2** Software engineering.
- sweat cooling** See *transpiration cooling*.
- sweating, sweated joint** Joining two tinned members without additional solder or brazing metal.
- sweep** **1** Sweepback or sweepforward.  
**2** Total angular movement of aerial, eg surveillance radar, oscillating in azimuth (sector scan).  
**3** Total movement, normally expressed in linear

## sweepback

measure, of time-base spot scanning across CRT or other display.

**4** One complete cycle of VG wing.

**5** Angular deviation of locus of centroids of propeller blade sections from radial line tangential thereto at propeller axis projected on plane of rotation (BS).

**6** Offensive tactical mission against surface targets, normally targets of opportunity (WW2).

**7** To range over continuous (usually large) band of frequencies.

**8** To employ technical means to uncover covert surveillance devices (DoD).

**sweepback** Visibly obvious backwards inclination of aerofoil from root to tip so that leading edge meets relative wind obliquely. This is usually done to increase critical Mach number.

**sweepback angle** Angle between normal to longitudinal OX axis (axis of symmetry in most aircraft) and reference line on aerofoil, normally 0.25 (one-quarter) chord line or, less often, leading edge; both normal line and reference line lie in same plane, which is usually that containing centroids of aerofoil sections from root to tip (thus for canted verticals, \*\* measured in plane of each surface).

**sweepforward** Visibly obvious forwards inclination of aerofoil from root to tip so that leading edge meets relative wind obliquely; hence \* angle, or forward-sweep angle.

**sweeping** Modifying wing or tail to incorporate sweep (1).

**sweeping check** Confirming that cockpit flight controls [inceptors] move freely over full range of travel.

**sweep jamming** To emit narrow band of jamming able to sweep (7) back and forth over wide operating band of frequencies.

**sweep oscillator** Signal generator whose frequency is varied periodically by fixed amount at constant amplitude above and below central fixed frequency; also called Wobbulator (UK), sweep generator (US) or scanning generator.

**sweep-tip blade** Helicopter rotor (main or tail) blade whose locus of centroids is radial from root to near tip and then sharply inclines back.

**sweet spot** Condition in which aircraft can maintain precise altitude, heading and speed without pilot input or autopilot.

**swept** Incorporating sweepback (never used of forward sweep).

**Swerve** Sandia winged energetic re-entry vehicle experiment.

**SW/FR** Slow write, fast read.

**SWG** 1 Standard wire gauge (UK); standard range of sheet thicknesses.

2 Square waffle grid (space structures).

**Swift** 1 Standoff all-weather radar for inflight terrain surveillance.

2 Specification of working position in future ATC.

**Swift 64** Pioneer mobile connectivity service enabling mobile phones to be used by airline passengers [2006–].

**SWIM, Swim** 1 System-wide integrity management (USAF).

2 System-wide information management (ATC1).

**Swims** Shallow-water influence minesweeping system.

**swing** 1 Involuntary and often uncontrollable divergent excursion from desired track of tailwheel-type aeroplane running on ground.

2 To turn propeller by hand to start piston engine; if not

## switching system

engaged in starting engine, or with turboprop, term is to hand-turn or pull-through.

**3** To calibrate compass deviation by recording its value at regular intervals, usually 15°, during 360° rotation of aircraft on compass base.

**4** Distortion of radio range; also called night effect.

**5** Sudden yaw of aeroplane consequent upon loss of power of engine mounted away from centreline.

**swing-by** Close pass of planet or other celestial body by spacecraft on Grand Tour.

**swing force** Aircraft or complete combat unit can fly air/air and air/ground in same mission.

**swinging base** Compass base; also called deviation clock.

**swinging compass** Magnetic compass used as standard for calibrating that in aircraft.

**swing-piston engine** Various topological families of piston engine in which two, three or more pistons oscillate around toroidal cylinder alternately compressing mixture between them, being driven by firing strokes or, in some, acting as pumps. Most do not have mechanical drive but supply gas, eg to drive turbine.

**swing-role** Often interpreted differently from swing force in that aircraft and crews can fly offensive missions or (on different occasions) defensive missions.

**swing-wing aircraft** Aeroplane with variable sweep (1); also called VG aircraft (colloq.).

**Swinter** Study of women in non-traditional environments and roles, which included military pilot training (Canada).

**SWIP** 1 Super weight-improvement program (US).

2 Systems weapon improvement program.

**Swipe** Simulated weapon-impact predicting equipment.

**SWIR** Short-wave IR.

**swirl** 1 Gross rotation of flow about axis approximately aligned with flow direction, eg in propeller slipstream, upstream or downstream of turbine, downstream of gas turbine fuel nozzle, or induced by large drive fan in low-speed tunnel (removed by straighteners).

2 Rotation of air in whirling-arm room or other non-evacuated chamber containing high-speed rotating object.

**swirl vanes** Fixed aerofoils for imparting swirl to a fluid flow. At inwards-radial entry to a centrifugal compressor they are usually miniature wings parallel to axis of rotation. In turbine-disc cooling air and upstream of fuel burners they are radial.

**SWIS** 1 Stall-warning and identification system.

2 Satellite weather information system.

**swishtail** See *fishtail*.

**SWIT** Software integration and test.

**switch** A specialized aerospace meaning is the rejection of the target by a missile seeker, which instead locks on to a decoy; this may be followed by response.

**switchblade** An oblique flying wing aircraft [colloq.].

**switchery** Complete array of switches and other inceptors for on-board systems other than flight controls (colloq.).

**switches off** Traditional verbal command in hand-starting piston engine to ensure that ignition is inoperative at start (actually switches normally closed, short-circuiting HT).

**switches on** Seldom used; normal call is “contact”.

**switch-in deflector** For jet lift, shuts off normal jet nozzle and diverts flow through rotatable side cascade (1957-70).

**switching system** Automatic switching in large network, eg military communications, airline reservations or nationwide computer link; normally electro-mechanical pre-1960

## switchology

and electronic later, allowing for on-line, real-time messages, data transfer, storage or display.

**switchology** Fluency in human interaction with operating systems (colloq.).

**swivel** Pivoted attachment for windsock.

**swivelling engine** Entire engine, or liquid-rocket thrust chamber, that is gimbal-mounted or pivoted so that thrust axes can rotate relative to vehicle.

**Swizz** SWIS (colloq.).

**SWL** 1 Strategic-weapon launcher.

2 Single-wheel loading.

**SWLAN** Secure wireless local area network.

**SWMCM** Shallow-water mine countermeasures.

**SWO** Station Warrant Officer (RAF).

**Sword** 1 Stand-off all-weather observation and reconnaissance drone.

2 System for all-weather observation by radar on drone.

3 Short-range missile defence with optimised radar distribution (US).

**SWOS** Synoptic weather observing (or observation) station.

**SWP** Stub-wing pod.

**SWPA** South-West Pacific Area (painted on many captured Japanese aircraft 1944-45).

**SWPC** Small War Plants Corporation (US, 1942-50).

**SWPI** Confusingly wing leading-edge sweep angle.

**SWR** 1 Standing wave ratio.

2 Surface-wave radar.

**SWS** 1 Standard warning system (CAA).

2 Strategic Weapons School.

**SWSL** Supplemental Weather Service location.

**SWTDL** Surface-wave tapped delay line.

**SWTL** Surface-wave transmission line.

**SWTRR** Software test readiness review.

**SWU** Switching unit.

**SWY** Stopway.

**SX** Sheet explosive.

**S<sub>x</sub>** Simplex.

**SXGA** Super extra graphics array, 1,280×1,024 pixels.

**SXT, Sxt** Sextant.

**SXTF** Satellite X-ray test facility.

**SYC** Statistical yield control.

**SYCAF** Système de Couplage Automatique sur Faisceau (ILS coupler, F).

**Sycep** Syndicat des Industries de Composants Electroniques Passifs (F).

**Syco** Symbiotic communications (USAF/DARPA).

**Syers, SYERS** Senior Year electro-optical relay [or reconnaissance] system [P<sup>3</sup> adds preplanned product-improvement program].

**Sypong** System go/no-go.

**sylphon** Stack of aneroid capsules; sometimes called \* tube.

**symbology** Symbols conveying meanings to human beings, the technology of their design and production and their incorporation in systems and displays; most important are alphanumerics, in various national languages, followed by more than 9,000 standard conventional symbols so far available for various technologies. About 50 different forms and variations have been agreed for HUDs, Hudsights and other weapon-aiming systems, eg simple cross or cross/ring reticles, range rings that unwind as range closes, and various aiming lines, wing bars and arrow or triangular markers.

## sync pulse/signal

**symmetric aerofoil** Wing profile whose mean line is straight.

**symmetric double-wedge** Wing profile in form of sharp-edged parallelogram, used mainly for supersonic missiles whose subsonic qualities are unimportant.

**symmetric flight** Both left/right wings equally loaded.

**symmetric flutter** Left/right symmetry in amplitude and direction.

**symmetric immersion** Both flying-boat tip floats in water equally (rare).

**symmetric instrumentation** Installation of experimental sensing equipment (such as pressure transducers) over the entire surface of aircraft such that for each sensing head on left half there is an exactly corresponding unit on right.

**symmetric principal axis** See *principal axis of symmetry*.

**symmetric pull-out** Pull-out from dive with wings level.

**symmetric stall** Stall with wings level, longitudinal axis rotating within plane of symmetry.

**symmetry check** Measurements to corresponding L/R points from centreline.

**Syname** Syndicat National de la Mesure Electrique et Electronique (F).

**synchro** Generalized term for bipolar a.c. synchronous systems in which a master unit or sensor commands identical response (eg angular position) by one or more instruments or other receivers. An alternative to voltage signalling by potentiometer and digital signalling by encoder.

**synchronization** 1 Commanding all aircraft engines to rotate at same speed.

2 Commanding automatic guns to fire at cyclic rate forming exact fraction of multiple of blade-passing frequency of propeller; not same as interrupter.

3 Process of adjusting timing (epoch), frequency and phase of spread-spectrum receiver's PN correlation to match those of received signal.

4 Process of preadjusting outputs of two or more control (eg FCS) channels to reduce dead-zone if operated together or switchover transient if operated separately.

**synchronized aerobatics** Performed by two [possibly more] sections of same aerobatic team; see *synchro pair*.

**synchronous corridor** Equatorial belt within which synchronous satellite must remain (normally describing small vertical figure-eights).

**synchronous orbit** See *geostationary orbit*.

**synchronous satellite** One whose rotation is synchronized with that of Earth; also called geostationary.

**synchronous sighting** See *tachymetric aiming*.

**synchro pair** Two aircraft which perform synchronized manoeuvres to entertain crowd while rest of team reposition.

**synchrophasing** Commanding all propellers of multi-engine aircraft to rotate in step with propeller of master engine, with all blades instantaneously at same angular positions.

**synchropter** Helicopter lifted by two or more rotors whose blades intermesh (suggest colloq.).

**synchroscope** Instrument for giving visual indication of synchronization, or lack of it, between two or more frequencies or speeds.

**syncom** Synchronous communications (satellite).

**sync pulse/signal** Sync is generalized term for synchronization between TV camera and receiver, or between any raster-scan sensor and display or output, hence \* is integral

**syncrude**

part of transmitted waveform to maintain lock on synchronization.

**syncrude** Synthetic crude petroleum; starting point for various synthesized petroleum-type hydrocarbons.

**synergic ascent** Following synergic curve.

**synergic curve** Trajectory for departing spacecraft for minimum energy requirement, ie lowest propellant consumption for given position and velocity; on Earth initially vertical to leave denser atmosphere quickly and then curving to take advantage of Earth's rotation.

**synergism** Favourable interrelationship between variables such that overall benefit of a change is greater than sum of individual gains; eg scaling down aircraft size has synergistic effects on structure weight, drag, engine size, fuel consumption and fuel mass for given range.

**Synjet** Non-petroleum-based fuel produced to current (or broadened) Jet A specification.

**synodic period** Interval of time between identical positions of celestial body in solar system measured with respect to Sun.

**synodic satellite** Hypothetical Earth satellite located on Earth/Moon axis at 0.84 lunar distance from Earth.

**SYNOP** Special meteorological report.

**synoptic chart** Standardized map of weather, showing isobars, fronts and weather symbols, and covering large area for one particular time.

**synoptic meteorology** Collection of meteorological information covering large area at one time (as near as possible to present), esp. with view to forecasting.

**syntactic foam** Composite material consisting predominantly of premanufactured hollow microspheres embedded in resin; for radomes usually 30-140  $\mu$  spheres with 1.5  $\mu$  wall, in epoxy or polyimide matrix.

**synthetic-aperture radar** Various methods of summing the returns from many locations [eg, at TAS 600 kt, spacing 1 kHz gives returns from 1 ft apart, so a block of 50 gives definition equal to 50-ft antenna].

**synthetic lubricants** Post-1948 families of turbine oils originally based on esters of sebacic acid, especially dioctyl sebacate; later with complex thickeners added.

**synthetic resins** Too numerous to outline, but mainly polymers or copolymers and often thermosetting; used as bases for many materials (eg plastics and paints) and as adhesives, including nearly all those for aerospace bonding and for fibre-reinforced composites.

**synthetic rubber** Vast family of rubber-like materials originally (1917) based on isoprene and today nearly all based on copolymers of butadiene; includes many solid propellants.

**synthetic training** All training that simulates, eg with simple Link, mimic boards, system rigs, air-combat simulators and, esp., flight simulators. Also generally held to include actual flight training when something, eg absence of external vision, is simulated.

**SyOP** Security operating procedure[s].

**Syrc** Système de restitution de combat aérien (F).

**syrup** Generic term for accumulation of spilled beverages, water [and condensate], toilet and lavatory fluids and dust.

**sys** System, or system identifier.

**Syscat-B** System Category B (FAA format).

**Sysci** System configuration item.

**Sysco** System co-ordination (ATC).

**Sysop** Systems operator.

**SYSPO** Systems Command Program Office[r] (USAF).

**system** 1 Generalized term for any dynamically functioning organization of man-made devices.

2 Portion of vehicle, eg aircraft, missile, etc, forming integral network of related and inter-controlled devices to accomplish set of specific related functions.

3 Composite of equipment, skills and techniques capable of performing and/or supporting operational role (USAF).

4 Often used to mean (1) plus supporting equipment, documents, training devices and all other products and services, as in weapon \*.

5 Incorrectly used to mean mere assemblage of mechanical parts, eg engine LP \*.

**system concept** Integrated approach to design, procurement or operation of system in sense [4].

**System Design Review** The PSD leads to Requirements Analysis which the SDR supports in parallel by providing a top-level review of all relevant hardware to ensure that Preliminary Software and Hardware design can proceed with confidence.

**system discharge indicator, SDI** Yellow disc or blow-out plug in aircraft skin to indicate fire-extinguishing system discharged for reason other than fire or overheat warning.

**Système International** In full, SI d'Unités, system of unified units of measurement adopted by all principal industrialized countries since 1960 and gradually being implemented; seven base units, metre (m), kilogram(me) (kg), second (s), ampere (A), kelvin (K), candela (cd) and mole (mol).

**System Requirements Review** A top-level multidisciplinary review to check the requirements against the original concept objective. It makes possible the Preliminary System Design.

**system[s] engineering** Not briefly definable, but extremely broad discipline akin to operations research whose main objective is to apply broad overview of entire system [4] in order to advise customer and/or management on objectives and possibilities and refine and integrate all subsystems before start of hardware design.

**System Safety Analysis** The final stage in perfecting a system prior to certification. The SSA studies the results from the Functional Hazard Analysis and the answers proposed by the Preliminary SSA, and in a rigorous manner confirms that the proposed system does meet certification requirements.

**system source selection** Selection by government of industrial source, known as system prime.

**system turnover** Formal acceptance by customer of responsibility for system [4].

**Systo** Systems Command program officer (USAF).

**Systrid** Powerful 3-D CAD technique (Battelle).

**syzygy** Point on orbit, esp. that of Moon, at which body is in conjunction or opposition.

**SZH** Schweizerische Zentrale für Handelsförderung (Switzerland).

# T

- T**
- 1 Temperature, esp. absolute.
  - 2 Tesla[s], nT being more common.
  - 3 Prefix tera,  $10^{12}$ .
  - 4 Aircraft designation, transport (USA 1919–24), torpedo [carrier] (USN 1922–35), transport (USN 1927–30), trainer (RAF, RN, since 1941, USN, USAF, since 1948).
  - 5 Modified mission, suffix, two-seat trainer version (USN 1946–62), prefix, trainer version (USAAF, USAF, 1943 to date).
  - 6 Time of day, or in countdown, or of a sample in gust calculation. In US increasingly used in place of t(1).
  - 7 Transmitting, or transmits only.
  - 8 Thrust (F preferred); helicopter main-rotor thrust vector.
  - 9 Torque.
  - 10 Period.
  - 11 Kinetic energy.
  - 12 Aircraft has transponder with 64-code but no altitude encoding.
  - 13 Short ton[s], usage usually confined to NW yield.
  - 14 Navaid terminal frequency.
  - 15 Designation suffix, turbocharged [piston engine].
  - 16 Designation prefix: turboprop.
  - 17 Tropical air mass.
  - 18 Class: light autogyro (BCARs).
  - 19 Twin-wheel landing gear[s].
  - 20 Terrain-clearance altitude.
  - 21 Airport terminal, followed by number.
  - 22 Tracer.
  - 23 Radar-target strength.
  - 24 Electrochemical transport number (also t).
  - 25 Threshold lights, lighting.
  - 26 See *basic T*.
  - 27 True [headings].
  - 28 Designation suffix: fully heat-treated.
  - 29 A small T-shaped hangar for one [usually small private] aircraft.
  - 30 Training, also (T).
  - t**
    - 1 Time, especially elapsed time in seconds.
    - 2 Tonne[s].
    - 3 Thickness, including maximum of aerofoil.
    - 4 Triode.
    - 5 Turns.
    - 6 One revolution (F), as in t/min = rpm.
    - 7 Often, non-absolute temperature.
    - 8 Threads, eg in tpi (per inch).
    - 9 Trend landing forecast.
    - 10 As subscript, total pressure.
    - 11 Main landing-gear track.

**T<sub>0</sub>**

    - 1 Free-stream total temperature.
    - 2 Absolute temperature.

**°T**

    - True heading.

**T+**

    - Severe thunderstorm.

**†**

    - Non-dimensional time [in structural analysis].

**T<sub>1</sub>**

    - Compressor or fan inlet total temperature.

**T<sup>2</sup>**

    - Total time.

**T<sup>2A</sup>**

    - Total-terrain avionics.

**T<sup>2CAS</sup>**

    - 1 Taws-TCAS; the box still fits a single LRU.
    - 2 Traffic and terrain collision-avoidance system.

**T<sup>3</sup>**

    - Tailplane trimming tank.

**T<sub>3</sub>**

    - HP turbine inlet temperature (can have other meanings).

**T<sup>3CAS</sup>, T<sub>3CAS</sub>**

    - Comprised of TCAS, Class A TAWS and Mode S transponder.

**T<sub>4.5</sub>**

    - Common US usage for power-turbine inlet temperature.

**T<sub>6</sub> or T<sub>7</sub>**

    - Total turbine exit (outlet) temperature.

**T-aerial**

    - Aerial [antenna] comprising a wire from the top of the fuselage or mast to the tip of the fin, with a quasi-vertical connection from near mid-point to the radio installation.

**T-bridge**

    - Telescopic, usually means apron-drive.

**T-channel**

    - TDMA channel for air/ground data messages too long for R-channel (GPS).

**T-forces**

    - Specialized, often inter-Service, military units assigned a mission to obtain and investigate specific enemy equipment items or facilities (1944–, OSS, later CIA).

**T-hangar**

    - Wide front for wing, narrow rear for tail, usually arranged in two rows back-to-back to make full use of ground footprint [usually 30 × 24 ft or 40 × 30 ft].

**T-layer**

    - Notional top of the ionosphere.

**T-rail**

    - Standard longitudinal floor rail tailored to receive pax seats, cargo tie-down rings or stretcher racking.

**T-stick**

    - Thermally sensitive indicator inserted into airline meal, changing colour at 71°C.

**T-section**

    - Shaped like T or inverted T in cross-section.

**T-Stoff**

    - HTP plus a little oxyquinoline or phosphate stabilizer (G).

**T-tail**

    - Aeroplane tail with horizontal surface mounted on top of fin (vertical stabilizer).

**T-time**

    - Reference time in countdown, often that for start of engine ignition.

**TA**

    - 1 Trunnion angle (INS).
    - 2 Telescoped ammunition.
    - 3 Twin-aisle (transport).
    - 4 Target alert, or acquisition.
    - 5 Terrain avoidance.
    - 6 Tuition assistance.
    - 7 Transition altitude (CAA).
    - 8 True altitude.
    - 9 Trainer, aircooled (USA 1919–24).
    - 10 Ambient temperature.
    - 11 Terrain-clearance altitude.
    - 12 Traffic advisory.
    - 13 Technical assessment.
    - 14 Terminal automation.
    - 15 Towed array.
    - 16 Technischen Ausschuss (DAeC).

**Ta**

    - Tantalum.

**T<sub>a</sub>**

    - 1 Actual temperature.
    - 2 Radar antenna noise.
    - 3 Tropical Atlantic.

**t<sub>a</sub>**

    - Action time.

**T/A**

    - Helicopter rotor disk [disc] loading.

**TAA** 1 Transportation Association of America [office, Washington, DC].  
 2 Technical Assistance Agreement.  
 3 Target aspect angle.  
 4 Transatmospheric aircraft.

**TAAATS** The Australian advanced air-traffic system.

**TAAF** Test, analyse and fix.

**TAAM** 1 Terminal-area altitude monitoring.  
 2 Tactical (or Tomahawk) airfield attack missile.  
 3 Total airspace and airport modeller.

**TAAP** Tethered-aerostat antenna program.

**TAATD** Target acquisition advanced technology demonstration.

**TAB** 1 Technical Assistance Bureau (ICAO).  
 2 Tape-automated bonding.

**Tab** Tabulation and insertion program.

**tab** 1 Hinged rear portion of flight-control surface used for trimming (trim \*), to reduce hinge moment and increase control power (servo \*, balance \*, spring \* etc) or to increase hinge moment and effectiveness of powered surface (anti-balance \*, flap \*).  
 2 Rarely, auxiliary aerofoil hinged to trailing edge of flight-control surface, usually of servo type.  
 3 Small hinged spoilers on inside of propelling nozzle or rocket expansion nozzle for thrust vectoring or noise reduction.  
 4 Hinged panels along lower edges of side flaps (walls) of ejector-lift duct, deflected to give maximum augmentation.  
 5 Abb. tabulator, alphanumeric display.

**tabbed flap** Flap, usually Fowler, whose trailing edge is hinged (without slot) and at maximum landing setting is pulled down by linkage to much greater angle than main surface.

**tablock** Flat washer with rectangular tab bent up to lock nut (sometimes capital T).

**TABMS** Tactical air battle management system.

**Tabs** Telephone automated [also total avionics] briefing system, or service.

**tabulated altitude** Altitude of celestial body read from a table.

**Tabun** Lethal nerve gas (G, 1937; in US called GA).

**TABV** Theatre airbase vulnerability.

**Tab-Vee** Alternative form of TABV, common name for NATO hardened shelter for aircraft.

**TAC** 1 Tactical Air Command (USAF, now part of Air Combat Command).  
 2 Trim augmentation computer.  
 3 Turbo-alternator compressor (Brayton cycle).  
 4 Thermosetting asbestos composite.  
 5 Terminal-area chart.  
 6 Test-access control.  
 7 Thrust-asymmetry compensation.  
 8 Total accumulated cycles (especially USAF).  
 9 True-airspeed computer.  
 10 Transportation Association of Canada [office, Ottawa, PQ].  
 11 Tacan.

**Tac** Usually tactical.

**Tacamo** Take charge and move out (USN airborne v.l.f. strategic communications system, mainly NCA to SSBNs).

**Tacan** Tactical air navigation; UHF R-theta-type navaid [principally military] giving bearing/distance of

aircraft from an interrogated ground station.

**Tacbe** Lightweight tactical beacon equipment; 2-channel ground/air voice (Burndept).

**TACC** 1 Tactical Air Control Centre (RAF).  
 2 Theater Air Control Center (USAF TAC).  
 3 Tactical air combat cycle.  
 4 Tanker Airlift Command, or Control, Center (USAF).

**Taccar** Time-average clutter coherent airborne radar.

**Taccims** Theatre automated command and control information management system.

**TACCO, Tacco** Tactical co-ordinator; flight-crew member of ASW aircraft responsible for overall mission management during search or attack operations.

**TACCS** Tactical air command and control specialist.

**Tacdew** Tactical combat direction and EW.

**TACDS** Threat-adaptive countermeasures dispensing, or dispenser, system.

**TA/CE** Technical analysis and cost estimate.

**Taces** Tactical communications exploitation system.

**Taceval** Tactical evaluation, hardware development, test and training effort on production air weapon systems (USAF, RAF).

**Tacfax** Tactical digital facsimile.

**TACG** Tactical air control group (USAF).

**TacGA** Tactical ground-to-air.

**tach** Tachometer, pronounced tack, as are following entries.

**tachogenerator, tachometer generator** Tachometer of electric synchronous-motor type with shaft-driven generator feeding AC to one or more synchronized displays.

**tachometer** Instrument for indicating speed of rotating shaft, in rpm and/or as percentage of normal maximum.

**tachometer cable** Rotary drive of mechanical tachometer, two spiral layers of steel wire.

**tachometric** Tachymetric.

**tachymetric aiming** Aiming of gunfire, bomb or other weapon by continuously maintaining sightline on target, thus determining speed relative to surface target and in some cases track through target.

**TACIU** Test access control interface unit.

**Tacjam** Tactical jamming of UHF/VHF communications.

**tack** Degree of stickiness in prepreg resin.

**tack coat** Very thin coat of finish, usually dope, which precedes the full-density wet coat.

**tack rag** Soft lint-free rag slightly damp with thinner.

**tack weld** Small dab of weld metal making local link to hold parts in correct location (but capable of easy rupture if in error) while main weld is made.

**TACL** Tactical all-weather collection at long range.

**TACLS, Tacls** Tactical airborne combat laser system[s] (USAF).

**Tacmet** Tactical countermeasures evaluation trainer.

**TACMS** Tactical missile system (USA).

**Tacnav** Tactical navigator, or navigation; mod or /mod adds modification.

**Tacom** Tactical-area communications.

**Tacon** Tactical control.

**Taconis oscillation** Pulsating (c 1 Hz) resonance in cryogenic refrigerant.

**Tacor** Threat-assessment and control receiver (ECM).

**Tacos** Tactical airborne countermeasures or strike.

**TACP** Theatre [or tactical] air control party; -M adds modernization; O officers (NATO, USAF).

**TacR** Tactical reconnaissance.

**TACS** 1 Tactical, or theater, air control system (USAF).

2 Less often, tactical air control squadron.

3 Thruster, attitude-control system.

**Tacsatcom** Tactical satellite communications (DoD).

**TACSI, Taci** TACS (1) improvements.

**Tacsim** Tactical simulation.

**TACT** 1 Transonic aircraft technology (NASA).

2 Tactical aircrew co-ordination trainer.

**tact** Tactical air-traffic flow management.

**Tactas** Tactical towed-array sonar.

**Tactass** Tactical towed acoustic-sensor system.

**Tactec** Totally advanced communications technology (RCA).

**tactical** Generalized term meaning concerned with warfare against directly opposing forces, usually involving air, land and sea forces together, and in limited theatre of operations.

**tactical aeromedical evacuation** From combat zone to outside it, or between points in combat zone.

**tactical air combat cycle** Standard fighter mission assumed in determining engine life.

**tactical air command center** Theatre HQ of USMC air operations.

**tactical air control centre** Principal centre, shore or ship-based, from which all tactical air is controlled.

**tactical air co-ordinator** Directs, from aircraft, air close support of surface forces.

**tactical aircraft shelter** Normally protects against conventional attack but may be extended to offer protection against NW blast, radiation and CBW.

**tactical air officer (afloat)** Responsible under amphibious task-force commander for all supporting air operations until control is passed ashore.

**tactical bomb line** See *bomb line*.

**tactical code** Two-digit number in various colours on combat aircraft (R, CIS).

**tactical finish** Camouflaged: can be all one colour.

**tactical input segment** Subsystem for receiving EO and IR images in real time.

**tactical intervention vehicle** Designed to rescue hostages from parked aircraft.

**tactical laser weapon system** An array of mirrors aim powerful laser simultaneously at multiple munitions.

**tactical targeting network technologies** Creates networks between airborne platforms passing data, video and voice, at  $\leq 2$  Mbit/s over distances  $\leq 100$  nm, 185.3 km (USAF).

**Tactifs** Tactical integrated flight system.

**tactile faceplate** Electronic display screen sensitive to fingertip touch for reprogramming, selecting from menu, changing scale or operating mode, or adjusting any variable.

**tactile situational awareness system** A high-tech aircrew vest.

**Tacts** Tactical aircrew combat training system (ACMI).

**TAD** 1 Turbo-alternator drive.

2 Target assembly data.

3 Technology availability date (or data).

4 Towed aerial decoy.

5 Theater, or tactical, air defense.

6 Trim-aid device.

7 Target acquisition and designation.

8 Terrain-awareness display.

**TADC** Tactical air direction center.

**Tadds** Target alert data display sets; part of FAAR.

**tadec, TADEC** Totally automatic digital engine control [piston engines].

**Tadil** 1 Tactical digital intelligence, or information, link (C adds command, J adds joint [service]).

2 Tactical aircraft digital information link.

**TADIRCM** Tactical aircraft directional, or directable, IRCM.

**TADIXS-B** Tactical data information exchange system – broadcast.

**Tadjet** Transport, airdrop, jettison.

**TADMS** TR-1 Asars-2 data manipulation system.

**Tadoc** Transportable, or tactical, air-defense operations center, possible confusion with Tradoc.

**tadpole** Track of moving target on radar display presented with comet-like tail to show direction of travel. Most air-defence radars can select tadpoles on or off.

**tadpole profile** Aerodynamic profile with conventional nose followed by single-surface construction downstream (eg fin of A-4 followed by single-skin rudder).

**TADS, Tads** 1 Tactical air defense sight (US).

2 Towed angular deception system.

3 Target acquisition and designation sight, [one report says "system"] /PNVS adds pilot's night-vision system.

4 Target airborne data system.

5 Tactical laser and designation system.

6 Triple air-data system.

7 Type Acceptance Data Sheet (PFA).

**TAE** Thrust-augmented entomopter.

**TAEL** Turning-area edge light[s].

**TAEM** Terminal-area energy management.

**TAERS** Tactical aircrew eye respiratory system.

**TAF** 1 Tactical air force.

2 Terminal area , or aerodrome, forecast [international meteorological figure-code].

3 Thermal acoustic fatigue.

4 Thermo-acoustic facility.

**TAFI** Turn-around fault isolation.

**TAFIIS** TAF (1) integrated information system.

**Tafim** Technical architecture framework for information management.

**TAFS** Airfield meteorological forecast.

**Tafseg** Tactical air force systems engineering group.

**TAG** 1 Telegraphist/air gunner (Royal Navy, WW2).

2 Thrust-alleviated gyroscope.

3 Tactical Airlift Group (USAF).

4 Telescoped-ammunition gun.

5 Transport Air Group (USMC).

6 Tailored air group.

7 Target-adaptive guidance.

8 Towed acoustic generator.

9 Technical Advisory Group (USAF).

10 Test analysis guide.

**tag** Small battery-powered transceiver designed to provide a communications link on ground between an airborne radar and its associated receiving interrogator, switched by the incoming signal (USAF).

**Taggart** Sometimes rendered Taggent, a tagging agent incorporated in a strike weapon and released on detonation for detecting and tracking biological aerosols.

## tagging

**tagging** Attaching unmissable warning notice during maintenance to point out, e.g., that item has been switched off or disabled.

**Tags** Technology for automated generation of systems.  
**Tagwes** Target weapons effects simulation, or simulator, or system[s].

**TAH** Transfer and hold.

**TA/H** Twin altitude/height.

**TAI** 1 Total active inventory.

2 Thermal anti-icing.

**TAIA** Taiwan Aerospace Industry Association [office, Taipei] (Taiwan).

**TAIC** Transport Accident Investigation Commission (NZ).

**tail** 1 Rear part of aircraft, where applicable.

2 Assembly of aerofoils whose main purpose is stability and control, normally located at rear of aerodyne or airship.

3 Trailing luminous area behind blip of moving target.

4 Normal verb meaning in air-intercept shadowing from astern.

**tail arm** The moment arm of a horizontal or vertical (or inclined) tail surface. There are several definitions:

1 The distance parallel to the longitudinal axis between the aircraft centre of gravity and a nominated point on the specified tail surface.

2 The distance between the c.g. and the centroid of the nominated tail surface.

3 Becoming the usual meaning, the distance parallel to the longitudinal axis between the intersection of the wing  $\frac{1}{4}$ -chord line and the spanwise location of the mean aerodynamic chord and the corresponding  $\frac{1}{4}$ -chord point on the nominated tail surface.

**tail bearing** The rearmost bearing of a gas-turbine main-shaft [suggest not common use].

**tail boom** Tubular cantilever(s) carrying tail (2) attached either above short fuselage nacelle or as L/R pair to wings.

**tail bumper** Projecting or reinforced structure under tail designed to withstand impacts and scraping on runway.

**tail chase, tail chasing** One aircraft closely following another, elementary form of air-combat training [often one word].

**tail chute** See *tail parachute*.

**tailcone** Conical fairing of rear of body, esp. downstream of turbine disc in jetpipe.

**tail damping power factor** Numerically the product of TDR [see next] and URVC.

**tail damping ratio** A [suggested limited] measure of anti-spin quality based on side area under tailplane multiplied by distance to c.g.

**tail-down angle** In an aircraft fitted with nosewheel landing gear, the angle between the ground line and the plane defined by the underside of the rearmost main landing wheels and the underside at the tail; thus, the angle of the longitudinal axis in a tailscape test.

**tail drag** Restraining mass free to slide on ground to which moored airship stern is attached.

**taildragger** Aircraft with tailwheel or tailskid (colloq.).

**tailed delta** Aircraft with delta wing and horizontal tail.

**tail efficiency factor** A multiplicator of elevator control power equal to  $\alpha\delta_F T_{ch}$  (angle of attack, flap angle, thrust coefficient and ground effect), symbol  $\eta$ .

**tail-end Charlie** 1 Formation of aircraft in single line, each behind the other.

## tailplane tank

2 Last aircraft in such a line.

3 Rear gunner in tail of large aircraft (1935–50).

**taileron** Single-piece horizontal tail surface, one of two forming tailplane whose left/right halves can operate in unison (as tailplane commanding pitch) or differentially (as ailerons commanding roll). Term preferable to ailelevator or rolling tailplane. Elevon differs in that it is hinged to wing. US term stabilator is ambiguous and can mean \* or slab tailplane.

**taillets** Small fixed fins on underside of tailplane near each tip.

**tailfeathers** Free-floating flaps forming periphery of supersonic airbreathing propulsive nozzle, usually as outer boundary of large secondary nozzle. These take up slipstreaming angular positions aligned with streamlines.

**tail fin** Fixed stabilizing fin at rear, ‘tail’ normally being redundant.

**tail-first** Aerodyne configuration in which the only auxiliary horizontal surface is ahead of the wing, commonly called a foreplane or canard.

**tail float** Float supporting tail of float seaplane (now arch.).

**tail group** Complete tail (2), considered as design task or as element of total aircraft mass.

**tail guy** Secures tail of moored airship, often to tail drag.

**tailheaviness** Condition in which aircraft rotates nose-up unless prevented.

**tailhook** 1 CTOL by carrier aircraft.

2 Naval pilot (colloq.).

**tail kit** Prepacked item[s] to convert iron bomb into precision air/ground missile.

**tail length** Tailplane moment arm.

**tailless aircraft** Normally applied to aeroplanes and gliders only and usually meaning that there is no separate horizontal stabilizing or control surface, though there may be a vertical tail (2). In extreme case there is no tail surface, and (esp. if fuselage vestigial or absent) this is more often called flying-wing aircraft.

**tail load** Vertical up or down thrust acting on tailplane.

**tail logo** Bold logo of operator displayed on tail; hence \*\* light, also valuable as anti-collision beacon.

**tail number** See *serial* (2).

**Tailored Air Group** An embarked airpower package assembled from suitably configured air assets from any or all of the armed forces to suit a specific operation or campaign (UK).

**tailored fuel** Synthesized to meet specific operational specification.

**tail parachute** Parachute attached to tail, normally for anti-spin or anti-superstall purpose. Not used as braking parachute.

**tailpipe** Exhaust pipe of turboprop or turboshaft; according to some, piston engine exhaust pipe downstream of collector or manifold.

**tailplane** 1 More or less horizontal aerofoil at tail of aerodyne (invariably fixed-wing) providing stability in pitch; fixed or adjustable only for trim, and carrying elevators (US = stabilizer).

2 Aerofoil pivoted at tail about horizontal axis and driven directly by pilot of fixed-wing aerodyne or rotorcraft as primary flight control in pitch in translational flight; forms complete surface without separate elevators (US = stabilizer).

**tailplane tank** Fuel tank, invariably integral, in hori-

## tail rotor

zontal tail, to increase system capacity and, esp., to control longitudinal trim without drag.

**tail rotor** Helicopter anti-torque rotor, rotating at tail about more or less horizontal axis. Not used for rear tandem rotor.

**tailscape** See *tailstrike*.

**tail setting angle** The acute angle between chord lines of wing and tailplane (1).

**tailsitter** VTOL aerodyne whose fuselage is approximately perpendicular at takeoff, in hovering mode and at landing, today preferably called Vtol.

**tailskid** Projection, usually a sprung lever with end-shoe, supporting tail of aerodyne on ground, esp. one whose c.g. is well aft of main landing gear.

**tailskid shoe** Replaceable pad on end of tailskid which slides on ground.

**tailslide** Transient flight condition of fixed-wing aerodyne in which relative wind is from astern, eg in stall from near-vertical climbing attitude.

**tailspin** Spin (arch.).

**tailstander** *Tailsitter*.

**tailstrike** Scraping rear fuselage on runway on rotation. Hence, \* indicator, frangible foil which causes a bright flash on EICAS.

**tailstrike protection** Any of several systems which prevent a tailstrike, usually by limiting authority of horizontal tail.

**tail surface** Any aerofoil forming part of tail (2).

**tail turret** Defensive gun turret, usually power-driven, forming the tail end of the fuselage, today becoming rare.

**tail undercarriage** Rearmost unit of tailwheel-type landing gear (rare, suggest arch.).

**tail unit** Complete tail (2) of horizontal, vertical and/or canted surfaces, often including ventral fins or strakes. Also called empennage.

**tail-up procedure** Final closure of production at end of need for spares or support.

**tail view** Tail-on view showing object from directly astern; not normal aspect for layout drawing.

**tail volume** See *V*.

**tailwagging** 1 Lateral flexure of fuselage.

2 Flat turns, esp. to steepen glide.

**tail warning radar** Aft-facing radar, usually of active type, intended to detect other aircraft (and possibly SAMs) intercepting from behind.

**tailwheel** 1 Rear wheel of \* type landing gear, supporting tail on ground.

2 Auxiliary wheel under tail of aircraft with nosewheel-type landing gear (eg Albemarle); fitted in place of tail bumper.

**tailwheel landing gear** Landing gear comprising left/right main units ahead of c.g. and tailwheel at rear.

**tailwind** Wind blowing approximately from astern of aircraft and thus increasing groundspeed.

**TAIMS** Three-axis inertial measurement system.

**TAINS, Tains** Tercom and, or Tercom-aided, inertial navigation system.

**TAIR** Terminal-area instrumentation radar.

**TAIRCW** Tactical air control wing.

**TAIS** 1 Tactical air intelligence systems.

2 Technology application information system (SDI).

3 Tactical airspace integration system.

4 Thermal active intervention system.

**Take 5** Traffic crossing airway must maintain

## takeoff thrust

prescribed separation of 5 nm horizontally and 5,000 ft vertically from any GAT track in airway.

**takeoff** 1 Procedure in which aerodyne becomes airborne; not normally used for launch of glider (except on aerotow) or high-acceleration launch of missile or RPV, and never for any ballistic vertical-liftoff vehicle. In author's opinion verb is best as two words, noun and adjective as single word without hyphen.

2 Moment or place at which aerodyne leaves ground or water.

3 Net flightpath from brakes-release to screen height.

4 Power \* for extraction of shaft power.

**take off** To perform a takeoff.

**takeoff boost** Boost pressure permitted for takeoff, usually 2 minute limit.

**takeoff cone** Airspace occupied by aircraft in first minutes of flight.

**takeoff distance, TOD** Field length measured from brake-release to reference zero (at screen); can be longer than runway and extreme limit  $TOD_a = \text{entire runway} + \text{stopway} + \text{clearway} = TOR_a \times 1.5$ . For multi-engine aeroplanes usually factored according to number of operative engines, thus  $TOD_4$  or  $TOD_3$ .  $TOD_1 = TOD$  required for particular aircraft and WAT, not normally to exceed 0.87  $TOD_a$ .

**takeoff distance available** Actual distance at particular time, not necessarily length of runway.

**takeoff distance ratio**  $TOD$  into wind divided by  $TOD$  downwind [with tailwind], usually expressed as percentage.

**takeoff/liftoff area** Heliport area, a square with side equal to main-rotor diameter (FAA).

**takeoff limit** No general meaning.

**takeoff mass** Not normal term; for rocket or space launcher usually liftoff mass or launch mass.

**takeoff noise** Measured on extended runway centreline 3.5 nm (strictly 6,485.5 m, but taken as 6.5 km) from brakes-release. A second reference point, not used for certification, is at side or runway opposite supposed start of run 1 nm from centreline.

**takeoff power** Power authorized for piston engine or turboprop for takeoff, usually 2½-minute rating for turbine engines. In case of turboshaft, a lower rating than 2½-minute contingency.

**takeoff rating** 1 Boost/manifold pressure/rpm figures authorized for piston engine at takeoff.

2 Thrust published for turbojet or turbofan at takeoff, normally achieved by engine control system rather than set directly by pilot, and subject to ATR or FTO techniques.

**takeoff rocket** See *rocket-assisted takeoff*.

**takeoff run** 1 Loosely, distance travelled over land or water in aeroplane or aerotow-glider takeoff to point of becoming airborne.

2 TOR, field length measured from brake-release to end of ground run plus one-third of airborne distance to screen height.  $TOR_a = TOR$  available = length of runway;  $TOR_4, TOR_3$  are factored for engine-out cases, and  $TOR_r = TOR$  required.

**takeoff safety speed**  $V_2$ , lowest speed at which aeroplane complies with required handling criteria for climb-out following engine failure at takeoff.

**takeoff speed** Not defined but loosely = unstick speed.

**takeoff thrust** Takeoff rating (2).

## takeoff weight

**takeoff weight** 1 See *MTOW*.

2 Actual weight at takeoff (2) on particular occasion.  
**TAKEOVER** In HUD or as caption: autopilot has disconnected.

**T-AKX** Ro/Ro ship commandeered in emergency for RDF.

**TAL** Transatlantic abort landing (Shuttle).

**talbot** MKS unit of luminous energy;  $1^*/s = 1 \text{ lm}$ .

**TALC** Tactical airlift center (USAF).

**TALCE** Tactical, or tanker, airlift control element (USAF).

**TALCM** Tactical air-launched cruise missile.

**TALD** 1 Tactical air-launched decoy [vehicle or mission].

2 Tactical airborne laser designator.

**Taleos** Terrain-aided localization using EO sensors.

**talkdown** Landing, esp. in bad visibility, using GCA.

**talk-through** Facility whereby two mobile radio stations communicate via a base station.

**tall aircraft** One calling for LEW technique or experience.

**tall-aircraft VASI** See *T-VASI*.

**Tallboy** Armour-piercing bomb, 12,000 lb [5443 kg] (RAF WW2).

**Tallboy torch** Turbinlite.

**Tally** Visual sighting of air-to-air target (RAF).

**Tally Ho** Air-intercept code: target visually sighted. Normally followed by Heads Up or Pounce (DoD).

**Talon** 1 Theater application launch on notice.

2 Technology for advanced NO<sub>x</sub>.

**Talon(s)** Tactical airborne Loran (system).

**TALT** Tactical arms limitation talks.

**TAM** 1 Technical acknowledgement message (ICAO).

2 Time and materials [contract].

**Tamaca** Tactical mid-air collision avoidance.

**T<sub>amb</sub>** Ambient air temperature.

**Tamda** Tactical acoustics measurement and decision aid.

**TAMF** Training Aircraft Maintenance Facility (DARA St Athan).

**Tammac** Tactical airborne, or aircraft, moving-map capability.

**Tamps** Tactical automated, or aircraft, mission-planning system.

**Tams** 1 Total-airport management system.

2 Transportable automated meteorological station.

**TAN** Tananarive [tracking station], now called Antananarivo.

**Tana, TANA** Two-point adaptive non-linear approximation[s].

**T&B** Turn and bank.

**T&E** Test, or trial, and evaluation.

**tandem actuator** Has two pistons or jacks on same axis, with linear output.

**tandem bicycle gear** Two main landing gears on centre-line.

**tandem boost** Rocket boost motor(s) mounted directly behind main vehicle, staging rearwards at burnout.

**tandem clapping aerial swimmer** Small (the first was 19.5 kg, 43 lb) electrically powered aircraft with four reverse-cambered aerofoils which clap against each other in alternate pairs (NRL).

**tandem-fan engine** Gas turbine with single core driving front and rear fans on common shaft projecting ahead of

## Tans, TANS

engine; fans can have shared inlet for conventional flight or valved separate inlet and exits for V/STOL.

**tandem main gears** Two or more similar main gears in tandem on left and on right, as on C-5 or C-17.

**tandem parachute descent** Two people in close contact, or one parachutist and a suspended load.

**tandem rotors** Helicopter lifted by two (usually identical but handed) rotors, designated front and rear.

**tandem seating** One behind the other, in combat aircraft usually with rear seat at higher level.

**tandem vehicle** One assembled from portions, eg stages, assembled in tandem and staged axially, in contrast to strap-on, lateral or other configuration such as Space Shuttle.

**tandem-wheel gear** Two or more similar wheels in tandem on one leg, ie not a bogie.

**tandem-wing aircraft** One lifted by two wings in tandem, neither bearing more than 80% of total weight.

**T&M** Time and material [contract].

**T&O** Training and operations.

**T&R** Training and Readiness (USN).

**T&S** Turn and slip.

**Tanegashima** Principal Japanese satellite launch facility.

**tangential ellipse** See *Hohmann*.

**tangential landing** Running landing by rotorcraft or VTOL.

**tangential on-board injection** An advanced method of cooling gas-turbine rotor blades by preventing gas/metal contact.

**tangent modulus** Slope of tangent to stress/strain curve at any point, symbol E<sub>t</sub>.

**tangent of camber** In aerofoil profile, line drawn tangent to mean camber line at intersection with leading edge, in modern wings occasionally negative (sloping up to front).

**TANGO, Tango** Technology application to the near-term business goals and objectives, 34 partners in 12 countries with part-EU funding.

**Tango** 1 Standard ground position marker in shape of T (RAF).

2 Turbulent (Airmet advisory).

**tank** 1 Container of all fuel, liquid, propellant, lube oil, hydraulic fluid, anti-icing fluid or toilet chemical, and often gun ammunition; not used for containers of breathing Lox, air-conditioning refrigerants, potable water or suppressant/extinguishant.

2 Verb, to fly air-refuelling tanker, QTDN, qualified to tank day or night.

**tankage** Aggregate capacity of all tanks for particular fluid.

**tank circuit** Tuned RF circuit with capacitor and inductor in parallel.

**tanker** Aircraft equipped for inflight refuelling of others.

**tank farm** Cluster of storage tanks, usually for fuel, at airport.

**tank pump** Booster pump.

**tank sealer** Various thermoplastic liquids, resistant to hydrocarbon fuels, sloshed inside integral tankage to seal all interior surface; today superior methods of wet assembly and multiple coatings are used.

**tank vent** Vent (1).

**Tans, TANS** Tactical air navigation system; airborne

## tantalum

computer storing many waypoints and fed by other inputs (eg Doppler, magnetic heading).

**tantalum** Ta, shiny metal, MPt 2,996°C, density 16.7, important in refractory alloys. A carbide is harder than diamond.

**TAO** Test automated operations.

**TAOC** Tactical air operations centre (RAF/Army).

**TAOM** Tactical air operations module.

**TAOR** Tactical area of responsibility (UK).

**TAP** 1 Terminal approach procedure[s].

2 Air-transport regiment (R).

3 Tactical autopilot, or technology.

4 Technical, or technology, assessment program[me].

5 Terminal-area productivity, or planning.

**tap** 1 To bleed; hence tapping, pipe for bleed air.

2 To cut threads in drilled hole; also tool for doing this.

3 Electrical power wire connected to main conductor at point along latter.

4 Engine throttle or power lever (colloq.).

**TAPA** 3-D antenna pattern analyser (USAF ECM).

**Tape** Total airport performance and evaluation (Euret).

**tape** 1 Main meaning in aerospace is as medium for software, usually magnetic or punched paper.

2 One form of CF or other reinforced-plastics prepreg, used for layups or moulding but seldom for filament winding.

3 Pinked-edge fabric strip used for surface finishing (surface \*).

**tape control** Automatic control, eg of machine tool, by tape (1).

**tape instrument** Cockpit instrument whose presentation is based on linear tape driven over end spools, usually in conjunction with fixed and/or movable index pointers or bars. Usually vertical, as in VSFI.

**tapelayer** Computer-controlled tool for laying-up prepreg tape in manufacture of composite parts; automatically positions, starts, stops and dumps material rejected during prior editing.

**tape lay-up** The parts produced by the tapelayer.

**tape mission** Reconnaissance of Elint type in which digital (eg signal) or digitized pictorial information is stored on 7-track magnetic tape from which whole mission profile can be assigned to exact ground track, with each hostile emitter or other target assigned to precise location and timing.

**Taper** Turbulent air-pilot environment research (1960–65 NASA-FAA).

**taper** For given wing section profile \* equal in plan and thickness, usually defined as straight or compound; in some aerofoils \* not equal in plan/thickness so section profile changes.

**tapered-roller bearing** Use of tapered rollers enables such a bearing to resist axial [endways] loading.

**tapered sheet** Thickness varies (usually at uniform rate) along one axis.

**taper ratio** Normally defined as ratio of tip chord  $C_t$  to either root chord or equivalent centreline chord  $C_c$ . Common rendering,  $R_T = C_t/C_r$ .

**taper reamer** Used to smooth and true previously tapped hole.

**taper tap** Hand-turned tap (2) to initiate thread cutting.

**Tapley meter** Damped pendulum in heavy stable case whose limit of swing feeds record of instantaneous or

## target allocation

maximum vehicle deceleration; not suitable for runway friction measures.

**Taps, TAPS** 1 Tercom aircraft (or tracking and) positioning system.

2 Terminal applications processor system.

3 Target analysis and planning system.

4 Twin annular pre-swirl, or premix swirlier.

5 Total, or towed, airborne plume simulator.

**taps** Throttles (colloq.).

**tap test** Crude search for delamination or other flaw in composite structure, typically with a coin.

**TAR** 1 Terminal-area surveillance radar (ICAO).

2 Terminal approach radar.

3 Thrust auto reduce (SST).

4 Threat-avoidance receiver; passive ECM.

5 Trials ATN router.

6 Test action request.

**Tara** Terminal and regional airspace.

**Tarad** Tracking asynchronous radar data.

**Taran** 1 Tactical attack radar and navigation.

2 Test and repair as necessary.

**Taras** Tactical [digital] radio system (Sweden).

**Tarasov-Bauer** Computer-based method of smoothing out judge's scores to eliminate highest and lowest (CIVA).

**TARC** 1 Transport Aircraft Requirements Committee (UK 1956–62).

2 Tactical air reconnaissance center (USAF).

**Tarcap** Target combat aircraft practice (practise), or patrol.

**Tardis** Tornado advanced radar display and information system.

**TARE, Tare** 1 Tactical air reconnaissance equipment.

2 Telemetry, or telegraph, automatic relay equipment (NATO).

**tare** Unladen, without load, crew or fuel; normally used only in connection with surface vehicles, except for ULDs, where \* includes linings and fittings according to specification or registered with IATA.

**tare effect** Forces and moments on tunnel model caused by support-structure interference.

**tare weight allowance** Free allowance given by IATA to shippers for ULDs not owned by members.

**tare-weight objective** Non-mandatory target weight for a ULD.

**TAREWS, Tarews** Tactical air reconnaissance and electronic-warfare support; RPV (USAF).

**TARG, Targ** Telescoped ammunition revolver gun.

**Target** Training and rehearsal generation toolkit.

**target** 1 Objective of air-combat mission, either in air or on surface.

2 Objective of intelligence or Elint activity.

3 Any true echo (blip) seen or radar, and object causing it.

4 Objective of any missile.

5 To insert position co-ordinates of fixed surface \* into guidance software of ballistic or cruise missile; also called targeting.

6 Unpiloted (towed or RPV) aerodyne serving as target for friendly fire.

7 Aircraft within surveillance range of TCAS.

**target acquisition** Detection, identification and location in sufficient detail for effective employment of weapons.

**target alert** EFIS warning of future turbulence.

**target allocation** In air-defence weapon assignment,

**target approach point**

process of assigning particular target or airspace to particular interceptor or SAM unit (NESN).

**target approach point** Navigation checkpoint, usually prominent land feature similar to initial point, over which final turn in to DZ or LZ is made.

**target CAP** Target combat air patrol; patrol of fighters over enemy target area to destroy hostile aircraft and cover friendly surface forces.

**target capture** To detect, identify and locate a target in flight.

**target crossing speed** Relative lateral velocity or sight-line spin (angular rate) or aerial target seen from interceptor.

**target date** Date on which particular planned event should take place.

**target designation** Marking or otherwise pointing out a target, or setting it into HUD or fire-control system.

**target designation control** Throttle thumbswitch for slewing sight (or HUD) brackets to contain a surface target.

**target director post** Positions friendly aircraft, in all weathers, over predetermined geographical positions, eg targets.

**target discrimination** See *discrimination*.

**target dossier** File of assembled intelligence information on target, normally including multisensor readouts and Elint.

**target drone** Pilotless target aircraft, today often an RPV.

**target ensemble** Region of sky occupied [or expected to be occupied] by multiple air/ground munitions.

**target-following radar** One locked on to target.

**target indicator, TI** Visible pyrotechnic, electronic homing beacon or other device air-dropped on surface target.

**targeting** 1 To target (5).

2 Distribution of targets assigned to weapons, esp. to ICBMs and SLBMs.

**target marker** Visible pyrotechnic dropped on surface target, or aircraft dropping same.

**target of opportunity** 1 Target visible to a sensor or observer and within range of weapons and against which fire has not been scheduled or requested (DoD).

2 Target which appears during combat and which can be reached by weapons and against which fire has not been scheduled (NATO).

Note: both the above can be ground or air.

3 NW target detected after operation begins that should be attacked as soon as possible within time limits for co-ordination and warning friendly forces.

**target pattern** Flightpath of aircraft (meaning is normally in plan view) during attack phase (DoD).

**target price** That hoped to be achieved, eg in incentive-type contract.

**target recognition** Positive identification of type of target (eg type of aircraft), by visual means or by high-resolution sensor giving jet modulation or prop/rotor reflection signature.

**target reverser** Jet-engine (turbojet or turbofan) thrust reverser comprising two deflectors (also called clamshells or buckets) which swing down to meet downstream of nozzle.

**target strength**  $T = E - (S+2H)$  where S is source, E echo and H radar transmission loss; unit is dB.

**target symbol** Computer-generated on display.

**target tape** Basic software for programming missile guidance of inertial and certain other species.

**target tug** Manned aircraft or RPV towing target (6) for live air/air or surface/air firing.

**tarmac** Colloq. UK (esp. non-aviation people) for paved apron; US = hardstand.

**Tarmos** Tactical radio monitoring system.

**Tarms** Tactical aerial resource-management study (aerial firefighting).

**TARN** Telegraphic auto routing network (NATO, Litton).

**Tarpol** Tariff policy.

**Tarpos** Target positional data [attack on moving surface target].

**Tarps** Tactical-aircraft, or air, reconnaissance-pod system (USN).

**TARS, Tars** 1 Tethered aerostat radar system.

2 Theatre airborne, or tactical air, reconnaissance system.

3 Tactical Air Research and Survey Office (USAF, formerly).

**Tarsp** Tactical air radar signal processor.

**TAS** 1 True airspeed.

2 Training aggressor squadron.

3 Target-acquisition system.

4 Typed air station.

5 Thallium arsenic selenide.

6 Tactical acoustic system.

7 Towed-array sonar.

8 Tracking adjunct system (SAM).

9 Targeting avionics system.

10 Traffic-avoidance system (Japan).

11 Tactical Air Squadron (Poland).

12 Transportable aerosat system.

13 Tail actuation system (JDAM).

**TASA** Thai Aero Sport Association.

**TASC** 1 Touch-activated screen (or simulator) control.

2 Technical and Air Safety Committee of Gapan.

**TASD** Trajectory and signature data.

**Tasdac** Tactical secure-data communications (USAF).

**taser** Hand-held NLW which delivers temporarily incapacitating shock via probes fired by nitrogen gun.

**Tases** Tactical airborne signal exploitation system.

**Tasets** Tactical steerable emitter threat simulator.

**Tasi** True airspeed indicator (pronounced 'tarzi').

**task** 1 Specific assignment to one air vehicle, or any other military force, normally involving operational or simulated mission or particular training exercise or programme.

2 Specific assignment to competitors in sailplane championships, eg speed round triangle, distance or declared goal, not disclosed prior to day.

**tasked** Required to fulfil certain tasks (1), either of variable operational or routine nature. Not available for other missions.

**tasking** Process of assigning tasks to available units or individual aircraft or crews to fulfil all mission requirements.

**TASM** 1 Total available seat-miles.

2 Tactical anti-ship, or air-to-surface, missile.

3 Top-attack submunition.

**Tasmo** Tactical air support for maritime operations.

**TASR** 1 Tactical automated situation receiver.

- 2** Terminal airport surveillance radar.
- TASS** Tactical Air Support Squadron (USAF).
- Tass** *1* Tactical automated security system.
- 2** Towed-array surveillance system.
- 3** Terminal-area surveillance system (1995 onwards).
- 4** Tethered-aerosat surveillance system.
- 5** Target-acquisition sensor suite.
- TASST** Tentative airworthiness standards for [a future] SST (FAA).
- Tasuma** Target and surveillance unmanned aircraft.
- Tasval** Tactical-aircraft survivability against armour; post-Jaws (USA/USAF).
- TAT** *1* Total, or true, air temperature.
- 2** Turnaround time.
- 3** Tactical aircraft turret (helicopter).
- TATC** Terminal ATC; A adds automation.
- Tatcof** Transportable ATC facility.
- TATF** Terminal Automation Test Facility (FAA).
- TATI, Tati** Trim and tailplane incidence (indicator) (pronounced ‘tatty’).
- TATP** Triacetone, or tricyclo-acetone, triperoxide, liquid high explosive.
- TATS** *1* Tactical aircraft training system.
- 2** Tactical Aerial Targets Squadron (USAF).
- TAU** *1* Target acquisition and tracking unit.
- 2** Terminal access unit.
- 3** Threat awareness unit.
- TAV** *1* Transatmospheric vehicle.
- 2** Total asset visibility.
- TAW** *1* Thrust-augmented wing.
- 2** Terrain-awareness warning.
- 3** Tactical Airlift Wing.
- TAWC** Tactical Air Warfare Center.
- TAWDS** Target-acquisition/weapon-delivery system, with Pave Mover.
- Taws** *1* Terrain-awareness [or avoidance] warning system [previously EGPWS, now e-TAWS].
- 2** Theater airborne warning system.
- tax** Taxiway lights (ICAO).
- TAXI** Taxi and parking facilities airfield chart.
- taxis** To move aircraft on surface (land or water) under its own power.
- taxi channel** Defined path for marine aircraft.
- taxis-holding position** Designated point at which all vehicles may be required to hold to provide adequate clearance for arrivals/departures on runway.
- taxisiing** Participle/gerund from taxi; note spelling.
- taxilane** Path on large apron or other paved area to be followed by nose gear, marked by continuous white line.
- taxitrack** Assigned taxiing route at land airfield, not necessarily paved. Most or all may be perimeter track.
- taxisway** Assigned taxiing route at land airfield, paved.
- Taylor diagram** Plot of dry and saturated adiabatic curves on axes of pressure and volume (reciprocal of density) showing loss of pitot pressure in moist air.
- Taylor/Maccoll** Original more exact solution for pressure over unyawed circular cone in supersonic flow (1932).
- Taylor MacLaurin** Mathematical expansion of  $f(x)$  for values near  $x = 0$ .
- Taylor recorder** Automatically counted number of times a preset vertical acceleration was exceeded (RAE, 1950).
- Taylor series** Power series of  $f(x)$  in ascending powers of  $x - a$  where  $f(x)$  and derivatives are continuous near  $x = a$ .
- TB** *1* Turn/bank.
- 2** Timebase.
- 3** Torpedo-bomber (USN, 1935–46).
- 4** Terminal block.
- 5** Heavy bomber (USSR).
- 6** Turbulence.
- tb** *1* Burn time.
- 2** Panel thickness necessary to resist bending.
- TBA** *1* Total (helicopter main rotor[s]) blade area.
- 2** Test-bed analysis.
- T-bar system** See *T-VASI*.
- TBB** Transfer-bus breaker.
- TBC** *1* Toss-bombing computer.
- 2** Tailored-bloom chaff.
- 3** Tactical bombing competition.
- 4** Thermal barrier coating.
- TBCC** Turbojet-, or turbine-, based combined cycle.
- TBCP** Telebrief control panel.
- TBD** *1* To be determined, or decided.
- 2** Time/bearing display.
- 3** Trail[ing] blade damage.
- 4** Track before detect [radar].
- TBE** Timebase error.
- TBH** *1* Truck-bed height.
- 2** Turbine- [or tail- or thrust-] bearing housing.
- TBI** Turn/bank indicator = turn/slip.
- TBiG** Terbium iron garnet.
- TBL** *1* Turbulent boundary layer.
- 2** Towbar-less, i.e. not fitted with towbar.
- 3** Twin-bogie loading.
- TBM** *1* Theater battle management; CS adds core system[s], S system.
- 2** Tactical, or theater, ballistic missile; D adds defense, DFS defense feasibility study, EWS early-warning system (USA).
- TBO** Time between overhauls.
- TBPA** Torso back protective armour.
- TBR** Torpedo-bomber reconnaissance.
- TBRP** Timebase recurrence period.
- TBS** *1* To be supplied, or specified.
- 2** Tailored business stream (DCAC).
- TBT** *1* Turbine-bearing temperature [also used to mean turbine temperature and turbine-blade temperature].
- 2** Transonic blowdown tunnel.
- TBV** Tilt-body vehicle.
- TBW** Throttle by wire.
- tBX** Air temperature (USSR, R, Cyrillic characters).
- TC** *1* Toilet cart.
- 2** Time constant, or critical [see TCAIA, TCT].
- 3** Turn (or twin) co-ordinator.
- 4** Thermocouple.
- 5** Test-complete (verb).
- 6** Type, or Technical, or Transport, Certificate (US).
- 7** Top of climb.
- 8** Taxiway centreline (lights).
- 9** Turbocharged.
- 10** Tropical cyclone, or continental.
- 11** Top of cylinder.
- 12** True course.
- 13** Transport Canada, with many suffixes, including N (data-processing network) and TSB (technical services branch).
- 14** Transformational communications (USAF).
- 15** Terminal chart[s].

- Tc** 1 Tropical continental air mass.  
 2 PN code bit length, also called chip width.  
 3 Adiabatic flame temperature of rocket.  
 4 Superconducting critical temperature.  
 5 Torque concentrated at a particular location or plane in large panel.
- T/C** Top of climb.
- t/c** Thickness/chord ratio of aerofoil; inferior suffixes include r root, k kink and t tip.
- TCA** 1 Terminal control area.  
 2 Télécommande automatique; IR/optical + wire guidance for missile. Operator merely keeps sight on target.
- 3 Time of closest approach.  
 4 Track crossing angle.  
 5 Temperature control amplifier.  
 6 Technical collaboration agreement.  
 7 Turbine cooling airflow.  
 8 Technical, or technology, concept aircraft (SST).  
 9 Tungsten carbide alloy.  
 10 Traffic-collision avoidance; D adds device (for GA; 1980s).  
 11 Throttle-control assembly.  
 12 Transformational communications architecture.  
 13 The Canberra Association.
- TCAA** 1 Taiwan CAA.  
 2 Transatlantic Common Aviation Area.
- TCAC** Tactical Control and Analysis Center.
- TCAIA** Time-critical automatic identification and attack.
- TCAP** Tricyclo-acetone peroxide [liquid explosive].
- TCAR** Transatlantic collaborative [or co-operative] advanced [ or AGS1] radar.
- TCAS** 1 Pronounced T-cass, traffic alert and collision-avoidance system [see entry]; -RA adds resolution advisory.  
 2 Tandem clapping aerial swimmer.
- TCB** 1 Turret control box (helicopter).  
 2 Trusted computer, or computing, base.
- TCBM** Transcontinental ballistic missile.
- TCC** 1 Thermal-control coating.  
 2 Thrust control computer.  
 3 Telecommunications center(s).  
 4 Titanium-coated carbon.  
 5 Turbine-case cooling.  
 6 Tactical co-ordination console.  
 7 Tactical control center.  
 8 Technical co-ordinating committee.  
 9 Troop Carrier Command (USAAF, WW2).  
 10 Temporary Council committee.  
 11 Tip clearance control [turbine rotor].  
 12 Traffic coordination centre.
- TCCA** Transport Canada Civil Aviation [certification authority].
- TC<sup>3</sup>, TCCC** Tower control computer complex; S adds system.
- TCCF** 1 Tactical combat control facility (USAF).  
 2 Technical communication control facility.
- TCCP** Take-command control panel.
- TCD** 1 Time-critical data.  
 2 Total-contents display.
- TCDD** Tower-cab digital display (ATC).
- TCDL** Tactical common data-link.
- TCDS** Type Certificate data sheet.
- TCDT** Terminal countdown demonstration test.
- TCEA** Training Centre for Experimental Aerodynamics (NATO, Brussels).
- TCF** Terrain clearance floor.
- tcf** Trillion cubic feet.
- TCG** Troop Carrier Group (USAAF).
- TCH** 1 Threshold crossing height.  
 2 See *TKP*.
- TCI** 1 Tape-controlled inspection.  
 2 Time-controlled item.
- TCIM** Tactical communications interface modem, or module.
- TCIR** Toxic-chemical inventory release.
- TCJ** Tactical communications jamming.
- TCL** 1 Taxiway centreline light[s].  
 2 Transient control logic.
- TCLT** Tentative calculated landing time.
- TCM** 1 Trim-control module.  
 2 Trellis coded modulation.  
 3 Throttle clutch motor.  
 4 Trajectory-correction, or change, manoeuvre.  
 5 Technical co-ordination meeting.  
 6 Transformational communications milsatcom, or military [also called TCS, TSAT].
- TCMA** Time co-ordinated multiple access.
- TCML** Target co-ordinate map locator.
- TCMS** Test-content management system.
- TCN** Tacan.
- TCO** 1 Total cost of ownership.  
 2 Tape-controlled oscillator.  
 3 Tactical Control Officer.  
 4 Tone cut-off (noise reduction).
- TComSS** Telephonics communications management system.
- TCP** 1 Transfer-of-control point.  
 2 Transmission control program, or protocol (Autodin).  
 3 Tri-cresyl phosphate.  
 4 Thrust centre position (of gross thrust vector).  
 5 Takeoff-chart computation program.  
 6 Traffic, or transport, control protocol; IP adds Internet protocol.
- TCPA** Time to closest point of approach.
- TCPED** Tasking, collection, processing, exploitation and dissemination.
- TCP/IP** TCP (2) internet protocol.
- TCQ** Throttle control quadrant.
- TCR** 1 Terrain-closure rate.  
 2 Thickness/chord ratio; usually t/c.  
 3 Time-compliance requirements.
- TCS** 1 Tilt-control switch (tilt-wing V/StOL).  
 2 TV camera set (F-14).  
 3 Tracking and communications subsystem (ACMI).  
 4 Telemetry and command system (satcom).  
 5 Turbulence-control structure.  
 6 Tactical-control system, or squadron.  
 7 Trusted computer system, meeting requirements for secure access.  
 8 Tactical-command system.  
 9 Touch-control steering.  
 10 Target control set.  
 11 Total-component support.  
 12 Troop Carrier Squadron (USAAF).  
 13 Traffic charging system (BAA).

**14** Transformational communications system (DoD).

**TC/s** Teracycles per second, = THz.

**TCSC** Titanium-coated silicon carbide.

**TCSEC** Trusted-computer system evaluation criteria.

**TCSS** Terminal communications switching system.

**TCT** **1** Time-critical target, or targeting; A adds aid.

- 2** Tactical computer terminal.
- 3** Transverse-current tube.
- 4** Target-centred tracker.
- 5** Takeoff configuration test.
- 6** Turbomachinery and combustion technology.
- 7** Targeting-cycle timeline = S2S.

**TCTO** Time-compliant, or compliance, technical order.

**TCTT** Time-critical target technology.

**TCU** **1** Tracking control, or and communications, unit.

- 2** Thermal cueing, or control, unit.
- 3** Tracking and communication unit (UAV).
- 4** Take-control unit.
- 5** Tacan control unit.
- 6** Telephone conversion unit.
- 7** Transport Communications International Union [Rockville, MD20850] (US).

**TCU, TCu** Towering cumulus.

**TCV** **1** Total-containment vessel.

- 2** Terminal-configured vehicle.

**TCW** **1** Terminal controller workstation.

- 2** Tactical Communications Wing (RAF).
- 3** Tactics and Countermeasures Wing (RAF AWS).
- 4** Troop Carrier Wing (USAAF).

**TCWF** Terminal convective weather forecast [predictive tool] (MIT).

**TCX** Transfer-of-control cancellation message.

**TCXO** Temperature-controlled crystal oscillator.

**TD** **1** Target drone (USN category 1942–46).

- 2** Touchdown.
- 3** Transposition docking.
- 4** Time difference, or delay.
- 5** Tunnel diode.
- 6** Test directive.
- 7** Time duplex.
- 8** Tactical Director (USAF).
- 9** Tactical display.
- 10** Thrust decay; S adds system.

**Td, Td, T-D** Dewpoint temperature.

**td** Ignition delay time of rocket.

**T/D** Top of descent.

**TDA** **1** Tunnel-diode amplifier.

- 2** Temporary danger area.
- 3** Trade and Development Agency (US).
- 4** Theater-defense architecture.
- 5** Today.
- 6** Tail-down angle.
- 7** Transient dynamic analysis.

**TDAAPS** Training data-acquisition analysis and playback system.

**TD&E** **1** Transposition, docking and LM ejection.

- 2** Tactics development and evaluation.

**TDAP** Touchdown aim point.

**TDAR** Tactical defence alerting radar.

**TDAS** Test, or tracking and, data acquisition system.

**TDATS, T-Dats** Target detection, acquisition and tracking system.

**TDC** **1** Top dead centre.

- 2** Through-deck cruiser, for Stovls.

**3** Technical Development Center (FAA).

**4** Target designator, or designation, control.

**5** Theater-deployable communications (USAF).

**TDCP** Tactical-data communications processor (USMC).

**TDCS** Traffic-data collection system.

**TDD** **1** Tactical-related data-dissemination system.

- 2** Target-detection device.

**TDE** **1** Target-data extractor.

- 2** Tactical-data equipment.

**TDEC** Technical Development and Evaluation Center (CAA Indianapolis from 1939).

**TDEFS** Technology demonstrator for enhancement and future systems.

**TDEU** Test and data-extractor unit.

**TDF** **1** Tactical digital facsimile.

- 2** Tactical-display framework (Awacs).

**TDG** **1** Triggered-discharge gauge.

- 2** Two-displacement gyro.

**TDH** Tiedown helicopter.

**TDI** **1** Triple-display indicator [fluid pressure, three dial scales].

- 2** Tapped delay input.
- 3** Trade-data interchange, part of Apex.
- 4** Time-delay and integration (TICM).
- 5** Time-of-day interface.

**TDL** **1** Tactical data-link; MC adds management cell; PS adds processing system.

- 2** Tactical data-loop; S adds system.
- 3** Trapped delay-line.
- 4** Truck dock lift.

**TDLS** Tower data-link services, such as pre-departure clearance and D-ATIS.

**TDM** **1** Time-division, or -domain, multiplex.

- 2** Tactical-data management, or modem.

**TDMA** Time-division, or domain, multiple access.

**TDMMMS** Telemetry Doppler metric measurement system.

**TDMS** Test-documentation, or tactical-data, management system.

**TDO** Tornado.

**TDoA** Time-difference, or delay, of arrival.

**TDOP** Time-dilution of precision.

**TDP** **1** Touchdown point; D adds dispersion.

- 2** Target-data panel.
- 3** Technology-demonstration, or development, programme, or project.
- 4** Three-day planning; F/C adds forecast chart.

**TDPF** Tail-damping power factor.

**TDPS** Tracking, or test, data-processing system.

**TDR** **1** Tail-damping ratio.

- 2** Takeoff-distance ratio.
- 3** Technical-despatch reliability.
- 4** Transponder [XPDR more common].
- 5** Traffic-data record.
- 6** Terminal Doppler radar.

**TDRE** Tracking and data relay experiment.

**TDRS** **1** Tracking and data-relay satellite; S adds system.

- 2** Technology demonstration and [or for] risk-reduction.

**TDS** **1** Tactical-data system.

- 2** Time/distance/speed scale.
- 3** Tactical Drone Squadron.

4 Thermal diffuse scattering.  
 5 Training Depot Station (RFC).  
 6 Target-designation sight.  
 7 Threat deception system.  
 8 Threat-detection system; -FA adds fighter aircraft, -H helicopter.  
 9 Thrust-decay system.  
 10 Terminal display system.

**TDST** Tower data services terminal.

**TDT** 1 Tactical data terminal.  
 2 Transonic dynamics tunnel.  
 3 Twin delta tandem.

**TDTG** Twin delta tandem [landing] gear.

**TDTS** Tactical-data transfer system.

**TDU** 1 Test, or TV, or terminal, display unit.  
 2 Torpedo Development Unit (RAF Gosport, 1938, became ATDU).

**TDV** 1 Technology development vehicle.  
 2 Truck dock vehicle (cargo handling).

**TDWR** Terminal Doppler weather radar.

**TDX** Target-data extractor.

**TDY** Temporary duty.

**TDZ** 1 Touchdown zone; CL adds centreline lighting, E adds elevation, L lights, M marking.  
 2 Target defence zone [in attack by NW].

**TDZE** See TDZ, “highest point in first 3,000 ft [914 m] of landing surface”.

**TDZ marking** White axial stripe on each side of runway.

**TE, t.e.** 1 Trailing edge.  
 2 Tactical evaluation.  
 3 Taxiway edge (lighting).  
 4 Table of equipment.  
 5 Transponder equivalent [satellite].

**T/E** Twin-engine[d].

**Te** Tellurium.

**TEA** 1 Tri-ethyl alcohol, hypergolic igniter.  
 2 Tri-ethyl aluminium, rocket fuel.  
 3 Transferred-electron amplifier.

**TEAM, Team** 1 Training equipment and maintenance (NATS).  
 2 Technology for efficient agile mixed-signal micro-systems.

**teaming agreement** 1 Inter-company agreement for marketing purposes, not involving licensing or co-production.  
 2 Now coming to mean any inter-company agreement to assist penetration of markets.

**teaming down** Getting into partnership with smaller companies.

**teaming up** Getting into partnership with one or more giant companies, one of which may be eventual prime.

**teampack** Packaged for carrying across rough terrain by team of 2 to 8 personnel.

**Teams** 1 Tactical evaluation and monitoring system (Northrop).  
 2 Tactical electronic-aircraft [or EA-6B] mission support system (USN/USMC).

**tearaway connector** Umbilical pull-off coupling.

**teardown** Dismantling into component parts. When aircraft or engine is being scrapped this is the initial stage in which salvageable items are carefully removed.

**teardrop** Standard procedure flying pattern similar to racetrack but with one end having large-radius and the other small.

**teardrop canopy** Of smoothly streamlined shape, usually moulded from one transparent sheet.

**tear off a strip** To deliver spoken reprimand (RAF, colloq.).

**tearoff cap** Lightly sewn fabric parachute cover torn off pack by static line.

**tearstrap** Doubler fastened [if possible, bonded] to skin to arrest progress of tensile crack.

**tease** Faulty operation of circuit-breaker in which snap-action is absent; hence \*-free.

**TEB** Tri-ethyl borane.

**TEC** 1 Trans-Earth coast.  
 2 Thermal (or thermoelectric) energy converter.  
 3 Thermoelectric cooler, or cooling.  
 4 Tower en-route control.  
 5 Temperature error correction.

**TECEVAL** Technical evaluation (USN).

**tech** Adjective, to go \* = unserviceable (colloq.).

**techint** Technical intelligence.

**tech mod** Technology modernization.

**Technimation** Technical animation, methods for training and educational displays giving illusion of motion, eg flow through pipes, rotation of shafts, etc.

**Technical Assistance Agreements** Bilateral agreements permitting disclosure of sensitive items by the US to the UK, notably concerned with LO technology (10 negotiated by early 2003).

**technical delay** Delay ascribed to fault in hardware, lasting longer than 5 (sometimes 15) min.

**technical despatch reliability** Percentage of scheduled flights which are unaffected by any prior technical fault, but ignoring delays due to other causes.

**technical electrics** All services other than commercial electrics.

**technical intelligence** An amalgam of the ten or more current methods of obtaining knowledge about an enemy's methods and equipment.

**technically closed** Problem has been solved.

**Technical Standard Order** Establishes quality control for avionics and other equipment; thus TSO'd items bear higher price (FAA).

**technical stop** Stop by commercial transport at airport for reasons other than traffic; not shown in timetable.

**technical survey** Inspection for monitoring (bugging) systems (DoD).

**Techroll** Patented (CSD) configuration for vectoring nozzle of solid-propellant rocket motor in which nozzle drive forces are reduced by fluid-filled constant-volume surround sealed by flexible diaphragm.

**Tecmus** Tactical ECM upgrade system.

**Tecom** Test and Evaluation Command [HQ, Aberdeen Proving Ground, MD 21005–5055] (USA, APG).

**Tecos** Terminal co-ordination system.

**TECR** Technical reason (ICAO).

**Tecstat** Nazionale Associazione Tecnici di Stato (I).

**TED** 1 Transferred-electron device.  
 2 Tactical (or threat) evaluation display.  
 3 Trailing edge down, or device[s].  
 4 Threat-environment description.  
 5 Tool and equipment drawing.  
 6 Trace [of] explosives detector.

**TEDA** Triethylenediamine.

**Tedlar** Flexible PVF film for surface protection (registered name).

## TEDS

## telltale

**TEDS** Tactical expendable drone system, for ECM saturation jamming.

**TEE** Tubular extendible element, produced by unrolling steel tape.

**tee** Air/ground wind-direction indicator in shape of large T in white, either placed on ground and occasionally rotated or pivoted to base (and in a few cases moved by weather-cocking). Cross-piece is at downwind end of upright.

**TE-Ebaps** Transferred-electron electron-bombarded active pixel sensor.

**tee connector** T-shaped plumbing connector.

**Tee Emm** Training memoranda [and excellent periodical] (RAF).

**tee gearbox** One rotary shaft geared to another at 90° at a point other than one end.

**tee junction** T-shaped connection of two microwave waveguides.

**teetering rotor** Helicopter main rotor with two blades freely pivoted as one unit about horizontal axis transverse to line joining blade tips.

**TEF** Total environment facility, for processing reconnaissance data.

**Teflon** Trade name (du Pont) for large family of fluorocarbon-resin rubbers and plastics.

**Tefzel** Trade name (du Pont) for fluoropolymer resins suitable -100/150°C.

**TEG** 1 Tactical exploitation group (satellites).

2 Thermo-electric generator.

**tehp** Total equivalent horsepower, normally same as ehp.

**TEI** 1 Trans-Earth insertion (or injection).

2 Text-element identifier[s].

3 Thermocouple engine instrument.

**TEIM** Trans-Earth injection module.

**tekites** Small glassy bodies unrelated to surrounding Earth surface and believed of extraterrestrial origin.

**TEL** 1 Tetraethyl lead.

2 Telebrief.

3 Telephonic (ICAO).

4 Transporter/erector/launcher; AR adds and radar.

**Telar** TEL (4) and radar, on one vehicle.

**TELATS** Tactical electronic locating and targeting system (USAF).

**telebrief** Direct telephone link between ground personnel, eg air controller or ground crew, and military aircrew seated in aircraft on ground.

**telecommunications** Transmission, emission or reception of signs, signals, writing, images or sounds by wire, radio, visual or other EM system; abb. telecom.

**teleconference** Conference between participants linked by telecom system.

**Teleflex** Mechanical remote-control systems in which push/pull commands are transmitted by tube-mounted cable with complex coiled overlayers [able to drive toothed wheel].

**telegraph** Telecom using succession of identical electrical pulses.

**teleguided** Not a normal expression; could mean a missile guided by radio command or by wires.

**telematics** This word does not appear in normal English dictionaries. It appears to mean automatic control over wide areas encompassing several systems.

**telemetry** Transmission of real-time data by radio link,

eg from missile to ground station; today invariably digital and important in RPVs and unmanned reconnaissance systems. Data can be pressure, velocity, surface angular position or any other instrument output, or any form of reconnaissance output. Telemeter is verb; use as noun arch. Noun is \* system or telemetering system.

**telemetry intelligence** A branch of sight, involving analysis of hostile telemetry signals.

**teleoperator** Robot for performing mechanical tasks under remote control.

**telephone** Transmission of sounds, signals or images by wire or other discrete-path link, eg microwave beam or optical link using free coherent beam or fibres.

**telephone box** Figurative enclosure of aircraft whose energy has decayed in air combat to point where he is low and slow and has 'no place to go'.

**telephotography** Photography of distant objects on Earth.

**telephotometer** Visibility meter.

**teleprinter** Telegraphy with keyed input and printed written output.

**teleprocessing** EDP (1) by computer fed by telecom system.

**teloran** Television radar air navigation; use of ground radar to feed airborne TV display.

**Telesacs** Telematics for safety-critical systems, in particular co-ordination of ACAS, STCA and precision navigation (Euret).

**telescience** Increasing output of space science experiments by use of Internet and broadband satellite communications to involve ground-based researchers.

**telescope** 1 In astronomy, instrument for collecting EM radiation (esp. light, radio, IR and X-ray) from extra-terrestrial sources.

2 To reduce overall dimensions by folding or, esp., linear retraction, eg helicopter rotor.

3 To reduce propeller diameter by cropping tips.

**telescoped ammunition** Rounds in which the projectile is carried largely within the case, reducing length and increasing propellant energy per unit overall volume.

**telescope gauge** Precision rod sliding in tube and locked to measured dimension, eg hole diameter, subsequently measured by micrometer.

**telescoping** To telescope (2, 3).

**telesramble** 1 To render telecom, usually telephone, conversation unintelligible by scrambling.

2 Dedicated telephone cable plugged into aircraft, especially one armed with NW, waiting on ORP.

**teletype** US term for teleprinter; hence \*-writer; often capital T (registered name).

**television** Transmission and reception of real-time imagery by electronic means. Link usually by radio but may be any other telecom form, and imagery usually keyed to sound channel, entire received signal also being recordable by receiver; abb. TV.

**television command** See *television guidance*.

**television guidance** Command guidance by radio link sending steering commands from operator watching TV picture taken by camera in nose of vehicle.

**telezygology** Technology of smart fasteners.

**telint** Telemetry intelligence.

**telling** See *track telling*.

**telltale** An indicator of position external to cockpit,

## tellurium

such as rods projecting through wing skin to show landing-gear position.

**tellurium** Te, semi-metal, density 6.2, MPt 450°C, metal alloys, glass, ceramics, electronics.

**Telops** Telemetry on-line processing system.

**TELS** Turbine-engine loads simulator.

**TEM** 1 Transmission electron microscope (or microscopy).

2 Technical error message (ICAO).

3 Thermally expanded metal.

4 Illustrated tool and equipment manual.

5 Threat and error management.

**T/EMM** Thermal and energy-management module.

**TEMP, Temp** 1 Temperature (ICAO).

2 Temporary.

3 Test and evaluation master plan (AFSC).

**temper** Degree of hardness introduced to metal by heat treatment, cold-working or other process.

**temperature** Property of material systems, commonly called intensity of heat, determining whether they are in thermodynamic equilibrium. Normally a measure of translation kinetic energy of atoms or molecules. SI unit is K, not necessarily written °K. Specified as reported \*, a local actual value, or as forecast \* or declared \*, read from statistical tables.

**temperature accountability** All factors, in aircraft design, operation and certification determined by reduction in propulsive thrust and wing lift caused by increase in atmospheric temperature.

**temperature coefficient** Rates of change of variable per unit change in temperature.

**temperature coefficient of pressure** For a given ratio of solid-rocket-motor surface to throat area,  $\pi_k = \delta I_n P_c / \delta T$  where  $I_n$  is initial specific impulse,  $P_c$  is chamber pressure and T is temperature.

**temperature correction** Correction applied to bring instrument reading to STP conditions.

**temperature gradient** Rate of change of temperature with unit distance through material in direction normal to isotherm surfaces, esp. rate of change of temperature in atmosphere with unit increase in height.

**temperature inversion** See *inversion*.

**temperature lapse rate** *Lapse rate*.

**temperature probe** Sensor protruding into air-stream, giving output requiring correction to give static temperature.

**temperature recovery factor** Usually, equilibrium temperature of solid surface in high-speed flow, varying according to turbulence of boundary layer; usually  $T_w$  and given by several formulae.

**temperature-sensitive paint** *Thermal paint*.

**temperature shear** Rapid change in atmospheric temperature with horizontal or vertical travel [can cause unacceptable change in Mach whilst holding airspeed/altitude constant].

**temperature stress** Stress caused by temperature, esp. changes in temperature between different parts of monolithic body.

**temperature traverse** Series of temperature (usually stagnation/total temperature) measures taken either over area or along straight line perpendicular to fluid flow, eg at exit from combustion chamber.

**Tempest** Transient EMP emanation standard.

**template** Simple pattern, usually planar, either cut to

shape of a part or with shape and dimensions marked on surface, used as guide in repeated marking out of desired shape. In UK occasionally written templet.

**Temple-Yarwood** Formula for pressure coefficient at low Mach as function of critical Mach  $M_c$ :  $C = 1 - 0.522(1 + 0.2 M_c^2)^3/M_c^2(1 - 0.05 M_c^2)^2$ .

**Tempo** 1 Technical military planning operation.

2 Also TEMPO, temporary or temporarily.

**temporary flight restriction** Order prohibiting unauthorized aircraft from airspace above major accident, natural disaster or other event.

**temporary revision** Document printed on yellow paper which temporarily amends an item in a maintenance manual [now also issued electronically].

**TEMS** Turbine-engine monitoring system.

**TEN** Tactical environment network (USMC).

**10baseT** A standard high-capacity databus (Ethernet).

**Tencap** Tactical exploitation of national capabilities (US).

**TEND** Trend forecast.

**tendency** Variation with respect to time, esp. change in atmospheric pressure in 3 h period prior to an observation.

**Tenley** Secure voice system for Tri-Tac, for NSA (US).

**Tensabarrier** Seat-belt-type barrier to control people movements at airport (BAA); quickly closed or opened.

**tensile strength** Tensile force per unit cross-section required to cause rupture.

**tensile stress** That produced by two external forces acting in direct opposition tending to increase distance between their points of application.

**tensiometer** Measures actual tensile stress in flexible cable, such as flight-control circuit; can be used for flexible bracing wires.

**Tensioned Skin** Patented method of assembling circular-section structure from 3-D segment panels with skin under tension [Aviation Traders].

**tensioner** Self-contained mechanism inserted into cable carrying tensile load, eg in manual flight-control system, which maintains desired (usually constant) tension throughout; often in form of spring-loaded quadrants.

**tension field** Surface within which tensile force acts, with direction parallel to forces. Hence \* beam, eg wing spar, within which \* acts diagonally in vertical plane, tending to pull upper and lower booms together.

**tension regulator** See *tensioner*.

**tent** Quasi-conical upper compartment of long-endurance balloon housing near-spherical helium cell, the main purpose being thermal insulation.

**tent-pegging** Mistakenly diving into the ground (RAF colloq.).

**tenuity factor** In level bombing, correction for variation with height of atmospheric density.

**TEO** 1 Transferred-electron oscillator.

2 Top engine overhaul.

**TEOC** 1 Tactical electro-optical camera.

2 Technical-objective camera.

**TEORS** Tactical electro-optical reconnaissance system.

**TEOS** Technologies for energy-optimised systems.

**TEOSS, Teoss** 1 Tactical emitter operational support system; EW locator (USAF).

2 Tracking electro-optical sensor suite.

**TEP** Tactical electronic plot.

**tephigra,**

**tephigram** Graphical plot of atmospheric temperature and entropy on grid of intersecting isotherms and isentropic lines against vertical axis of height (decreasing pressure levels); also written  $T\phi$  gram, for temperature and entropy. Pronounced tee-fie-gram.

**Tepigen** Television picture generation (or generator).

**Teppop** Tracking-error propagation and orbit prediction.

**TER** 1 Triple ejector rack.

2 Total-energy requirements.

3 Terrain-following radar (TFR preferred).

**TERA** Terminal effects research and analysis.

**tera** Prefix =  $\times 10^{12}$ , symbol T.

**terabit** One trillion bits/s.

**teraflops** One trillion flops =  $10^{12}$  operations per second.

**TeraGrid** Most powerful computing system, created in US under auspices of NSF by linking 3,300+ processors to give speed of 13.6+ teraflops and storage of 450+ trillion bytes.

**terbium** Tb, soft silvery metal, density 8.23, MPt 1,356°C, importance growing.

**Tercom** Terrain comparison or terrain contour-matching; navigation technique in which vehicle guidance memory compares profiles of terrain below, sensed as unique sequences of digital height measures, with those already stored; hence, each match with terrain increases accuracy of refinement of basic (eg INS) guidance, whereas most systems degrade with time.

**térbenthine** Refined turpentine used as rocket fuel (F).

**Terec** Tactical electronic reconnaissance (Litton).

**TERLS** Thumba Equatorial Rocket Launching Station (UN facility in India).

**Term** Terminates.

**terminal** 1 Building, either discrete or dispersed, at airport which links airside with landside and through which all passenger traffic passes, or through which all cargo traffic passes. Very seldom is there one \* for pax and cargo, and at many major hub airports each airline or group of airlines has its own \*.

2 Downtown (city-centre) building at which passengers may check in for flights and from which they may be conveyed by public transport with baggage already checked to pass straight through a \* (1).

3 Normal general meaning of being connecting point through which flow passes into or out of a system in electric circuits, air traffic, data processing and many other disciplines.

4 Final portion of flight of missile between midcourse and target.

**terminal airport** That at which flight terminates. Also correctly used as point at which particular item of traffic leaves flight.

**terminal alternate** Alternate named in flightplan as second-choice terminal (3) if for any reason normal destination unattainable.

**terminal area** See *terminal control area*.

**terminal ballistics** Behaviour of projectiles at impact with, and penetration of, target.

**terminal building** See *terminal* (1).

**terminal clearance capacity** Maximum amount of cargo or personnel that can be moved through terminal (3) daily (DoD).

**terminal communications** Communications services or

facilities within terminal control area other than those used for approach or ground movement.

**terminal control area** Airspace control area, or portion thereof, normally at confluence of airways or air traffic service routes in vicinity of one or more airports. Extends from surface or from higher FL to specified FL and within it all aircraft are subject to specified rules and requirements. Often a TMA.

**terminal count** Final portion of countdown ending in lift-off.

**terminal guidance** 1 That governing trajectory from end of midcourse to impact with or detonation beside target.

2 Electronic, mechanical, visual or other assistance given to aircraft pilot to facilitate arrival at, operation within or over, or departure from, air landing or airdrop facility (DoD).

**terminal manoeuvring area, TMA** Controlled airspace region surrounding busiest airports (usually large city with many airfields); normally permanent IFR with other traffic by dispensation.

**terminal nosedive** Vertical dive at full power (arch.).

**terminal phase** 1 Portion of trajectory of ballistic missile between re-entry and target. Also other meanings in particular space missions, eg LM/CM redocking in lunar orbit.

2 Final part of missile trajectory after missile's own seeker has detected and locked on to target.

**terminal radar service area** Primarily an electronic environment, not extending below a floor at medium FL, providing radar vectoring and sequencing of all IFR and VFR aircraft landing at primary airport, separation of all aircraft in TRSA service area, and advisories on all unidentified aircraft on a workload-permitting basis.

**terminal velocity** 1 Highest speed of which aeroplane (rarely, other aircraft) is capable, reached at end of infinitely long vertical dive at full power through uniform atmosphere (suggest arch.).

2 Ultimate speed reached by inert body in free fall through particular prescribed atmosphere.

**terminal VOR** VOR located at or near airport at which particular flight terminates and specified as navaid used in final approach clearance.

**terminating bar lights** Red lights between final-approach lights and wing-bar lights.

**terminator** 1 Solid-propellant rocket subsystem comprising signal input, squib or detonator and blow-out port(s) for causing immediate thrust termination.

2 Boundary between sunlit and dark sides of planetary body, eg Earth, Moon.

**TERMM** Transportable emergency-response monitoring module.

**Terms** Terminal management system.

**Tern, TERN** Terminal and en route nav.

**ternary** Device capable of three states, normally called 0, 1, x.

**terne plate** US term for tinned, or lead-coated, mild steel sheet (not plate).

**Terp** 1 Turbine-engine reliability programme.

2 Terminal instrument-approach procedure [see Terps].

**Terpes** Tactical electronic reconnaissance processing and evaluation system (primarily USN/USMC).

**Terprom** Terrain profile matching, usually similar in principle to Tercom.

**Terps** Terminal en-route procedures (FAA).

## terrain-avoidance system

## test vehicle

**terrain-avoidance system** System, usually radar-based, providing pilot or other crew member with situation display of ground or obstacles ahead which project above either horizontal plane parallel to aircraft or plane containing aircraft pitch/roll axes so that pilot can manoeuvre aircraft laterally to avoid obstruction. Radar becomes primary flight instrument.

**terrain board** Physical model of landscape formerly used in simulation of air activity.

**terrain-clearance system** System, usually radar-based, providing pilot or autopilot with climb/dive signals such that aircraft maintains preset flight level while clearing peaks within selected height in vertical plane through flight vector. Unlike terrain-following, after each protruding peak aircraft levels out at prescribed FL.

**terrain comparison** See *Tercom*.

**terrain database** Comprises computer-stored 2-D grid of ground spot heights plus land culture information.

**terrain-following system** System, usually radar-based, which provides pilot or autopilot with climb/dive signals such that aircraft will maintain as closely as possible a selected lo height above ground contour in vertical plane through flight vector. In effect system projects radar skitoe locus which slides over terrain ahead to give minimum safe clearance.

**terrain masking** Obscuration of aerial and other targets by hills or buildings, esp. as seen at acute grazing angles by overland downlook radar.

**terrain orientation** Holding topographical map so that aircraft heading is at top of sheet or folded sheet.

**terrain profile** Outline of profile of ground surface, usually with vertical scale  $\times 5$  (sometimes  $\times 10$ ) published on approach chart or other documents to assist pilots.

**terrain-profile recorder** Airborne instrument, recording sensitive radar or laser altimeter, giving hard-copy readout for mapping and surveying.

**terrain-referenced navigation** Terrestrial reference guidance.

**terrestrial radiation** Earth IR radiation; also called eradiation.

**terrestrial reference guidance** Any method providing steering intelligence from characteristics (usually stored as quantified digital measures) of surface being overflown, thereby achieving flight along a predetermined path without the need for emissions. One example is Tercom. Also called terrain-reference [or referenced] navigation.

**terrestrial refraction** Refraction observed in light from source within Earth atmosphere; thus caused only by inhomogeneities of atmosphere itself.

**terrestrial scintillation** Generalized term for scintillation effects observed in light from sources within Earth atmosphere; also called atmospheric boil, optical haze and shimmer.

**Tersi** Series of EW jamming and aerial-pattern simulators.

**tertiary airflow** That passing through tertiary holes.

**tertiary holes** Apertures in gas-turbine flame tube or combustor downstream of secondary holes admitting air purely for dilution and cooling purposes to achieve desired uniform gas temperature across chamber exit plane.

**tertiary initiation** Impact with Earth's surface, especially land (NW).

**TERTM** Thermal-expansion resin transfer machine.

**TES** 1 Test and evaluation squadron.

2 Technology Experiment Satellite (India).

3 Tactical environment, or engagement, simulation [or system].

4 Thermal emission spectrometer.

5 Transportable Earth station.

6 Threat-emitter system.

7 Trials end system (ATN).

8 Total engine support.

9 See next.

**TES-A** Tactical Exploitation System-Army [EA-6B] (USN).

**TESAC, Tesac** Training and evaluation system for active countermeasures.

**Tesar** 1 Tactically enhanced synthetic-aperture radar.

2 Tactical-endurance synthetic-aperture radar (UAV) or search and rescue.

**tesla** SI unit of magnetic flux density;  $1\text{T} = 1 \text{ Wb/m}^2 = 10^4\text{G}$ .

**tesla coil** Induction coil without iron core normally giving HF output.

**TES-N** Tactical exploitation system – Navy (USN).

**Tess** 1 Tactical engagement, or threat-emitter, simulation system.

2 Transport efficiency support system.

**Test** Checklist at start of takeoff: time, engine instruments, strobe, transponder.

**testbed** Mounting, either on ground or in form of aircraft, upon which item can be mounted or installed for test purposes. When an aircraft may be, but not necessarily, prefixed by 'flight' or 'flying'. In US normally called test stand.

**test cell** Usually horizontal test stand, eg for rocket motor, surrounded except on operative side by protective shelter giving protection from weather and limited protection externally from explosion inside.

**test chamber** Environmentally controlled sealed chamber in which test can take place; eg can simulate stratosphere or hard vacuum with space solar radiation.

**test clip** Spring-steel clip for quick electrical connections to terminals.

**test club** Club propeller making no pretence at aerofoil shape but merely having stubby projecting arms in correct balance.

**test diamond** Region in supersonic tunnel working section within which model is placed and within which flow conditions are essentially constant at any one time.

**test firing** Firing of rocket, of any type, while mounted on testbed (test stand).

**test flight** Flight by aircraft, winged spacecraft or cruise missile for purpose of evaluating or measuring performance, handling or system operation.

**test pattern** Geometric pattern used in testing electronic displays.

**test program[me] set** Small box which is brought to check out cockpit processors.

**test rig** See *rig* (3).

**test section** 1 Tunnel working section.

2 Special glove aerofoil carried on flying testbed.

**test set** Packaged equipment, either versatile or for testing specific system, of electronic, hydraulic, pneumatic, microwave/RF or any other character, which can readily be brought to aircraft or have device brought to it.

**test vehicle** Air vehicle, normally unmanned, built to test

major element of its design, construction or systems and thus prove new concept.

**TET** <sup>1</sup> Turbine-entry temperature, see *turbine temperatures*.

<sup>2</sup> Tolerable exposure time, esp. with reference to aircraft in high-speed flight in gusts.

<sup>3</sup> Technical evaluation test.

**TETA** Triethylene-triamine.

**Tete** Total estimated time en route.

**tethered satellite** One connected to a space station, Shuttle Orbiter or other parent body by a fine cable up to 100 km (62.1 miles) in length.

**tether system** Later concept in which two masses are joined by tether (typically 50 km, 31 miles), self-aligning along radial from planetary body and offering advantages in changing orbital parameters, visiting bodies (e.g. Jovian satellites) in succession and generating electric power.

**Tetra** <sup>1</sup> Turbine-engine transient response analyser (EDP code).

<sup>2</sup> Terrestrial trunked radio.

**tetraethyl lead** Liquid added to most petros (gasolines) to improve resistance to detonation (anti-knock value or fuel grade); base material is Pb(C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>. Resulting fuel is called leaded. TEL content is typically about 5.2 ml/gal, 4.33 ml/US gal [or 2.18/1.815 for LL fuel]. See *Avgas*.

**tetrode** Thermionic valve (tube) containing cathode, plate and two other electrodes.

**Tetwog** Turbine-engine testing working group.

**TEU** Trailing edge up.

**TEV** Test, evaluation and verification.

**Tevi** Turbine-engine vibration indicator.

**Tewa, TEWA** Threat-evaluation and weapon assignment.

**TEWS, Tews** Tactical electronic-warfare suite, or electronic warning system.

**TEWT** Pronounced tute, tactical exercise without troops.

**Textolite** Obsolete ‘plastics’; hot pressed canvas/resin laminates.

**textured visuals** Visuals whose CGI tones are not plain grey shades but have texture corresponding to real life, giving enhanced spatial cues. Usually achieved by digital and photographic imagery combined.

**TEZ** Total exclusion zone.

**TF** <sup>1</sup> Trip fuel.

<sup>2</sup> US military engine-designation prefix: turbofan.

<sup>3</sup> US military aircraft designation prefix: fighter trainer; dual version of established fighter.

<sup>4</sup> Turbine fuel is available.

<sup>5</sup> Toroidal field.

<sup>6</sup> Technology forecasting.

<sup>7</sup> Torpedo (armed) fighter (UK, pre-1953).

<sup>8</sup> Terrain-following.

<sup>9</sup> Thin film.

<sup>10</sup> Tandem fan.

<sup>11</sup> Task force.

<sup>12</sup> Toll free.

<sup>13</sup> Time/frequency (or T/F).

<sup>14</sup> Traffic flow.

<sup>15</sup> Track to a fix.

**T/F** Transformer.

**Tf** <sup>1</sup> Temperature at flexible T-O rating.

<sup>2</sup> Fuel temperature.

**tf** Radar frame time.

**TFA** Transfer-function analyser.

**tfa** Average time between false alarms.

**T-fast** Technology for frequency-agile digital synthesised transmitters.

**TFB** Tower fly-by.

**TFC** <sup>1</sup> Total final consumption.

<sup>2</sup> Tactical fusion centre (AAFCE).

<sup>3</sup> Tactical fire control.

<sup>4</sup> Tactical flag command; C adds centre.

<sup>5</sup> Taxes, fees and charges.

**tfc** Traffic (FAA).

**TFD** <sup>1</sup> Thin-film diode.

<sup>2</sup> Time/frequency display.

**TFDC** Test Flight and Development Centre [Overberg AFB] (S Africa).

**TFE** <sup>1</sup> Terrain-following E-scope.

<sup>2</sup> Therminic fuel element.

<sup>3</sup> Tetrafluoroethylene, major additive to magnesium IRCM.

**TFEC** Tactical fighter electronic combat.

**TFEL** Thin-film electroluminescent display, a CRT alternative.

**TFF** <sup>1</sup> Tri-fluid fuel.

<sup>2</sup> Thin-film filter.

**TFG** <sup>1</sup> Thrust-floated gyro.

<sup>2</sup> Tactical Fighter Group.

**TFH** Thick-film hybrid.

**TF/HF** Tandem fan, hybrid fan.

**T-fix** Elapsed time since last update of position of moving surface target.

**TFK** Trainer facility kit.

**T-Flir** Targeting FLIR.

**TFM** <sup>1</sup> Tactical flight management system.

<sup>2</sup> Traffic flow management.

**TFMS** <sup>1</sup> Tactical frequency-management system.

<sup>2</sup> Traffic-flow management system (FAA).

**TFOV, TfOv** Total field of view, limited in HUD by head freedom and optical aberrations.

**TFP** Technology forecast panel.

**TFPA** Torso front protective armour.

**TFQI** Transonic flying qualities improvement.

**FPRT** Thin-film platinum resistance thermometer.

**TFR** <sup>1</sup> Terrain-following radar.

<sup>2</sup> Total fuel remaining.

<sup>3</sup> Temporary flight restriction area (FAA).

**TFS** <sup>1</sup> Tactical Fighter Squadron.

<sup>2</sup> Transformational force structure.

**TFSD** Tungsten-filament seven-bar display.

**T/FSDS** Time/frequency standards distribution system.

**TFSF** Time to first system failure.

**TFSUSS** Task-force on scientific users of space station.

**TFT** <sup>1</sup> Thin-film transistor.

<sup>2</sup> Trim for takeoff.

**TFTA** Terrain following, terrain avoidance.

**TFTA**<sup>2</sup> Terrain following, terrain avoidance, threat avoidance.

**TFTP** Trivial file transfer protocol.

**TFTS** <sup>1</sup> Tactical Fighter Training Squadron.

<sup>2</sup> Terrestrial flight telecommunications, or telephone, system.

**TFU** <sup>1</sup> Turret Flir unit.

<sup>2</sup> Technical follow-up.

**TFV** Traffic-flow violation.

**TFW** Tactical Fighter Wing.  
**TFWC** Tactical Fighter Weapons Center.  
**TG** 1 Transportgeschwader (G).  
 2 Tactical, or Task, Group.  
 3 Techniques generator (EW).  
 4 Transmission gate.  
 5 Training glider (USAAF, 1941–47).  
 6 Timer – VDL management entity.  
 7 Terminal guidance.  
 8 Terminal gap.  
 9 With suffix numbers, amine-based rocket fuels (Russia); see suffix zero-2.  
**Tg** Tropical Gulf.  
**TGA** Target gate analysis.  
**TGAT** Tactical GPS anti-jam technology.  
**TGB** Transfer gearbox.  
**TGC** 1 Travel-group charter (US term, basically = UK ABC).  
 2 Turbulence gain control.  
**TGCR** Tactical generic cable replacement (FO transmission system).  
**TG4** Maximum time between GSIF's timer.  
**TGG** Third-generation gyro (Northrop).  
**TGIF** Transportable ground interface facility.  
**TGL** 1 Touch-and-go landing (ICAO).  
 2 Temporary guidance leaflet (FAA).  
**TGO** Thermally-grown oxide.  
**TGP** 1 Twin-gyro platform.  
 2 Terminally guided projectile.  
**TGS** 1 Triglycine sulphate; pyroelectric IR detector material.  
 2 Taxiing, or taxiway, guidance system, (ICAO) or sign.  
 3 Turreted gun system.  
 4 Maximum link-overlap timer.  
 5 Tactical ground station.  
**TGSM** Terminally guided sub-munition.  
**TGT** Turbine gas temperature.  
 2 Target.  
 3 Titanium/graphite/titanium.  
**Tgt Opp** Target of opportunity.  
**TG3** Ground-station's maximum time between transmissions.  
**TGW** Terminally guided weapon.  
**TG-02** Rocket fuel, 50/50 triethylamine and xylidene, used with AK-20F oxidant (R).  
**TH** True heading.  
**T<sub>H</sub>** Total temperature.  
**THAAD** Theater high-altitude air defense [S adds system] (USA).  
**THAD** Terminal-homing accuracy demonstrator.  
**Thagg** Tactical high-antijam GPS guidance.  
**THAR** Tyre height above runway.  
**THAWS, Thaws** Tactical homing and warning system (RCA).  
**THDG** True heading.  
**THDR** Thunder.  
**theatre** Geographical area of military operations in which commander of unified or specified command has complete responsibility; today used as adjective, often synonymous with tactical.  
**theatre range** Range of combat aircraft within a theatre, as distinct from deploy range.  
**Thel, THEL** 1 Tactical high-energy laser.

2 Theater high-energy laser (US, Israel).  
**The lact** Tactical high-energy laser advanced-concept technology.  
**The LTAS** The Lighter-Than-Air Society [Akron, OH 44306] (US).  
**Themis** Thermal-emission imaging system.  
**Then Year** Actual funds voted or spent; must be factored for inflation to enable comparison to be made with 'now'.  
**theodolite** Optical sight or telescope whose az/el can be accurately read off angular scales.  
**Theodorsen** Theory [1935] solving unsteady aerodynamic loads on a 2-D harmonically oscillated aerofoil in inviscid incompressible flow, \* function = symbol C(k).  
**theoretical gravity** That at Earth's surface if Earth's mass was reshaped as perfect sphere.  
**theoretical thrust coefficient** A thrust/time value for solid-propellant rockets computed from large equation involving an effective value and assumed conditions for various areas and pressures. Symbol C°<sub>1</sub>.  
**therapeutic adaptor** Coupled to continuous-flow oxygen mask, approximately triples flow rate; used for passengers with respiratory or heart problem.  
**therapeutic oxygen** Administered primarily to treat ailment, eg pulmonary or cardiac faults.  
**therm** Non-SI unit of energy = 10<sup>5</sup> BTU = 105.506 MJ.  
**thermal** 1 Local column of rising air in atmosphere, usually caused by surface heat source.  
 2 To use (1) as energy input for soaring flight.  
**thermal acoustic fatigue** Fatigue of structure caused by impingement or close proximity of hot gas jet.  
**thermal anticing** Anticing by heating affected surface.  
**thermal barrier** Notional barrier to further increase in some variable, eg flight speed in atmosphere or turbine entry temperature in engines, caused by inability of materials to withstand increased temperatures. Continually being eroded by new refractory materials.  
**thermal barrier coating** Vast range of refractory materials, usually deposited by electron beam or plasma spray, based on zirconia, yttrium and similar exotics.  
**thermal battery** Electrical cell stored inactive and activated chemically for one-shot high-power output.  
**thermal blooming** See *blooming*.  
**thermal coating** See *thermal barrier coating*.  
**thermal coefficient of expansion** Increase of (1) length per unit length, or (2) area per unit area, or (3) volume per unit volume, caused by rise in temperature of 1°C (often defined as from 0° to 1°C, or from 15° to 16°C).  
**thermal conductance** Rate of flow of heat per unit time through unit cross-section area; 1 BTU.ft<sup>-2</sup>h.<sup>-1</sup>F = 5.67826 Wm<sup>-2</sup>h.<sup>-1</sup>C; 1 Wm<sup>-2</sup>h.<sup>-1</sup>C = 0.17611 BTU.ft<sup>-2</sup>h.<sup>-1</sup>F.  
**thermal conductivity** Time rate of flow of heat through unit area normal to temperature gradient per unit T° difference. Symbol λ or k, rate given by Fourier's law. SI unit is Wm<sup>-1</sup>K<sup>-1</sup>; Imperial (obs.) might be BTU ft<sup>-1</sup>s<sup>-1</sup>F<sup>-1</sup>.  
**thermal cueing unit** Adjunct to FLIR-based attack system which puts marker boxes round all likely surface targets, picking them according to their high temperature, and which automatically feeds target co-ordinates to the attack system if any of these boxes is touched by the pilot on the HDD touch display.  
**thermal cycling** Oscillating between low and high temperatures.  
**thermal de-icing** De-icing by heating affected surface.

## thermal diffusivity

**thermal diffusivity** Measure of transfer of heat by diffusion analogous to viscous motion; symbol  $\alpha = \lambda/\rho C_p$ .

**thermal diode** Solid-state generator of electricity comprising layer of semiconductor at room temperature joined by thermal insulative layer to layer heated to 250–450°C.

**thermal efficiency** Basic efficiency parameter of heat engine, defined as percentage ratio of work done in given time to mechanical equivalent of heat energy burned in fuel supplied in same period. Usual symbol  $\eta_T$ .

**thermal emission** EM radiation solely due to body's temperature (which if hot enough contains strong visible radiation).

**thermal excitation** Acquisition of excess energy by atoms or molecules as result of collisions.

**thermal expansion** Increase in dimensions caused by increase in temperature.

**thermal exposure** Calories/cm<sup>2</sup> received by normal surface in course of complete NW detonation (DoD).

**thermal fatigue** Mechanical fatigue caused by stresses repeatedly imposed by thermal cycling.

**thermal gradient** See *temperature gradient*.

**thermal gradiometer** Airborne instrument for detecting thermals by thermocouples on wing-tips which, in presence of temperature difference, sends electrical signal to cockpit indicator.

**thermal heating** Tautological; kinetic heating is meant.

**thermal imagery** Produced by measuring and electronically recording thermal radiation from objects (NATO). Normally IR wavelengths only are implied. Hence thermal imaging, to produce pictorial displays or print-outs showing variation of temperature over field of view.

**thermal index** A forecast value of the temperature difference between sinking and rising air.

**thermal instability** Any combination of temperature gradient, thermal conductivity and viscosity resulting in convective currents, eg wind in atmosphere.

**thermal keel** Generated by positioning engine jet nozzles well forward under the fuselage [helps reduce generation of sonic boom].

**thermal lift** 1 Lift due to thermal (1).

2 Lift imparted to air mass because of greater density of cold surrounding air, not quite synonymous with (1).

**thermal load** Imprecise term usually meaning temperature gradient or temperature stress.

**thermally expanded metal** Fabrication of parts from aluminium alloy sheets rolled together with intervening patterns of 'ink'; the latter prevents the sheets bonding and, on subsequent heating, expands to force the unbonded parts to fit a mould.

**thermal neutron** Neutron slowed, eg in moderator, to thermal equilibrium with surroundings at about 2,200 m/s (so-called slow neutron); \* analysis is principal method used in detecting presence of explosives.

**thermal noise** RF noise caused by thermal agitation in dissipative body (any conductor or semiconductor), also called Johnson noise.

**thermal paint** Paint which changes colour very precisely as the component is heated, afterwards remaining at the colour appropriate to the highest temperature reached.

**thermal picture synthesizer** Matrix of heat-emitting thin-film resistors on Si substrate, each representing individually addressed pixel to give overall large picture rate of 50 Hz.

## thermochemistry

**thermal protection** Protection against kinetic heating during atmospheric entry (re-entry) of spacecraft structure, RV or other body, esp. one intended for repeated space missions.

**thermal pulse** Total IR emission from NW detonation, or plot of IR flux against time during complete burst and fireball climb.

**thermal radiation** 1 See *thermal emission*.

2 Total heat and light radiation produced by NW detonation (DoD).

**thermal relief valve** Safety valve in fluid system to guard against excessive pressure caused by overheating.

**thermal runaway** 1 Fault condition with element of danger affecting Ni/Cd batteries characterized by particular cells losing resistance (possibly because of high temperature) and thus taking increased current, lowering resistance still further in chain-reactive process.

2 Similar divergent overheating in current-carrying transistor.

**thermal sensitivity** Of IR camera, quantified difference in temperature required to output different tonal value between black/white, typically 0.02–0.1°C.

**thermal shock** Severe mechanical stress resulting from sudden extreme temperature gradient.

**thermal soaring** See *soaring*.

**thermal stress** See *temperature stress*.

**thermal switch** Switch activated by temperature difference or particular temperature.

**thermal thicket** Flight conditions in which kinetic heating (or other thermal problems) is a factor to be considered but does not yet impose a thermal barrier (colloq.).

**thermal wind** Notional vector difference between winds at different heights, caused by horizontal variation of atmospheric temperature and hence pressure at all upper heights (note: not pressure surfaces).

**thermal X-rays** EM radiation, mainly in soft (low energy) X-ray region, emitted by extremely hot NW debris.

**thermel** Any device based on Seebeck, eg thermocouple, thermopile.

**thermie** Non-SI unit of work (mechanical energy); 1 th = 4.1855 MJ.

**thermionic** Involving electrons emitted from hot bodies.

**thermionic converter** Electric generator powered by hot emitter and cold collector.

**thermionic rectifier** Depends on unidirectional electron flow from cathode to anode.

**thermionic tube** See *thermionic valve*.

**thermionic valve** Evacuated capsule, usually glass, containing heated cathode emitting electrons attracted to anode, usually via one or more intervening control electrodes usually called grids. In US called vacuum tube.

**theristor** Protective resistor based on semiconductor having high negative temperature coefficient of resistance.

**thermite** Mixture of finely divided magnesium and iron oxide used as heat source in welding and as incendiary filling; originally spelt with capital T.

**thermobaric warhead** Creating both high-temperature and blast-wave effects [often said of FAE].

**thermobarograph** Provides continuous readout of temperature and pressure.

**thermochemistry** Branch of chemistry concerned with

## thermochromic

thermally induced reactions and relationship between chemical changes and heat.

**thermochromic** LO technology in which appearance is changed by variation in temperature.

**thermochromic tube** CRT with phosphor replaced by heat-sensitive layer.

**thermocline** Sharp submarine temperature gradient.

**thermocouple** Instrument based on Seebeck effect which measures temperature difference between pair of dissimilar-metal junctions; much used for high-temperature measures using refractory metals, and in common copper/constantan junction at room temperature, eg for met. observation.

**thermodynamics** Science based upon heat flow and temperature changes, esp. those in moving fluids.

**thermodynamic cycle** Operating cycle of any heat engine. In some, eg virtually all piston engines, one parcel of fluid at a time goes through complete \*\* in same enclosed (usually variable-size) volume; in others, eg gas turbines, continuous flow of fluid goes through \*\* by passing from one part of device to another, each component handling only one part of \*\*. The working fluid may be recycled, continually changing state liquid/vapour.

**thermodynamic efficiency** See *thermal efficiency*.

**thermodynamic energy equations** Exact expressions of variation of pressure, volume and temperature in reversible processes in perfect gas.

**thermodynamic equilibrium** Time-invariant state in which all processes are balanced by reverse process and entropy production vanishes.

**thermoelectric cooling** Local cooling using Peltier and cooling 'hot' junction; 'cold' junction then falls to desired level at -20 to -30°C.

**thermoelectric generator** Electric generator based on thermocouples using Seebeck, Thompson, Kelvin or Peltier effects; common spacecraft systems use nuclear reactor or radio-isotope to heat junction often based on Ge/Si alloy.

**thermogram** 1 Single-line output of traditional thermograph.

2 Pictorial output of thermographic camera.

**thermograph** Recording thermometer using pen/chart or light-spot trace on film. Output is a thermogram.

**thermographic camera** IR camera, usually of IRLS type.

**thermography** Translation of temperature changes in a scanned scene into visual picture, today important in military and civil aerial reconnaissance, industrial process control, medicine and many other fields. Either black/white (black = cold, white = hot) or colour.

**thermohydrometer** Hydrometer with thermometer, giving two chart outputs.

**thermometer** Instrument for measuring temperature.

**thermometer screen** Louvred box screening thermometer from direct sunlight; usually contains other met. instruments and in US called instrument shelter.

**thermonuclear** Processes in which extremely high temperatures are used to initiate fusion of light nuclei.

**thermonuclear weapon** Hydrogen bomb.

**theropile** Thermoelectric generator comprising stack of thermocouples.

**thermoplastic recording** Patented (GE) process for recording sound or video signals via electron beam direct

## thin-film circuit

on thermoplastic layer heated by microscopic currents induced in underlying conductive layer.

**thermoplastics** Large class of synthetic polymers which may be repeatedly softened and remoulded by heating.

**thermosetting plastics** Synthetic polymers that are chemically changed irreversibly by chemical action, for example a hardening agent, or by EM radiation, notably heat or UV irradiation, generally setting hard.

**thermosphere** Outermost region of atmosphere from top of mesosphere outwards into space, characterized by more or less steadily increasing temperature with distance from Earth.

**thermostat** Device for maintaining a desired temperature by taking action at preset limits of low and high temperature.

**thermotropic model** Atmosphere used in forecasting one temperature and one pressure surface.

**Thesh** Threshold, also Thld, THR.

**theta** Greek letter  $\theta$ , used for many parameters, including pitch angle (thus,  $\theta$  = pitch rate) and azimuth (hence R $\theta$ ). See Appendix 1.

**THI** Tactical hit indicator.

**thickened fuel** Aircraft fuel designed to resist fine dispersion and instead to break down in crash into globules with near-zero surrounding vapour; generally synonymous with gelled fuel.

**thick-film** Very diverse technology of electronics involving processing, high-current devices, current-generation (inc. solar cells) and many other topics, mainly using insulating substrates but often with semiconductor layer.

**thickness** 1 Of wing, maximum straight-line distance from external skin of upper surface to external skin of lower surface measured in plane of aerofoil profile and perpendicular to chord line.

2 According to some authorities, measured perpendicular to camber line.

**thickness/chord** Ratio of thickness to chord of wing, both measured in plane of aerofoil profile at same station.

**thickness distance** Distance aft of leading edge of maximum thickness of supersonic rhomboidal or double-wedge wing, expressed as % chord.

**thickness gauge** See *feeler gauge*.

**thickness lines** Lines joining points on chart where vertical distance between pressure surfaces is everywhere same.

**thickness ratio** Wing t/c ratio.

**thimble** 1 Pear-shaped eye around which end of control cable is spliced.

2 Ratchet turning knob of hand micrometer.

3 Pimple-like radome, especially on or under nose [usually adjectival].

**thin-aerofoil theory** For most modern transonic aerofoils t/c is low enough for it to be assumed that thickness along the camber line is zero.

**thin-case bomb** Conventional bomb for blast effect against soft target. Also called light-case (UK, WW2).

**thindown** Progressive energy loss by primary cosmic rays in ionising surrounding medium.

**thin-film circuit** Electrical or electronic circuit formed by depositing thin film on (usually insulating) substrate; normal manufacturing methods are vacuum deposition and cathode sputtering. Films may be conductive, semiconductor or insulating.

## **thin-film lubrication**

**thin-film lubrication** Imperfect, with occasional metal/metal contact.

**thin-film transistor** IGFET constructed by evaporating on to insulating substrate metal electrodes, semiconductor layer(s), insulating upper layer and metallic gate; abb. TFT.

**think tank** Centralized group of people normally working for government or large corporation engaged in futures, forecasting, ultra-new technologies and other disciplines calling for visionary judgement.

**thinner(s)** Solvents for paint, dope and other liquids to reduce viscosity.

**thin route** Airline route, usually intercontinental, offering only modest traffic.

**thin-tape system** Applied to aircraft skin to increase stealthiness of joints.

**THIR** Temperature, humidity and IR radiometer.

**third-angle projection** Convention in engineering drawing in which front view, side elevation and plan each show face nearest to it in adjacent view; traditional US arrangement becoming standard in European aerospace.

**third-level carrier** Generalized term for 'third tier' of scheduled airline operations, also called feeder or commuter and often of radial nature serving single city hub. No clear demarcation separating from second-level (local-service or regional).

**thixotropic** Becoming liquid when vibrated or stirred, setting after standing for a period.

**THK** 1 Turk Hava Kurumu [national air-sport association; office, TR-06100 Ankara] (Turkey).

2 Thick.

**THL** 1 Tailplane hinge line.

2 Tourelle hélicoptère léger (F).

**Thld** Threshold.

**THN** Thin.

**Th<sub>2</sub>O<sub>3</sub>** Thorium oxide.

**Thor, THOR** 1 Thermionic opening reactor (burst power up to GW range).

2 Terahertz operational reachback (Darpa).

**thoriated** Of a TIG electrode, impregnated with thorium oxide.

**thorium** Th, silvery radioactive metal, density 11.7, MPt 1,750°C.

**Thornel** Tradename for carbon and graphite fibres.

**thou** Thousandth of an inch, 25.4 µ.

**THP** 1 Thrust horsepower, often thp.

2 Through-hole plated.

3 Turbo-hydraulic pump.

4 Total-head pressure.

**THR** 1 Threshold, threshold lights.

2 Turboreacteur à hélice rapide = propfan (F).

3 Thrust.

**thread chaser** Tool for removing contamination, eg paint or dirt, from thread.

**thread filter** Long fine screwthread on outer surface of cartridge inserted tightly into surrounding unthreaded cylinder to filter fine fragments, typically as last-chance \* before oil reaches vital feed jets.

**thread gauge** Hand gauge with many specimen threads, one of which is matched with part.

**threading the needle** Process of accurately flying through a small gate in airspace, eg in setting a speed record (colloq.).

## **three greens**

**thread insert** Steel helix screwed into soft (eg aluminium) hole.

**threat** 1 Hostile anti-aircraft defences, especially air-defence radars, SAM systems, AAA and fighters.

2 A target that has satisfied the \* -detection logic and therefore requires a traffic or resolution advisory (TCAS).

**Threat awareness unit** Minimum time flight crew need to discern collision threat and take avoiding action; performance envelope of aircraft divided by closure rate of intruder.

**threat circle** Projected on cockpit display showing computed region in which LO aircraft might expect to be detected by particular hostile radars.

**threat cloud** Total collection of warheads, chaff and other penetration aids in ICBM attack.

**threat evaluation** Process of detecting, analysing and classifying hostile offensive systems, either in warning of attack or during penetration of hostile territory when systems are surface-to-air.

**threat library** Numerical characteristics of hostile threats, especially EM emitters, stored in friendly computer (eg of RWR receiver).

**threat simulation** Simulation of hostile offensive systems, eg by add-ons to RPV target to include emissions, dispensed payloads and jamming.

**3AF** Association Aéronautique Astrophysique de France; PAN adds Phénomènes Aérospatiaux Non-identifiés [UFO].

**three-axis autopilot** Has authority in pitch, roll and yaw.

**3-bar VASI** Comprises VASI plus additional pair of upwind (210 m, 700 ft) wing bars symmetrically disposed about centreline each having at least two light units, for use by LEW aircraft.

**three-bay biplane** Natural extension from *two-bay*.

**three-bearing swivel module** 3BSM, turbofan jetpipe comprising three sections with scarfed (diagonal) joints, such that rotation of the middle section causes the final portion to vector from horizontal to vertical (or slightly beyond). In some designs the whole unit can rotate relative to the aircraft to provide yaw control.

**three-body problem** Mechanics of motion of small body in gravity of two others.

**3BSM** Three-bearing swivel module (STOVL).

**3BV** 3-bar VASI.

**three-control aeroplane** Conventional, with separate pilot input for each rotational axis.

**3-D cam** Cam whose profile varies across its width and which moves axially as well as rotationally.

**3-D flow** Fluid flow which cannot be represented fully in 2-D, eg flow over a real wing.

**3-DOF** Three degrees of freedom, usually about orthogonal axes.

**3DQP** Three-dimensional quartz-phenolic.

**3-D radar** Radar enabling position of target to be determined in 3-D space, either by Cartesian methods or, more often, by az/el plus slant range.

**3-D tool** Jig or fixture used to define exact shape of finished assembly, eg complex hydraulic piping or wiring loom.

**3E** Environment, efficiency, economy.

**three-float seaplane** Main float on the centreline and stabilizing float on left and right.

**3GCS** Third-generation cellular system[s].

**three greens** Landing gear is down and locked (colloq.).

**3He** Helium, valency 3.

**3LM** Third-level maintenance.

**three-moment equation** For solving bending moments and other loads at ends of two adjoining spans of continuous beam.

**3-P** Planning, production, progress.

**three-phase current** Alternating electrical current made up of three phases, each with vector separation of  $120^\circ$ ; carried by triple wire.

**three-phase equilibrium** See *triple point*.

**3φ** Three-phase current [3-phi].

**three-pointer altimeter** Dial instrument with short needle for thousands (ft or m), mid-length for hundreds and longest for tens.

**three-point landing** Correctly judged landing by tailwheel-type aeroplane in which main and tail wheels touch ground simultaneously with wing stalled.

**three-point mooring** Mooring for aerostat in which three lines are run (often from single point, eg nose of airship) to three ground anchors, usually at apices of equilateral triangle.

**three-point tanker** Equipped with two outer-wing HDUs and one at the tail.

**3-pole switch** Opens and closes three conductors or circuits.

**three-poster** STOVL or V/STOL vectored-thrust propulsion system having three jets; normally two cold fan jets and one hot core jet, but alternatively two main (rear) jets plus an auxiliary nose jet fed via a bleed air duct.

**three-shaft engine** Gas turbine having LP, IP and HP shaft systems.

**three-stream engine** 1 Turbofan (HBPR) in which fan thrust (probably VIGV modulated) and core jet are used for propulsion and LP compressor (core supercharger) is used for blowing purposes.

2 Any engine in which fan thrust, core thrust and lift thrust or bleed are used separately.

**3 to 1 rule** Air distance 3 n.m. for each 1,000 ft lost in letdown.

**3-view drawing** GA drawing, normally showing elevation (left side), front and plan.

**3-way switch** Routes input along either of two outputs.

**3-wire** Target of most carrier arrested landings, No 3 wire; hence \*\* landing.

**3-wire circuit** Neutral wire between two outer wires, latter having potential difference from neutral equal to half that between them.

**threshold** 1 Beginning of usable portion of runway, ie downwind end.

2 In automatic control systems, point at which response is first noticed, usually defined in terms of input displacement (see \* level).

3 Flight condition when fixed-wing aerodyne is on point of stall.

4 Point at which sound just becomes audible (\* of audibility or of hearing), normally  $2 \times 10^{-5}$  N/m<sup>2</sup>.

5 EAS giving lowest comfortable cruising, possibly higher than that for minimum fuel.

6 See thresholds.

**threshold contrast** Smallest contrast in luminance visible under given conditions.

**threshold crossing height** Height of glideslope above threshold.

**threshold curve** Plot of sound frequency against noise

level in dB (or other noise measure) just audible against quiet background, eg anechoic chamber.

**threshold displacement** Linear distance between end of full-strength runway pavement and displaced threshold, with latter shown on airfield charts as white bar across runway crossed by narrow black line, and expressed as minus quantity in certain navaid figures, eg Vorloc II =  $-380$  ft.

**threshold dose** Minimum quantity of radiation producing detectable biological effect.

**threshold illuminance** Minimum value of illuminance eye can detect under given dark adaptation and target size; also called flux-density threshold.

**threshold level** Threshold (2), esp. in rate gyro developing electrical output as function of rate of turn; that angular rate after rotational acceleration from rest at which there is first indication of output, or change in output; normal unit is  $\text{°/s} \times 10^6$ .

**threshold lights** If fitted, bidirectional units, showing green towards approach and red towards runway, in continuous row across threshold (rare at displaced threshold).

**threshold limit value** Average airborne concentration of toxic substance[s] normal person can withstand 8 h per day 5 days per week, usually expressed as ppm or mg/m<sup>3</sup> at 25°C/760 mm Hg.

**threshold marking** For simple runway, runway number in white, visible to pilot on approach; if displaced threshold, preceded by white transverse bar touched by four arrowheads pointing upwind and preceded by series of centreline arrows. For instrument runway, four bold white axial stripes in rectangular group on each side preceeding runway number.

**thresholds** Limits on programme monetary changes imposed by US Defense Secretary.

**threshold sampling time** Time since overhaul at which engines are removed and inspected in preparation for extension in TBO; \* may be less or more than new TBO.

**threshold speed**  $V_T$ ,  $V_{AT}$  and  $V_{T\ max}$ .

**THR HOLD** Thrust, or throttle, hold.

**THRFTTR** Thereafter.

**throat** 1 Point of smallest cross-section in duct, especially that in con/di nozzle, supersonic tunnel upstream of working section, gas-turbine rotor blades and rocket engine or motor thrust chamber and nozzle.

2 Entry to windsock.

**throatable** Jet or fluid flow controllable by changing shape or area of throat (unusual except in tunnels).

**throat control** In gas turbines, system controlling flow through nozzle guide vanes upstream of turbine.

**throatless chamber** Rocket thrust chamber without throat yet still achieving supersonic expansion, eg multi-chamber toroidal type.

**throatless shear(s)** Power shear for cutting large sheet or plate which may be rotated during cut to leave curved edge.

**throat microphone** Microphone held against skin of throat; better for deep or guttural voices or languages.

**throttle** 1 Input control, usually hand lever rotating through arc, for main vehicle propulsion.

2 System responsible under pilot for varying engine power.

3 Valve in carburettor or fuel control which governs

## throttle back

admission to engine of either air, fuel or (piston engine only) mixture.

*4* To reduce power of engine, also called to \* back.

*5* To constrict fluid flow path and thus reduce mass flow.

**throttle back** To reduce power.

**throttle friction** Pilot-operated device which greatly increases resistance of throttle lever(s) to movement, effectively locking them in set position; also called friction lock.

**throttle icing** Ice accretion in carburettor near or on partially closed throttle (3).

**throttle lock** See *throttle friction*.

**throttle push** Pilot action to increase power.

**throttle sensitivity** Change in thrust or power per unit movement of throttle lever.

**throttle tension** Locking resistance value of friction lock.

**throttling capability** Range of thrust expressed as percentage to 100, over which liquid rocket (occasionally other type of engine or propulsion) is designed to operate.

**through-deck ship** Generally, one with flight deck unobstructed by any full-width superstructure, even though not necessarily extending to bow.

**through hardening** Heat treatment or other procedure which increases hardness through the entire piece of metal [see *case hardening*].

**through-stick feedback** Characteristic of some autopilots that, when engaged, pilots flight controls move.

**through-thickness pinning** Repair of major damage to composite structure in which numerous fine pins are collapsed by a foam carrier.

**throw** *1* Part of crankshaft to which conrod attached, comprising webs and crankpin.

*2* Loose measurement of distance to which ECS fresh-air inlet projects, in absence of bulk cabin air movement.

**thrower ring** Flange on rotating shaft which flings off leakage oil or other fluid.

**throw-off clutch** Mechanical shaft drive which automatically disconnects as a particular condition is reached [in starting an engine, when torque falls to zero].

**throw weight** Total mass of payload carried by ballistic missile, in case of ICBM including warheads, RVs, decoys and other penails, post-boost propulsion and terminal guidance systems.

**THRP** Port throttle (caption).

**THRS** Starboard throttle (caption).

**THRU, Thru** *1* Through.

*2* I am switching you to . . .

**thrust** Force, esp. that imparting propulsion, SI unit is newton (N), conveniently multiplied in kN = 224.80 lb st; 1 lb st = 4.44483 N [see *force* for other conversions]. Useful \* of turbofan or turbojet is resultant of all \* generated by fan (positive), front of combustor (positive), turbines (negative) and nozzles (negative),

\* at each location being  $AP + \frac{WV}{g}$  where A

is area of flow cross section, P is pressure, W is mass flow and V flow velocity. Overall net \* is  $A(P-P_0) + \frac{W(V_j-V)}{g}$

where P is static pressure at nozzle,  $P_0$  local atmospheric pressure,  $V_j$  is jet velocity and V velocity of aircraft.

**thrust angle** *1* Acute angle between axis of nozzle of canted solid motor and centreline axis of vehicle, measured in plane passing through both axes if possible.

## thrust/frontal area

*2* See *propeller angle of attack*.

**thrust augmentation** Usually means afterburning, but also applied to water injection, and to piston engine ejector-exhaust schemes.

**thrust-augmented wing** Aeroplane wing in which enhancement of circulation by powered-lift system also gives significant additional thrust (many arrangements, but augmentation of thrust invariably secondary objective).

**thrust axis** Axis along which resultant propulsive thrust acts. With a turbofan this is resultant of fan and core jets, and with a turboprop that of propeller and (probably angled) jet. In multiengined aircraft \* can oscillate because of engines outboard on flexible wing.

**thrust bearing** Bearing, usually tapered roller, needle or ball, that resists axial shaft load due to propeller thrust.

**thrust buildup** Sequence of programmed events in large rocket engine between ignition and liftoff.

**thrust bump** Sudden uncommanded change [especially increase] in thrust.

**thrust chamber** Complete thrust-producing portion of liquid rocket engine comprising combustion chamber and nozzle, often mounted on gimbals; not applicable to other types of engine.

**thrust coefficient** *1* For propeller, basic performance calculation method based on Drzewiecki method of plotting grading curve of thrust against blade radius, yielding value  $k_T$ , constant for each value of advance ratio J; \*\* then equals  $k_T J^2$  and has symbol  $C_T$ . This is also measured thrust divided by  $\rho n^2 D^4$  where  $\rho$  is density, n rpm and D diameter.

*2* For rocket motor, measured \*\* is thrust: time integral over action-time interval divided by product of average throat area and integral of chamber pressure: time over action-time interval, symbol  $C_f$ .

*3* For CC/BLC blowing slit,  $T/qS$ .

**thrust component** In propeller theory (Drzewiecki), force on one element parallel to axis of rotation,  $T_c$ ; convenient to plot  $T_c$  as ordinate against blade radius, area under curve being measure of total thrust,  $T = N/2 \rho V^2 \int_0^r T_c dr$  where N is number of blades,  $1/2 \rho V^2$  dynamic head and  $T_c$  integrated between axis of rotation (or, in practice, spinner diameter) and tip radius r.

**thrust control computer** AFCS computer providing control of engine  $N_1$  and thrust, computation of engine limit parameters, and autothrottle.

**thrust cutoff** See *cutoff*.

**thrust decay** Gradual falloff in thrust of solid motor, usually a slow fall from peak to cutoff or burnout followed by rapid \*\* over 2 to 8 s and to zero after perhaps 10–12 s.

**thrust-decay system** Idle-area reset (turbofan).

**thrust deflector** Various schemes for V/STOL or STOVL, see four-poster, switch-in deflector, vectored thrust, etc.

**thrust equivalent horsepower** See *thrust horsepower*.

**thruster** Small propulsor, normally any of many kinds of rocket, used for spacecraft attitude control or fine adjustment of velocity.

**thrust face** Side of propeller blade corresponding to underside of aerofoil.

**thrust/frontal area** Jet-engine thrust divided by engine's nominal or published frontal area; fair criterion in early days of jet propulsion but today meaningless. Important

**thrust horsepower**

only in highly supersonic aircraft, in which area of propelling nozzle exceeds that of engine.

**thrust horsepower** Seldom-used measure attempting to determine power imparted to aircraft. For propeller aircraft normally engine bhp or shp multiplied by propeller efficiency (in case of turboprop plus a variable component due to exhaust thrust). For jet engines, basically thrust actually imparted to aircraft multiplied by TAS, keeping units compatible. See *equivalent horsepower*.

**thrust lever** Jet-engine throttle, or power lever.

**thrust line** Thrust axis.

**thrust loading** W/F, total mass (in this case, weight) of jet-propelled vehicle divided by aggregate thrust, usually calculated for SLS-TO condition; units  $\text{lb}/\text{kN} = 224.8 \text{ lb/lb st}$ , reciprocal  $0.004448$ ;  $1 \text{ lb/lb st} = 102.04 \text{ kg kN}^{-1}$ , reciprocal  $0.0098$ .

**thrust meter** Instrument for measuring thrust, more commonly of jet engine.

**thrust power** Appears always to be synonymous with thrust horsepower.

**thrust rating computer** Central element in auto power management system (ATS).

**thrust rating panel** AFCS cockpit display of limiting and target values of engine parameters, and selectors for operating mode (climb, cruise, MCT or TO/GA) or FTO temperature(s).

**thrust reverser** See *reverser*.

**thrust section** Portion of vehicle, esp. slender rocket, containing propulsion.

**thrust specific fuel consumption** See *specific fuel consumption*.

**thrust spoiler** Pilot-controlled spoiler which when actuated diverts jet from jet engine (esp. from turbofan core) to reduce thrust close to zero. Lighter and simpler than a reverser and merely eliminates possibly embarrassing idling thrust.

**thrust structure** In large ballistic vehicle propelled by multiple rocket chambers, structure which transmits thrust from all chambers and diffuses it into airframe. Normally large tubular truss structure at rear but can include side structures for laterally attached motors, eg SRBs.

**thrust terminator** Any quick-acting device for terminating thrust of solid rocket motor, including blow-off ports, nozzle ejection and inert-liquid injection into case.

**thrust time lag** Time from abrupt throttle movement to reach stabilized thrust or power.

**thrust-vectoring** Control of vehicle trajectory by rotating thrust line, esp. that of rocket; may involve gimballed chamber, rotation of chamber about skewed axis, inert-liquid injection at nozzle-skirt periphery, jet tabs, spoilers, refractory vanes and other methods; abb. TVC.

**thrust-weight ratio** Basic measure of combat aeroplane performance: thrust (normally SLS-TO) divided by total mass of aircraft.

**thrust wire** Diagonal bracing wire transmitting airship propulsion thrust to envelope.

**THRUT** Throughout.

**THS** Tailplane, horizontal stabilizer [a tautological usage].

**THSA** Trimmable horizontal-stabilizer actuator.

**THSD** Thousand[s].

**THT** Transient heat transfer.

**THUM, Thum** Meteorological readings of temperature and humidity, hence \* flight.

**thumb-down** Pilot's visual confirmation of "switches off."

**thumbprint** Common meaning is aircraft T/W (thrust: weight ratio) plotted against W/S (wing loading).

**thumbstick** Pilot input controller, eg for RPV or anti-tank missile, in form of miniature stick operated by thumb, typically attached to pistol grip and with \* pivots between vertical thumb and operator.

**thumb up** Pilot's visual confirmation of "contact".

**Thump** Meteorological readings of temperature, humidity and pressure.

**thunderstorm effect** Error, possibly approaching  $180^\circ$ , of ADF in vicinity of thunderstorm; needle may point to nearby Cb or flick over, giving false indication of station passage.

**thyatron** Gas-discharge triode used as relay, switch or sawtooth generator.

**thyristor** Multilayer semiconductor device also called Si-controlled rectifier; bistable, in one state high-impedance in both directions, in other high-impedance in one direction only.

**THz** Terahertz.

**TI** 1 Target indicator.

2 Thermal imager, or infra-red.

3 Training [or tactics] instructor.

4 Trial installation.

5 Thermal index.

6 Tertiary initiation (NW).

**Ti** Titanium; hence such alloys as Ti3Al2.5V, Ti6Al4V, Ti6Al2Sn4Zr2Mo and Ti10V2Fe3Al.

**t<sub>i</sub>** 1 In gust analysis, the fraction of time spent in mission segment i.

2 Thickness of an individual ply in a laminate.

**TIA** 1 Type inspection [and] authorization; allows FAA to fly new aircraft.

2 Telephone interface adaptor card (TRV).

3 Telecommunications Industry Association (US).

4 Travel Industry Association of America.

5 Traffic information area.

**TIACA** The International Air Cargo Association

**TIAD** Tactical internet for air defence.

**TiAl** General symbol for titanium aluminides.

**TIALD** Thermal imaging airborne laser designator.

**ti-aluminides** Alloys of titanium and aluminium.

**TIAS** 1 Target identification and acquisition system (ARMs).

2 True indicated airspeed.

**TIB** Technical Intelligence Bureau (former UK government department, still a title in many countries).

**TIBA** Traffic information broadcast by aircraft.

**Tibs, TIBS** 1 Tactical information broadcast service (USAF).

2 Telephone information briefing service.

**TiB<sub>2</sub>** Titanium boride.

**TIC** 1 Technical information centre.

2 Tantalum integrated circuit.

3 Target-insertion controller.

4 Total inventory count.

5 Transport & Infrastructure Committee (US House of Reps.).

**6** Technologies of information and communication (also F).

**7** Turbine impingement control.

**tic** Visual marking pulse on telemetry readout indicating time intervals, often every 0.5 s (see *time*\*).

**TICA** Turbine impingement actuator.

**TICC** Technical Information and Communications Committee (ATA).

**TICCS, TIC<sup>2</sup>S** Target information command and control system.

**tick** Audible marking pulse serving as regular (often infrequent, eg each 10 s or 60 s) time signal.

**ticket** Pilot's licence (colloquial, especially pre-1914).

**TICM** Thermal-imaging common module(s).

**TiCo** Titanium-colombium.

**Ticonal** Magnetic alloy of Ni/Co plus a little Al/Cu.

**tic-tac airplane** Miniature free-flight aircraft for sonic-boom research.

**TID** **1** Tactical (or target) information display.

2 Touch input device.

3 Technical-interface description.

**tiddleywinks effect** Tendency of nose gear to project stones and other loose objects laterally.

**TIDLS, Tidals** Tactical information data-link system.

**TIDP** Telemetry and image data processing.

**TIDS** Tactical [or Terma] integrated dispenser system.

**tie** Structural member normally loaded in tension.

**tie bar** Filament-wound tension member connecting helicopter main-rotor blade to hub; fatigue-proof because of large number of load-bearing members. Also called dog-bone.

**TIEC** Tactical information exchange [datalink] capability (RAF).

**tied gyro** Gyro whose rigidity is related to Earth rather than space; eg that in traditional horizon has axis tied by gravity aligned with local vertical.

**tiered on** Air-intercept code: "Aircraft indicated is in formation with me."

**tiedown** **1** Picketing arrangement based on steel spiral for aircraft left in open (originally US).

2 Cargo lashing.

**tiedown diagram** Drawing illustrating method of securing particular type or item of cargo in particular vehicle (DoD).

**tiedown helicopter** Non-flying prototype for testing and endurance running of dynamic parts.

**tiedown point** Permanent attachment point for cargo provided on or in vehicle (DoD); hence \* pattern.

**tiedown test** Rocket engine static test.

**tie rod** General term for tie of rod-like form, esp. with threaded ends.

**tiers** Different levels assigned to subcontractors in major programme; Tier 1 are usually assigned responsibility for design and test, as well as manufacture.

**Ties** Tactical information exchange system.

**TIF, Tif** **1** Takeoff inhibit function, temporarily suppresses all non-essential cockpit warnings.

2 Text interchange format.

3 Terminal interface function.

4 Tactical Imagery Intelligence Flight [not TIIF] (RAF).

**TIFS** **1** Total in-flight simulator.

2 Total inflight-shutdown [rate].

**TIG** **1** Tungsten inert-gas welding.

2 Time of ignition.

**Tiger** **1** Targeting by image georegistration.

2 Terrifically insensitive to ground effect radar.

**tightening** Tendency of aeroplane or glider trimmed for level flight to increase rate of a commanded turn or dive pull-out, demanding a push force on stick or yoke to hold constant g.

**TIGO** Prefix, US piston engine, turbocharged, direct-injection, geared, opposed cylinders.

**TiGr** Titanium/graphite composite.

**TII** Threshold inspection interval.

**TiiMs** Texas Institute for Intelligent Bio-Nano Materials and Structures for Aerospace Vehicles.

**til** Until.

**tile** **1** Thin-film or thick-film substrate; also occasionally used for substrate of solar cell.

2 Discrete unit of surface thermal-protection system for RV or large spacecraft, eg Space Shuttle, inspectable and replaceable.

**TILL, Till** Tracking [and] illuminating laser (ABL), also interpreted as target illuminating laser.

**TILS** Tactical ILS.

**tilt** **1** Angular deviation of locus of centroids of sections of helicopter main-rotor blade from plane of rotation (BSI). Measured as forward or backward though actually up/down.

2 Angular movement or offset of camera axis about aircraft longitudinal axis (NATO).

**tilt angle** Angle between axis of air camera and aircraft vertical (OZ) axis; normally angle at perspective centre between photograph perpendicular and plumb line (NATO).

**tilt-body vehicle** Usually synonymous with tilting fuselage, standing upright on its tail for VTOL. A totally different species has the wing and power (lift/propulsion) system able to rotate up to 90° with respect to the free-pivoted wing and tail; this family are usually STOLs.

**tilting-duct VTOL** VTOL aeroplane which in hovering mode is lifted by ducted propellers or fans rotated through approx. 90° for translational flight.

**tilting-engine/jet/propeller/wing** Same definition as above but for different pivoted component. Tilting-jet means entire engine is pivoted.

**tilting fuselage** Unusual class of VTOL aeroplanes in which fuselage can be pivoted near mid-length, in some cases complete with attached wing, in order for jet thrust to act vertically. Also called nutcracker aircraft.

**tilting head** **1** Rotorcraft head pivoted about lateral axis relative to supporting structure.

2 Machine-tool cutter and drive pivoted about horizontal axis.

**tilting-nozzle VTOL** Not used; term is jet-deflection, vectored-thrust, lift/cruise, vectoring or vectored-jet.

**tilt-rotor** **1** VTOL aeroplane lifted in hovering mode by one or (usually) more rotors which are rotated through approx. 90° for translational flight.

2 A rotor arranged to operate with axis vertical or horizontal.

**tilt-wing** VTOL aeroplane whose wing, carrying complete propulsion system, is pivoted upwards through approx. 90° in vertical mode, thrust then exceeding total weight.

**TIM** **1** Total inventory management.

**2** Training integrated [or integration] management [S adds systems].

**3** Target information module.

**TIME** Top Industrial Managers in Europe (Int.).

**time** Normally measured by subatomic frequency reference, eg crystal clock, but defined according to position of celestial reference point; depending on which point chosen \* called solar (Sun), lunar (Moon) or sidereal (vernal equinox), solar being subdivided into mean or apparent according to which Sun. Practical time designated GMT or according to designated longitude zone. SI unit is s, 3,600 to h, 86,400 to week.

**timebase** **1** Straight line traced by spot on CRT or other display of cartesian and several other types providing timescale for measurement, eg of target range.

**2** Straight line, regularly incorporating time tic, on data readout.

**time between overhauls, TBO** Period recommended by manufacturer and beyond which all warranties become invalid and operation may be in violation of certification.

**time box** Small box, usually rectangular or square, which moves along cockpit display future track, according to flight plan, at selected groundspeed.

**time-change item** One whose operation is limited to number of operating hours, number of operating cycles or (rarely) passage of time, and which must be periodically replaced on this basis.

**time circle** Basic symbology of many HUDs and other attack systems in which bright circle starts at 60 s and unwinds anticlockwise to 180° at 30 s and to vanish at 0 s.

**time-compliant technical order** Mandatory instruction for modification or for retrofit of equipment.

**time constant** **1** Usually, time taken from start of input signal for instrument to indicate specified % final reading; for exponential response, eg thermometer, time to reach 63.2% final reading; also called relaxation time, lag coefficient. Same meaning in charge/discharge of electrical C/R circuit or current in L/R circuit.

**2** Time taken for aeroplane to reach maximum angular velocity [any axis] after hard-over control input.

**TIMED, Timed** Thermosphere, ionosphere, mesosphere, energetics and dynamics satellite launched 2001 (NASA).

**time dilation** Apparent slowing-down of time as observer's speed reaches significant fraction of that of light; also called clock paradox or twin paradox.

**time dilution of precision** Measure of errors [usually in navigation] resulting from errors or variation in measured or calculated time.

**time/distance/speed scale** Simple written scale, either purchased (in which case of sliderule type) or prepared before flight, with which unknown distance or speed can be immediately read if other two factors are known.

**time-division multiplex** Dividing several continuous measures, eg in telemetry system, or several input signals, to form single continuous interleaved pulse train sent over single channel to multiple receivers.

**time-division multiplex access** When multiple transmitters are using a single carrier the carrier is time-shared to avoid messages being garbled at receiver.

**time group** Four digits denoting time in hours and minutes, such as 1730.

**time hack** Time at which a future event is scheduled, eg

at which a particular squadron is to start engines (colloq. chiefly military).

**time in service** For maintenance time records, aircraft log and similar purposes, elapsed time from aircraft leaving surface until touching it again on landing (FAA).

**time lag** Any delay between stimulus and response, or cause and effect, esp. that between start of signal and full indication by instrument.

**time mean bleed** Short period of time during which large RCS bleeds are expected to be used, and beyond which thrust must be reduced.

**time of flight** Elapsed time from weapon launch, release or departure from gun muzzle to instant it strikes target or detonates.

**time-of-flight spectrometer** Instrument sorting particles, esp. neutrons, according to time to travel known distance.

**time of origin** Local time message is released for transmission.

**time of useful consciousness** See *time reserve*.

**time on target** **1** Time, either planned or actual, at which aircraft attacks or photographs target.

**2** Time at which NW detonation is planned at specified GZ (DoD).

**time over target** Time at which aircraft arrive(s) over designated point for purpose of conducting an air mission on a target (USAF).

**time pulse distributor** EDP (1) circuit that generates timing pulses during machine cycle, gated by command generator to carry out commanded operations.

**time reserve** Time between sudden total loss of oxygen supply and time when human can no longer be relied upon to function normally or rationally.

**time-response parameter** Addition of input time delay to assessment of response to pilot input of pitch rate [rotation] and normal acceleration.

**Time-Rite** Patented indicator of piston position for timing (1).

**time-sensitive targeting**] An ephemeral target, previously unknown, which must be recorded or attacked immediately.

**time series** Sequence of time-variant measures, either continuous (eg barograph trace) or discrete (eg hourly met. pressure readings).

**time sharing** **1** Use of one EDP (1) processor or computer, usually large and beyond means or requirements of each customer, by a number of customers or users whose programs are run in short bursts in time-division multiplexed form switched according to cyclic formula agreed between users (in simplest form, a round robin).

**2** Planned allocation of time to external scanning [typically 18 s] and to looking around cockpit [typically 3 s].

**time signal** **1** Broadcast signal used as very accurate time reference.

**2** Time reference mark along border of reconnaissance imagery or other film.

**time/size plot** Diagram whose ordinate is a measure of aircraft size, eg MTOW or pax seats, and abscissa is time in years.

**time slot** Slot (3).

**time/speed scale** Scale for given groundspeed used in conjunction with plotting chart or topographical map.

**timeswitch** Electrical switch activated by time of day or elapsed time from a start point.

## time/temperature indicator

**time/temperature indicator** Also called Smart Label, colour-coded sticker attached to galley trolley; changes colour with refrigerated contents. Upon activation turns green [17- hour life], turning yellow upon time/temperature expiry.

**time/temperature cycle recorder** Records time engine spends at critically high TGT, to give realistic indication of hot-end life.

**time tic** Time reference mark along telemetry readout; usually small inverted V every second along straight time-base.

**time tick** Regular time signal of one or more audible brief sounds.

**time to go** In air intercept, time to fly to offset point from any other initial position; after offset point, time to fly to intercept point (DoD).

**time-triggered protocol** A data-communication platform.

**time zone** Regions of local standard time, esp. over sea areas, where they are exactly divided by  $15^{\circ}$  widths of longitude.

**timing** 1 Angular positions of piston-engine crankshaft at which valves first rise from seats or touch them again, and at which spark occurs; also called valve \*, ignition \*.

2 In US, assessment of human pilot's ability to co-ordinate flight controls on correct time basis for smooth manoeuvres; not often regarded as a topic elsewhere unless demonstrably faulty.

**timing consideration** Measure of time missile (or, possibly, other weapon such as aeroplane) is exposed on ground between withdrawal from hardened shelter and launch (probably arch.).

**timing disc** Disc, engraved marking or other feature on piston engine to assist establishing exact crankshaft angular positions for timing purposes.

**timing parallax** Film distance between time signal (2) and corresponding frame of imagery.

**timing pulse** Pulse used as time reference in telemetry, radar and SSR and other electronic systems.

**TiMMC** Titanium metal-matrix composite.

**Timos** Total-implant MOS device or circuit.

**Tims, TIMS** 1 Technology integration of missile subsystems.

2 Tactical information management system.

3 Training Integration Management System, flight scheduling and student records (USAF).

**tin** 1 Soft white metal, density 7.31, MPt 231.85°C, symbol Sn (stannum).

2 To coat surface of mild steel sheet with tin to prevent corrosion.

3 To coat metal surface with solder before making joint.

4 Aircraft, not necessarily metal (US colloq.).

**Tina** Thermal-imaging navigation aid.

**tineways** Channels in ULD mating with tines of a forklift.

**tinfish** Torpedo (UK colloq.).

**TINS, Tins** Thermal-imaging navigation system, or set.

**Tinsel** Transmitter carried by bomber to jam ground instructions to German fighters (RAF WW2).

**tin-strip** Metal prefabricated-plank airstrip for STOVL.

**t<sub>int</sub>** Integration time, especially radar filter integration time.

**tin-tray game** Stewardess trolley race.

**tin wing** Lightplane whose wings are metal-skinned.

## tip loss

**TIO** US piston engine designation: turbocharged, direct injection, opposed.

**TIOS** Two-in-one service (Satcoms).

**TIP** 1 Message code: until past specified waypoint or other point (ICAO).

2 Tracking and impact prediction.

3 Technical information panel (Agard).

4 Test integration plan.

5 Tailored instruction program (US).

6 Threat image projection, to test X-ray baggage screeners.

7 Technical improvement program, or technically improved product (IFF).

8 Transit improvement program.

9 Tiros information processor.

**tip** 1 Extremity of aerofoil.

2 Angle of rotation of reconnaissance camera about aircraft transverse axis; also called pitch.

3 Wing-tip fuel tank (DoD) (colloq., adjective).

**tip aileron** Aileron forming most or all of tip of wing.

**tip-back angle** In aircraft with nosewheel landing gear, the angle between the vertical through the plane of ground contact of the rearmost MLG wheels and the plane through the ground contact line and the centre of gravity; symbol  $\beta$ .

**tip cargo** Special cargo, eg radioactive isotopes, carried in small compartment in wingtip of some transports.

**tip chord** Chord at tip of aerofoil, esp. wing, normally measured parallel to plane or symmetry of wing (for variable-sweep, at minimum sweep angle) between points where straight leading/trailing edges meet curvature at tip. Where both edges have pronounced sweep at tip, or where they are joined by line not parallel to plane of symmetry (eg Lightning, Tornado) other definitions apply, often unique to type.

**tip cropping** Cutting off at Mach angle.

**tip dragger** 1 Spoiler above wingtip used asymmetrically to cause yaw.

2 Sailplane (colloq.).

**tip drive** Rotation of main rotor(s) of rotocraft by thrust applied at or near tips.

**tip droop** Downward folding of wingtips through large angle, usually  $60^{\circ}$ - $80^{\circ}$ , to move forward aerodynamic centre of wing at supersonic speed and decrease trim drag; in some aircraft (XB-70) also generated compression lift.

**tip fins** 1 The obvious meaning, fixed fins at the tip of a wing or horizontal tail.

2 Ridges across the tip of a turbine rotor blade which almost touch between the surrounding seal segments to form a labyrinth.

**tip float** See *stabilizing float*.

**tip generator** Wingtip vortex generator.

**TIPH** Taxi into position [on runway] and hold, possibly to be discontinued practice (FAA).

**TIPI** Tactical information processing and interpretation system (USAF).

**tip in** To bank steeply away from takeoff flight path.

**tip jet** Any system providing propulsive thrust at the tip of a helicopter main-rotor blade: pressure jet, cold [compressed-air] jet, ramjet, pulsejet, rocket or turbojet.

**tip loss** Inefficiency of tip of aerofoil in lifting mode caused by spanwise deflection of isobars and relative wind, in some transonic cases approaching  $90^{\circ}$  and making tip mere dead weight.

**tip loss factor** Correcting factor in calculating lift of rotorcraft lifting rotor to allow for tip loss, usually 0.96+.

**tip-path plane** Plane containing path of tips of helicopter or other rotorcraft main lifting rotor blades, tilted in direction of travel or horizontal acceleration.

**tipping** See *propeller tipping*.

**tip pod** Streamlined container carried centred on or below tip of aerofoil.

**tip radius** Usually synonymous with radius.

**tip rake** See *rake*.

**Tips, TIPS** 1 Total integrated pneumatic system (C-5).

2 Telemetry integrated processing system (AFSC).

3 Technical issue panels (FAA).

4 Transatlantic industrial proposal solution[s] (AGS6).

**tipsail** See *winglet*.

**tip shroud** *Shroud* 1.

**tip speed** Tangential speed of rotating tip of propeller or rotor due solely to its rotation and ignoring superimposed vehicle airspeed; i.e.,  $V = r\omega$ , radius multiplied by angular velocity.

**tip-speed ratio** Helicopter forward [or whatever direction] speed divided by main-rotor tip speed, symbol  $\mu$ .

**tip stall** Stall of tip of aerofoil, esp. wing, while remainder of surface remains unstalled; common condition caused mainly by higher lift coefficient at tip unless stall strip applied inboard.

**tip tank** Fuel tank formed as streamlined body, jettisonable or otherwise, carried centred on or below wingtip.

**tip trailing vortex** See *vortex*.

**tip vortex** See *vortex*.

**TIR** 1 Total indicator reading.

2 Target-illuminating radar.

3 Tracking and illuminating radar

4 Thermal-imaging radar.

5 Traffic information radar.

6 Thermal infra-red.

7 Twin intermeshing rotors (helicopter).

**TIRC** Tactical IR countermeasure.

**tire** UK spelling ‘tyre’ is used in this dictionary.

**tiredness** General deterioration of airframe caused by long and intensive use, primarily manifest in repeated cyclic loading and successive severe gusts but also including superficial damage caused by impact of steps, ground vehicles, stones etc; no significant crack need be present but many structural parts will not be original and many boltholes will be oversized and re-reamed for bolts of increased diameter.

**Tiros** TV/IR observation satellite[s].

**Tirp** Terminal instrument radar procedure.

**TIRS** Transverse-impulse rocket subsystem (planetary lander).

**TIRRSS** Theatre intelligence, reconnaissance and surveillance study (USAF).

**TIS, tis** 1 Tracking information (or instrumentation) subsystem.

2 Thermal-imaging sensor, or system.

3 Tactical Intelligence Squadron.

4 Traffic information service(s) [aircraft-position datalink, ground or airborne receiver].

5 Tactical input segment (satellite).

**Tisar** Terrestrial inverse SAR.

**Tis-B** Traffic information service, broadcast (FAA).

**TISD** Tactical Information Systems Division (Langley AFB).

**Tiseo** Target-identification system, or sensor, electro-optical.

**TISH, Tish** Thermal-imaging sensor head.

**Ti6Al4V** See *Ti*.

**TISR** Total inflight-shutdown rate.

**TISS, Tiss** Thermal-imaging security system, or surveillance system.

**TIT** Turbine inlet temperature; see *turbine temperatures*.

**tit** Any control button, especially to fire guns (UK, colloq., WW2).

**Titan** Thunderstorm identification, analysis and ‘nowcasting’, under development from 1990s (USWB, NASA, FAA).

**titanium** Ti, hard silvery metal, density 4.5, MPt 1,660°C, reactive but bulk metal passivated by oxide/nitride coating in atmosphere, vast range of aerospace uses, main tonnage Ti-Al-V alloys, see *Ti*.

**titanium aluminides** Rapidly growing range of refractory (820°C) metals with properties marred only by poor toughness and ductility.

**Tite** Tews intermediate test equipment.

**title block** Standardized rectangular format on drawing, usually lower right corner, listing title, part numbers, mod states, names of draughtsmen/tracers etc, dates and other information.

**titles** Name of owner or operator painted on commercial or GA aircraft, to be read from a distance.

**TIU** Time insertion unit.

**TIV** Tactical intervention vehicle.

**TIVO** US piston-engine designation: turbocharged, direct injection, vertical crankshaft (for helicopter), opposed.

**TIW** Total[ly] integrated warfare.

**TIZ** Traffic information zone.

**TJ** Turbojet.

**TJAG** The Judge Advocate-General.

**TJF** Transportable JTIDS facility (RAF).

**TJRJ** Turbojet/ramjet or turboramjet.

**TJS** Tactical jamming system; R adds receiver, T transmitter.

**TK** 1 Turbocharger (R, G).

2 Thermal keel.

**Tk** Track, track angle.

**TKE, TkE** Track-angle error.

**TKF** 1 Tactical combat aircraft (G).

2 Takeoff, also TKO, Tkof.

**TKM** Tonne-kilometres.

**TKOF, tkof** Takeoff.

**TKP** 1 Tonne-km performed; basic measure of airline traffic.

2 Transport clearing house (R).

**TKS** Chemical de-icing pastes and pumped liquid (typically 60% aqueous solution of glycol), from Tecalemit/Kilfrost/Sheepbridge-Stokes.

**TKT** Sandwich of Teflon/Kapton/Teflon, uniquely resistant even to electric arcing.

**TL** 1 Thermoluminescence.

2 Transition level.

3 Transmission loss.

4 Until.

5 Terminal location (Agars/AFEPS).

6 Turbinen-luftstromtriebwerke = turbojet (G).

**T/L** Top level.

<b>TLA</b>	<i>1</i> Towed linear-array sonar. <i>2</i> Throttle- [or thrust-] lever angle.	<b>2</b> Trimethylamine.
<b>TLA</b>	Transition layer.	<b>3</b> Target-motion analysis.
<b>TLAR</b>	<i>1</i> "That looks about right", for manual release of NW by captain of V-bomber [RAF, 1960–90]. <i>2</i> Top-level aircraft requirements [for reliability].	<b>4</b> Traffic management advisor (FAA).
<b>TLBM</b>	Through-life business model.	<b>5</b> Timer/media access.
<b>TLBR</b>	Tactical laser beam recorder.	<b>TMAC</b> Tactical medium-altitude camera.
<b>TLC</b>	<i>1</i> Trans-lunar coast. <i>2</i> Ton[ne]s lifting capacity. <i>3</i> Through-life costs. <i>4</i> Takeoff and landing chart program. <i>5</i> Tender loving care.	<b>TMACA</b> Tactical mid-air collision-avoidance system (helicopter).
<b>T-LCD</b>	Transmissive liquid-crystal display.	<b>TMB</b> <i>1</i> Time mean bleed. <i>2</i> Turbulent mixing boundary.
<b>TLCM</b>	Through-life capability management.	<b>TMBACA</b> Times microwave broadband airborne cable assembly.
<b>TLCS</b>	Through-life customer support.	<b>TMC</b> <i>1</i> Thrust-management computer [F adds function, S system]. <i>2</i> Titanium [or titanium-aluminide metal-] matrix composite.
<b>TLCSM</b>	Total life-cycle system management.	<i>3</i> Terminal control.
<b>TLD</b>	<i>1</i> Technical-log defect. <i>2</i> Top-level domain.	<i>4</i> See next.
<b>TLDHS</b>	Target location designation and hand-off system.	<b>TMCC</b> Travel Management Companies Corporation (Int.).
<b>TLDM</b>	Royal Malaysian navy.	<b>TMCR</b> Total maintenance-cost reduction.
<b>TLE</b>	<i>1</i> Type, or total, life extension. <i>2</i> Target-location error. <i>3</i> Treaty-limited equipment.	<b>TMCS</b> Technical monitoring and control[ling] system.
<b>TLG</b>	Tail landing gear.	<b>TMD</b> <i>1</i> Tactical munitions dispenser. <i>2</i> Theatre missile defence.
<b>TLI</b>	Trans-lunar insertion.	<i>3</i> Test, measure and diagnose [or measurement and diagnostic]. <i>4</i> Tactical modular display.
<b>TLLF</b>	Tactical low-level flight, or flying.	<b>TME</b> Total mission energy, normally in non-SI kWh.
<b>TLM</b>	Telemetry-word.	<b>TMEL</b> Trimethyl-ethyl lead.
<b>TLMC</b>	Time limits and maintenance checks.	<b>TMET</b> Tethered medium Earth terminal.
<b>TLO</b>	<i>1</i> Terminal learning objective. <i>2</i> Touchdown/, or takeoff/, liftoff area [also TLOF].	<b>TMF</b> <i>1</i> True-mass flowmeter. <i>2</i> Thrust-management function.
<b>TLP</b>	Tactical leadership program(me).	<b>TMG</b> <i>1</i> Track made good. <i>2</i> Thermal/meteoroid garment.
<b>TRLR</b>	Target-locating radar.	<i>3</i> Towing motor glider. <i>4</i> Ton-miles per gallon.
<b>TLS</b>	<i>1</i> Tactical, or transponder, landing system. <i>2</i> Translunar shuttle. <i>3</i> Through-life support. <i>4</i> Target level of safety. <i>5</i> Training laser system (MoD, UK).	<b>TIMGS</b> Transportable/mobile ground station.
<b>TLSI</b>	Technical-log special inspection.	<b>TMIS</b> Technicians maintenance information system.
<b>TLSS</b>	Tactical life-support system (USAF flight suit).	<b>TML</b> <i>1</i> Tetramethyl lead. <i>2</i> Terminal. <i>3</i> TV microwave link.
<b>TLTV</b>	Towbarless tractor vehicle.	<b>TMLLF</b> Terrain-masking low-level flight, C adds computer.
<b>TLV</b>	<i>1</i> Transition level [also TL <sub>v</sub> ]. <i>2</i> Threshold limit value.	<b>TMM</b> Tantalum manganese-oxide metal device.
<b>TLWD</b>	Tailwind.	<b>TMMC</b> Titanium/metal-matrix composite.
<b>TLWS</b>	Tactical laser weapon system.	<b>TMMS</b> TOW mast-mounted sight.
<b>TM</b>	<i>1</i> Training memoranda. <i>2</i> Tactical missile. <i>3</i> Trade mark. <i>4</i> Ton-mile (seldom abb.). <i>5</i> Transcendental meditation, relevant to aerospace. <i>6</i> Transverse magnetic EM propagation mode. <i>7</i> Telemetry. <i>8</i> Technical manual, or memorandum. <i>9</i> Thrust magnitude (of gross thrust vector). <i>10</i> Time. <i>11</i> Transmit manifold (Awacs). <i>12</i> Timer/media (access control). <i>13</i> Thermal model. <i>14</i> Terrain masking. <i>15</i> Test and maintenance [bus].	<b>TMN</b> True Mach number.
<b>Tm</b>	Tropical maritime.	<b>TMO</b> <i>1</i> Traffic management office (AFSC). <i>2</i> Ten [nautical] miles out [from threshold].
<b>TMA</b>	<i>1</i> Terminal manoeuvring (or control) area, ie terminal airspace.	<b>TMP</b> <i>1</i> Transverse-magnetized plasma. <i>2</i> Twin machine-gun pod. <i>3</i> Theatre mission planning; S adds system. <i>4</i> Test-measurement program[me].
		<b>TMPA</b> Traffic-management program alert.
		<b>tmp<sub>r</sub>, tmp<sub>ry</sub></b> Temporarily.
		<b>TMRC</b> Technical-manual reference card.
		<b>TMS</b> <i>1</i> Thrust-management system. <i>2</i> Test and monitoring station. <i>3</i> Traffic, or technical, management system, or specialist. <i>4</i> Tactical mission system (helicopters). <i>5</i> Transformer mains supply. <i>6</i> Target-management switch [on throttle].
		<b>TMSA</b> <i>1</i> Trainer-mission simulator aircraft. <i>2</i> Technical Marketing Society of America.

## TMT

3 Tri-mode semi-active.

**TMT** Technology management team (ASTOVL).

**TM-Tim** Terrestrial MTI imagery (MR-Tip).

**TMU** 1 Traffic management unit (FAA).

2 Transducer matching unit (sonar).

**TMW** Tomorrow.

**TMXO** Tactical miniature crystal oscillator.

**TMZ** Transponder Mandatory Zone.

**TN** 1 Nuclear, thermonuclear (weapon prefix, USSR).

2 Technology need.

3 Technical note.

4 True north.

**TNA** 1 Truth in Negotiations Act (US Congress).

2 Training-needs analysis.

3 Thermal- neutron analysis, or activation.

4 Twin altitude.

**TNAV, T-nav** So-called four-dimensional navigation system commanding three spatial dimensions and time.

**TNC** Terminal node controller.

**TND** Trace narcotics detector.

**TNDCY** Tendency.

**TNE** Tungsten nuclear engine.

**TNEL** Total noise exposure level; see *noise*.

**TNF** Theatre nuclear forces ( $S^3$  or S-cubed adds ‘survivability, security and safety’).

**TNGT** Tonight.

**TNH** Turn height.

**TNI** 1 Total noise index; see *noise*.

2 Trusted network interpretation.

**TNR** Transfer of control message, non-radar.

**TNS** Technical news-sheet.

**TNT** 1 Trimotro-toluene; for \* equivalent see *yield*.

2 Tragflügel neue technologie, advanced supercritical wing (G).

**TNW** 1 Theatre nuclear weapon.

2 Tactical nuclear warfare.

**TO, T-O** 1 Takeoff.

2 Technical order.

3 Table of organization.

**TOA** 1 Total obligation[al] authority, sum that may be obligated in coming FY for contracts possibly running for many years hence.

2 Time of arrival, hence TOA/DME.

3 Usually plural, transportation operating agencies (MAC, MSC and MTMC, US).

4 Training options analysis [software tool].

**TOAA** Takeoff obstacle accountability areas (study).

**TO&E** Table of organization and equipment.

**TOAT** True outside air temperature.

**TOBI, Tobi** Tangential on-board injection.

**toboggan** In-flight refuelling technique in which shallow dive is maintained to match speeds of fast tanker (if necessary with spoilers or airbrakes) and slow receiver.

**TOC** 1 Top of climb.

2 Total operating cost (often t.o.c.).

3 Travel order card.

4 Tactical operations center (US).

5 Transfer of communication[s].

**Toca** Theatre operational CIS(3) architecture.

**TOCC** Tactical operations control centre.

**TOCG** Takeoff c.g. position.

**TOCS, Toes** Terminal operations control system.

**TOD** 1 Top of descent.

2 Takeoff distance.

## Tolstoy switch

3 Terrain/obstacle database.

4 Time of day, or of departure.

**TOD<sub>a</sub>, TODA** Takeoff distance available; H or (H) adds helicopter.

**TO dist** Takeoff distance.

**TOD<sub>r</sub>, TODR** Takeoff distance required.

**TODS, Tods** Tactical optical-disk system.

**TOE** 1 Ton (usually tonne or short ton) of oil equivalent; measure of energy.

2 Table of organization and equipment.

**toe** 1 Figurative forward extremity of ski shape whose contact with ground is commanded by TFR.

2 Any lateral extremity at foot of graphical plot.

**toe brakes** See *wheelbrakes*.

**toed in** Left/right (eg engines) have axes which in horizontal plane are inclined to meet aircraft centreline ahead of nose. Hence, **toed out**; axes meet centreline to rear, as in case of engines whose axes are perpendicular to tapered leading edge (eg Ju 52/3m).

**toe out angle** Angle between major chord of winglet and OX axis, generating inward side force.

**toe plates** Hinged tapered plates along outer edges of cargo-aircraft vehicle ramp.

**TOEPR** Takeoff engine pressure-ratio.

**TOF** 1 Takeoff fuel; quantity aboard at takeoff.

2 Time of flight.

3 Trigger on failure.

**TOFL** Takeoff field length.

**TO-FLX** Derated (flexible) take-off.

**TOFP** Takeoff flightpath.

**to/from** Indication of whether certain radio navaids are moving towards or away from ground station, either by caption window in instrument or by various switches or procedures; also called sense indication. Esp. applies to VOR.

**TOFT** Tactical operational flight trainer [simulator] (USN).

**TO/GA** Takeoff [or] go-around (overshoot).

**Toga button** Automatically advances throttle levers to takeoff thrust.

**toggling** Jogging.

**TOGR** Takeoff ground roll.

**TOGW** Takeoff gross weight, either published MTOW or that at one particular takeoff.

**TOI** Time of intercept.

**TOJ** Track on jam[ming].

**TOL** 1 Takeoff and landing; A adds analysis.

2 Tolerance.

**Told card** Takeoff and landing data, kept handy in cockpit.

**tolerance** 1 Maximum departure permitted between dimension of an actual part and its nominal value; usually part may be either over or undersize (eg  $653 \pm 0.1$  mm) but occasionally \* is unilateral (eg  $653 - 0.1$  mm).

2 Maximum error permissible in calibration of instrument or other device.

3 Maximum quantity of harmful radiation which may be received by particular person with negligible results, also called \* dose.

4 Ability of individual to withstand cumulative doses of drug.

**Tolstoy switch** Crucial inceptor for converting fighter weapon system from peace to war (RAF 1965–94).

**toluene** Flammable liquid used as solvent and thinner; also called methyl benzene ( $C_6H_5CH_3$ ) or toluol.

**TOM** Target object map.

**Tom** Abbreviated form of TSOM, test-set, overall, missile (RAF).

**tombstone technology** Advances triggered by fatal accidents.

**tome** X-ray slice through running engine or other subject. Generated by neutrons, gamma rays or other radiation [today usually PET (2)].

**tomodromic** Heading to intersect a particular line, eg trajectory of another aircraft.

**tomogram** Array of tomes scanned in sequence to provide 3-D picture.

**TOMS** Total ozone mapping spectrometer.

**ton** 1 Standard SI-related unit is tonne (t), = 1,000 kg = 1 Mg = 0.984207 long ton = 1.1023 US or short \* = 2,204.6236 lb. In Americas 2,000 lb, commonly called short \* (not abb.), = 907.18474 kg. In UK and Commonwealth 2,240 lb, commonly called long \* (not abb.), = 1,016.0469088 kg = 1.12 short \*. In aerospace much confusion exists because of these three values, especially 12% difference between short and long \* in aircraft payloads, airline traffic (usually short \*), airfield pavements (mainly metric) and many other areas. When used incorrectly as a force [tonf] UK ton = 9.96402 kN, US ton = 8.89644 kN.

2 In air-conditioning and *refrigeration*, rate of removal of heat sufficient to freeze 1 short \* of ice each 24 h = 3,140.05 W (if long \* is basis, 3,516.85 W).

**tonal balance** Can refer to audio frequencies (balance across pitches of sounds as heard by listener) or to white/grey/black or colour tones in radar or other electronic display.

**tone** 1 Sound of one pitch containing no harmonics, usually synonymous with mono-\*.

2 Specifically, in AAM launch, aural note which changes to singing or growling after IR lock-on.

**tone localizer** Localizer whose L/R indications are received as contrasting tones heard on each side of glide-slope centreline.

**tonf** Ton force, non-SI unit of force, = 9,964.02 N.

**Tonka** See *R-Stoff*.

**ton-mile** Unit of aircraft work; assuming long ton and statute mile = 1.5838 tonne-km (reciprocal 0.6314); \* per Imp. gal = 0.3484 tonne-km/litre (reciprocal 2.8703).

**tonne** Metric ton,  $10^3$  kg = 0.98433 long tons = 1.10231 US tons.

**TO N1** Takeoff engine fan speed.

**TOO** Target of opportunity.

**tool** Though obviously normal meaning applies in aerospace, an added meaning is extension to include any device or construction facilitating manufacture or assembly, even when it plays no part in shaping workpiece. Examples include assembly structures of species in most cases preferably called jigs (more explicit), as well as temporary fixtures, struts and props, inflatable bags, rubber press-\* and dies of all kinds, and devices for holding or locating during tests or other operations.

**tool bit** Small cutting tool, usually from square steel bar with super-hard added tip, fixed in place on machine tool; not used for drills and millers.

**tool design** Design of tools for particular programme, esp. design of all required jigs, fixtures, templates, gauges

and special-purpose tools, eg for checking dimensions and alignment of large parts.

**tooling** See *Tool*.

**toolmaker** Skilled person, usually previously machinist, responsible for making many special-purpose in-plant tools (both jigs/fixtures and cutting tools) and in particular for setting up machines for semi-skilled operatives and minders, today often versed in NC.

**toolroom** Originally room where cutting tool bits were kept, today clean (often in strict sense) environment for super-accurate measures, gauges and manufacturing operations calling for abnormal standards of accuracy.

**tool steel** High-carbon steels retaining extreme hardness at elevated temperatures (note: bits are now usually carbides, cermet or other materials).

**TOP** 1 Total obscuring power; basic measure of chaff or aerosol, in US expressed in non-SI units sq ft/lb (cross-section of sky per unit mass dispensed), for 80% opaqueness to hostile radar or other sensor.

2 Tube à ondes progressives = TWT (F).

3 Technical and office protocol, similar to CNMA and MAP 6 (US).

4 Takeoff power.

5 Top of cloud(s).

**Topcap** Total objective plan for career airmen personnel (USAF).

**top chord** Main transverse (end-to-end) upper member of truss.

**top cover** Defending friendly fighters watching over bomber or attack aircraft from higher level, esp. while over hostile territory.

**top dead centre** Instantaneous position of piston engine or reciprocating-pump crankpin in which centreline of crankshaft, crankpin and cylinder are all in line with piston at extreme top of stroke; hence also corresponding position of piston.

**top-down requirements capture** See *requirements capture*.

**top dressing** Application of ag-chemical to land or growing crops from above; normally method of applying fertilizers rather than insecticides, for which technique may be to coat undersides of leaves also.

**top-hat** Family of standard structural sections based on five straight surfaces, each at 90° to neighbour(s); resemble top hat in shape.

**Topkat** Tele-operated precision kill and targeting.

**top loading** Increasing apparent (effective) height of radiating aerial by adding metal plate, mesh or radial wires at extremity.

**top lock** Fitted in top edge of outward-opening door [hinged on sensibly-vertical axis] which is curved round to form top of cabin.

**TOPM** Takeoff performance monitor; S adds system.

**topocentric** Referred to observer's position; measures, usually linear distance or az/el, based on observer's position as origin.

**topographic** Representing physical features of Earth's surface, both natural and man-made; hence \* display, \* map. DoD definition of \* map: one which presents vertical position of features in measurable form as well as horizontal. Normally, essential feature is use of contour lines, as well as normal positional information.

**top overhaul** Overhaul of piston-engine cylinders (valve grinding, ring replacement, decarbonization etc) without opening crankcase.

## topping

**topping** Operating cycle of liquid-propellant turbopump for rocket engine in which cryogenic fuel is heated, producing high-pressure gas used to drive turbine(s); this gas then passes at lower pressure to combustion chamber (different nozzles from main flow), where it burns. Hence \* cycle, \* engine.

**topping off** Replacement of cryogenic propellant lost by boiloff.

**topping up** Replenishment of gas-filled aerostat, eg after a flight.

**topple** Real or apparent wander in vertical plane of gyro-axis (see *toppled*).

**toppled** Gyro whose gimbals have for any reason ceased to maintain its correct axis in space, so that further rotation of mounting results in violent direct precession. Traditional gyro instruments can be \* by aerobatics or any rotation of aircraft axes beyond defined limits, instrument then being useless as attitude reference until gyro has settled again into normal operation. New term is needed for either topple or toppled.

**top rudder** Applying rudder towards the upper wing in a turn; thus, in a steeply banked L turn, pushing on R pedal [eg, to keep nose from dropping below horizon].

**TOPS** 1 Thermoelectric outer-planet spacecraft.

2 Transfer orbit and payload-testing support.

**Topsar** Topographical synthetic-aperture radar.

**Topsat** Tactical optical satellite (UK).

**Topscene** Tactical operational scene (Tamps).

**Top Secret** High grade of defence classification for material whose unauthorized disclosure might result in severance of diplomatic relations, war or collapse of defence planning.

**Topsep** Targeting optimization for solar-electric propulsion.

**top shock** Shockwave on upper surface of aerofoil.

**topside** On carrier flight deck, esp. movement thereto by elevator; eg coming \* as aircraft or other item appears level with deck (USN).

**top-temperature control** Any subsystem limiting a temperature to a specified safe limit, esp. that for TET, TGT or equivalents.

**TOR, T-OR** 1 Takeoff run.

2 Tentative operational requirement.

3 Terms of reference.

**torr** Torr.

**TOR<sub>a</sub>, TORA** Takeoff run available, usually = TOR.

**Toray** Trade name [from torched rayon] of carbon fibres of outstanding specific strength and modulus.

**torch igniter** Combined igniter plug and fuel atomizer emitting jet of flame from burning fuel. Very rare in gas turbines but occasionally used in afterburners and a minority of liquid and solid rockets.

**torching** 1 Faulty operation of gas turbine, esp. jet engine, in which unburned fuel travels past turbine and results in flames travelling down jetpipe, often expelled from exhaust nozzle.

2 Faulty operation of piston engine in which unburned fuel travels through exhaust valve and burns in exhaust pipe, often causing visible flame beyond exhaust nozzle.

3 Degassing in ultrahigh-vacuum technology by applying gas flame to walls.

**toric** Having a surface described by a segment of a conic section.

**toric combiner** Optical lens assembly used to combine a

## torque-set screw

generated-information display with an image of real world.

**Torlon** Heat-resistant resin used in graphite-fibre composites for high-temperature applications (Amoco).

**tornado** Localized violent whirlwind east of Rockies in US with such low pressure in core as to explode structures in its path, usually pendant under a Cb. Also used for Gulf of Guinea thunder squalls advancing westwards in line.

**toroidal** Shaped like doughnut.

**toroidal vanes** Rings of curved section guiding air to eye of centrifugal compressor.

**torpedo director** Traditional optical sight for aerial torpedo attack; user sets target size/speed and receives azimuth guidance.

**torque** For all practical purposes, synonymous with turning moment or couple [which see]. A rigorous definition is effectiveness of a force in setting a body into rotation, according to which trying to loosen a tight nut unsuccessfully or rotate free end of rod fixed at other is not application of \* (though in second case it is torsion). Often invertedly defined as resistance to a twisting action. Conversions include 1 lbf-in = 0.112985 Nm; 1 lbf-ft = 1.35582 Nm; 1 Nm = 8.8507 lbf-in = 0.73756 lbf-ft. For propellers see \* component.

**torque box** Box-like structure, eg wing torsion box, designed to resist applied torque.

**torque brake** Variable brake on rotating shaft, eg slat drive, triggered at particular point of system travel.

**torque coefficient** Product of propeller torque divided by  $\rho N^2 D^5$ ;  $k_Q = Q / \rho N^2 D^5$ .

**torque component**  $Q_c$ , tangential force acting in plane of propeller rotation on any elementary chordwise lamina; thus total propeller torque  $Q = N/2 \rho V^2 \times \text{integral of } Q_c$  from axis to tip with respect to radius.

**torque dynamometer** Measures shaft power by measuring N (rpm) and torque.

**torque effect** Reaction on vehicle of torque applied to propeller or rotor (\*\* for rotodome usually ignored); in helicopter countered by tail rotor.

**torque gauge** Indicator of torque in propeller shaft.

**torque horsepower** Shaft horsepower, often same as brake horsepower. Use to be discouraged because of confusion with thp (thrust horsepower).

**torque link** Pivoted links preventing relative rotation between cylinder and piston of oleo shockstrut; limiting factor with bogie main gears on allowable steering angle of nose gear. Also called scissors or nutcracker.

**torquemeter** Device, either instrument or component part of engine, for measuring torque; in turboprop or some piston engines, usually oil-pressure system sensing axial load on reduction-gear planetary helical gears or, less often, tangential reactive load around annulus gear.

**torquer** Device imparting torque to an axis of freedom of a gyro, usually in response to signal input.

**torque roll** Performable only by aircraft with fast-responding (eg piston) engine on centreline giving very large torque in relation to aircraft weight; approach is made at flight idle at minimum safe flying speed, whereupon throttle is banged wide open to cause rapid roll in opposite direction as aircraft accelerates, pilot recovering to wings-level with aileron.

**torque-set screw** Can be repeatedly unscrewed without losing original torque needed to release; used to latch long-MTBM panels.

## torque stand

**torque stand** Test stand for engines, esp. aircraft piston engines.

**torque tube** Tubular member designed to withstand torque, either one applied inevitably and to be resisted or one to be transmitted as part of drive system (eg in primary flight controls).

**torque wrench** Hand tool with dial or other direct readout of torque imparted, usually set to slip if overloaded.

**torquing** Input to gyro from torquer for slaving, capturing, slewing, caging etc.

**torr** Non-SI unit of high-vacuum pressure, = 133.322 N/m<sup>2</sup> = 0.0193368 lbf/in<sup>2</sup>. Originally (and still very nearly) 1 mm Hg.

**torsion** Deflection, usually within elastic range, caused by twisting, ie applied torque (note: \* is result, not an applied stress).

**torsional divergence** Potentially lethal design fault in which wing's aerodynamic centre is ahead of shear centre or elastic axis, lurking unsuspected until a critical IAS is exceeded.

**torsional instability** Characteristic of structural member such that, when loaded in compression or bending, it will twist before reaching ultimate compressive stress.

**torsional load** One imparting turning moment or torque.

**torsional stress** Stress resulting from applied torque; for torque tube  $S_t = Tc/J$  where T is torque, c is radius and J polar moment of inertia.

**torsion balance** Instrument containing light horizontal rod suspended by fine fibre for measuring weak forces, eg gravitation, radiation.

**torsion-bar tab** See *spring tab*.

**torsion box** Main structural basis of wing, comprising front and rear spars joined by strong upper and lower skins; also called wing box, inter-spar box.

**torso harness** Normal seat harness of military pilot restraining torso over full length.

**Tort** Tactical operational-readiness trainer.

**TOS** 1 Transfer orbit stage (eg Shuttle to geosynchronous).

2 Time on station.

3 Traffic orientation scheme.

4 Tactical operations system.

5 Tiros operational satellite[s].

**TOSA** Takeoff space available.

**TOSS** Television optical scoring system.

**toss bombing** Method of attack on surface target with free-fall bomb, esp. NW, in which aircraft flies toward target, pulls up in vertical plane and releases bomb at angle that compensates for effect of gravity drop; similar to loft-bombing and unrestricted as to altitude but normally entered from lo. Two main varieties: forward \*\*, in which bomb is released at angle short of 90° (usually about 70°), after which aircraft continues with Immelmann-type manoeuvre; and over-the-shoulder \*\*, in which aircraft overflies target and releases at angle beyond 90°.

**TOT** 1 Time on (or over) target.

2 Turbine outlet, or operating, temperature.

3 Time-oriented task.

4 Total.

5 Transfer of title, on delivery of aircraft.

6 Takeoff time.

**tot** Time on target (radar).

## total temperature

**total** Noun or adjective, damaged far beyond economic repair.

**total air temperature** Temperature of air brought to rest including rise due to compressibility.

**total blade-width ratio** Ratio of propeller diameter to product of number of blades and maximum blade chord; also known as total propeller-width ratio.

**total conductivity** Sum of electrical conductivities of all free ions, positive and negative, in given volume of atmosphere.

**total curvature** Change in direction of ray between object and observer.

**total drag** Component of total aerodynamic force on unducted body parallel to free-stream direction = induced plus profile = pressure plus surface friction.

**total-energy equation** Expression for sum of pressure, kinetic and potential energies of given volume of atmosphere as result of combining mechanical energy equation with thermodynamic.

**total engagement training** Involving actual or simulated firing of weapons.

**total equivalent horsepower** See *equivalent horsepower*.

**total head** See *total pressure*.

**total impulse** Basic measure of quantity of energy imparted to vehicle by rocket, = integral of thrust versus time over total operating time, abb.  $I_t^t$ , expressed in Ns, kNs or (US) lbf-s.

**totalizer** Indicator showing quantity of variable (fuel, ammunition etc) that has passed sensing point (see *detotalising*).

**totalled** Damaged beyond repair.

**total lift** Component along lift axis of resultant force on aircraft.

**total-loss lubrication** System in which oil is supplied, usually under cartridge or other stored gas pressure, and finally dumped overboard; common in target or cruise-missile propulsion.

**total noise rating** See *noise*.

**total obligatory authority** Money for 5-year defence programme or any portion for a given FY (DoD).

**total operating time** Time between ignition of solid-propellant rocket motor and time when thrust decays to zero; this is usually at least 15% longer than burn time and 10% longer than action time.

**total-package procurement** Award of one very large prime contract for entire operative system from conceptual stage through R&D to engineering design, test and production.

**total pressure** Pressure that would be reached in fluid moving past body if its relative velocity were to be brought to zero adiabatically and isentropically. For low speeds taken as  $p + \frac{1}{2} \rho V^2$  and at high Mach numbers as  $p (1 + [\gamma - 1] M^2/2)^{\gamma/\gamma-1}$ . Also called total head or stagnation pressure, and usually same as pitot pressure, impact pressure.

**total-pressure head** See *pitot head*.

**total propeller width ratio** See *total blade-width ratio*.

**total refraction** Curvature of radiation out of layer or medium.

**total system** Entire system supplied to virgin site, including accommodation, civil engineering, power supply, refuse disposal etc, as turnkey contract.

**total temperature** Temperature of particle of fluid at stagnation point or otherwise brought to rest adiabati-

## total terrain avionics

cally and isentropically. If  $T_s$  is static temperature,  $T_H = T_s (1 + \frac{1}{2} [\gamma - 1] M^2)^{-1}$ .

**total terrain avionics** Combine digital contour and map information to enhance sensors and displays for carefree flight at high speeds at low altitudes in bad weather without any high-energy or readily detectable emissions, thus facilitating stealth design.

**TOTE, Tote** Tracker optical thermally enhanced.

**tote board** Display board presenting written information in tabular form, esp. in ATC (1) flight-progress board or cockpit alphanumeric tab (4). In RAF Fighter Command in WW2, presentation of tactical situation.

**TOTS, tots** Tower operator training system (USN ATC).

**touch-and-go** Practice landing in which aeroplane is permitted to touch runway briefly; in many cases flaps are moved to take-off setting while weight is on wheels.

**touch-control steering** Small inputs by pilot to change flight path while in autopilot mode.

**touchdown** 1 Moment, or location, of contact of aircraft with surface on landing or of soft-landing spacecraft with designated destination surface.

2 Intersection of glidepath with Earth's surface, not necessarily point of any actual landing.

**touch down** To perform touchdown.

**touchdown aim-point** Area of runway on which pilot intends to land. This is usually in touchdown zone, but on STOL runway a \*\* marker is provided in form of 90 m (200 ft) axial white strip on each runway edge projecting inwards from white edge strips.

**touchdown point** That programmed into UCARS or other UAV recovery system.

**touchdown ROD** Touchdown rate of descent; value shown by \*\* indicator, usually sensitive VSI based on radio altimeter or laser altimeter.

**touchdown RVR** Touchdown runway visual range; RVR at time and place of landing.

**touchdown zone** That portion of runway selected by most pilots as touchdown zone; on precision instrument runway marked by three close axial white bars 90 m (200 ft) long on each side between centreline and edge, beginning 150 m (500 ft) beyond threshold.

**touch drill** Simulation of condition [e.g., securing a failed engine] by touching controls and instruments without actual activation.

**touch-screen technology** Ability of advanced displays to interface with humans by direct fingertip touch of part of display of interest, notably by touching particular line or word in alphanumeric readout.

**touchwire** Human input to electronic display in form of matrix of fine wires, any of which, when touched, switches enlarged local region of display to fill entire area (or, in alphanumerics switches in amplified readout of that particular item).

**toughness** Ability of structural material to absorb mechanical energy in plastic deformation without fracture.

**tour** 1 Individual crew member's assigned total of combat missions. To qualify, mission must be effective. RAF \* in WW2 was usually 30.

2 More generally, \* of particular duty for military personnel.

**touring aircraft** 1 Original meaning, aircraft designed for long pleasure flights.

## Townend ring

2 Aircraft making appearances at successive air displays.

**touring motor glider** Light aeroplane designed to cruise under power but to soar when conditions permit.

**tourist** Originally (1949) special high-density airline accommodation usually synonymous with coach; today standard type of seating, denoted by symbol Y.

**TOVC** Top of overcast.

**TOVS** Tiros operational vertical sounder.

**TOW** 1 Takeoff weight, usually meaning MTOW.

2 Tube-launched optically-tracked wire-guided (missile).

3 Time of week (GPS).

4 Time on wing [engine life].

**tow** 1 Standard manufactured form of reinforcing fibre, eg carbon, graphite, as long unwoven staple.

2 Aero \* for one flight of sailplane; hence on \*, \* release.

**towbar** Connects tug and nose gear for towing or pushing away from gate.

**towbarless tractor** One designed to lift NLG off ground on to tractor body.

**tow dart** Dart-type aerial target towed by RPV or target drone or, in some cases and on 900 m (2,000 ft) line, by manned aircraft.

**towed body** Remote sensing unit of helicopter MAD or airborne magnetometer.

**towed glider** Glider on aero tow.

**towel rack** Rail-like aerial (antenna) for HF com or Loran (colloq.).

**tower** Airport or airfield control tower, esp. service or facility based therein; hence \* airport, \* frequency, \* controlled. Increasingly coming to mean seat of ATC even if no physical \* exists.

**tower fly-by** Fly past tower at low level, eg for determination of position error or visual check on aircraft configuration.

**towering** Opposite of stooping, refraction phenomenon in atmosphere in which visual image of distant object appears extended vertically.

**towering cumulus** Building rapidly, so that height exceeds any lateral dimension.

**towering takeoff** Helicopter rises vertically under full power and goes ahead as rate of climb decays to zero.

**tower shaft** Radial shaft transmitting drive from engine spool to accessory gearbox or other unit.

**tower-snag recovery** Recovery of RPV or other winged vehicle by flying it to hook a line suspended between arms on tower built for this purpose; in most systems line imparts decelerative drag which stalls vehicle within distance significantly less than height of tower.

**towhook** Pilot-operated coupling release on glider for tow cable.

**towing basin** See *towing tank*.

**towing eye** Eye (structural ring) attached to nose gear or other part of aircraft for towing on ground.

**towing sleeve** Towed sleeve (drogue) target.

**towing tank** Long, narrow water tank for hydrodynamic tests, also called seaplane basin/tank, along which models of hull/float forms, skis, ACVs and other objects are towed. Seldom used for wavemaking.

**town** The Treasury and MoD (RAF colloquial).

**Townend ring** Pioneer ring-type cowling for radial engines, with chord seldom greater than external diameter of cylinders and no pretension at true aerofoil shape,

though usually with tube around inner side of leading edge [Dr H C H Townsend, 1929].

**Townsend avalanche** Cascade multiplication of ions in gas-filled counting-tube technology.

**Townsend coefficients** In DC gas-discharge, First \*\* =  $\eta$  = number of electron/ion pairs per volt; Second \*\* =  $\gamma$  = number of secondary electrons emitted from cathode per impacting positive ion.

**Townsend discharge** DC discharge between two electrodes immersed in gas and requiring cathode electron emission.

**Townsend ionization coefficients** Average number of ionizing collisions electron makes in drifting unit distance along applied field.

**tow-reeling machine** Powered winch for winding in cable towing aerial target or other device.

**tow rope** Connection between tug and glider, in WW2 typically 9 in [229 mm] or 10 in [254 mm] (circumference). Manila [hemp], later replaced by Nylon. See *cable*.

**tow tractor** Usually means prime mover for towing aircraft or baggage train.

**Toxic-B** Most common lethal air-dropped or dispensed war agent (USSR).

**TP** 1 Turning point.

2 Thermoplastics.

3 Test pilot, or point.

4 Target, or training, practice.

5 Teleprinter.

6 Terminal processor.

7 Traffic pattern; A adds altitude.

8 Turbulence plot.

9 Technical Publication[s]

10 Tactics planner.

11 Two-seat pursuit (USA 1919–24).

12 Telecommunication [singular] processor.

13 Trajectory prediction (ATC).

**Tp** 1 Tailplane trim [actuator].

2 Tropical Pacific.

**TPA** 1 Target-practice ammunition.

2 Traffic-pattern altitude.

3 Taildragger Pilots' Association (US).

4 Trigger-pulse amplifier [D adds driver].

5 Taxi position awareness (Jeppesen).

**TPAR** 1 Tactical penetration-aid rocket, carrying expendable ECM payloads.

2 Trans-polar air route.

**TPAWS** Turbulence prediction and warning system (NASA).

**TPC** 1 Total programme cost(s).

2 Tactical pilotage chart.

3 Temperature- [or thermally-] protective coating.

4 Technical Partnership Canada.

**TPCI** Technical publications combined index.

**TPD** Tracking processing device.

**TPDA** Transmitting personal digital assistant.

**TPDR** Transponder (more often TXP or XPDR).

**TPDU** Transport Protocol data unit.

**TPE** 1 Tracking and pointing experiment.

2 Thermoplastic elastomer.

**TPED** Tasking, processing, exploitation and dissemination (Imint).

**TPF** 1 Terminal phase, final.

2 Technology performance financing.

3 Terrestrial-planet finder.

**TPFDD** Time-phased force and deployment data.

**TP4** Transport Protocol Class 4.

**TPFP** Target-practice frangible projectile [-T adds -tracer].

**TPFT** Tunable pipelined frequency transform.

**TPG** 1 TV picture generator, Tepigen.

2 Technology planning guide.

3 Topping.

**T-phi**,  $T\phi$  T-S.

**TPI** 1 Terminal phase initiation.

2 Third-part[y] insurance.

**t.p.i.** Turns (or threads) per inch.

**TPIS** Tyre-pressure indicating system.

**TPL** 1 Transmitted pulse length.

2 Terminal permission list (Acars/Afeps).

**TPM** 1 Terrain profile matching, or mode.

2 Technical performance management.

**TPMU** Tyre-pressure monitor[ing] unit.

**TPN** Technical procedure notice; (L) adds electronic.

**TPP** 1 Tip-path plane [see tpp].

2 Total-package procurement (C adds concept).

3 Technology program plan (AFSC).

4 Terminal procedures publication.

5 Tri-phenyl phosphate, extreme-pressure anti-scuff oil additive.

**tpp** Tip-path plane, hence  $\alpha_{tpp}$  for helicopter AOA.

**TPPX** Target-practice proximity-fuzed.

**TPR** 1 Terrain profile recorder.

2 Thermoplastic rubber.

3 Transponder [XPDR preferred].

4 Transient-phase restoration.

5 Turbofan pressure ratio.

**TPRM** Trusted protocol reference model.

**TPS** 1 Thermal protection system.

2 Test program set.

3 Technical problem-solving.

4 Thermal picture synthesizer.

5 Test Pilot School (USAF).

6 Tactical processing system.

**TPSA** Technologies, processes and system attributes.

**TPSRS** Terminal primary and secondary radar system(s).

**TPT, TP/T** 1 Target practice, tracer.

2 Transonic pressure tunnel.

**Tpt** Transport.

**TPTA** Tailplane trim actuator.

**TPTO** Temporary permission to operate.

**TPU** 1 Terminal position update (RV).

2 Tactical, or transmitter, or transceiver, processing unit.

3 Turbine power unit (Gripen).

**TPWG** Test planning working group.

**TPWS** Turbine prediction and warning system.

**TPX-42** Numeric decoder of aircraft beacons.

**TQ** Total quality; C adds cost, E engineering, M management, PP planning and producibility and S supportability.

**TQA** Throttle-quadrant assembly.

**TR, Tr** 1 Track.

2 Thrust reverser.

3 Tracking rate.

4 Tactical reconnaissance (US, role prefix).

5 Torpedo reconnaissance (UK, defunct).

6 Technical report, or readiness.

- 7** Temporary revision (ADRES, CAATS).
- 8** Braking parachute (R).
- 9** Total reaction.
- 10** Trace.
- 11** Tail rotor.
- T/R** *1* Transmitter/receiver, communications radio.  
*2* Transmission/reception, or transmit/receive.  
*3* Transformer/rectifier (or TR).  
*4* Thrust reverser.
- T<sub>R</sub>** Thrust required [usually for unaccelerated level flight].
- t<sub>R</sub>** Time from initial landing-gear wheel contact to maximum vertical reaction.
- t<sub>r</sub>** Round-trip transit time, especially of radar signal.
- TRA** *1* Track angle.  
*2* Radar transfer-of-control message.  
*3* Thrust-reverser aft (SST).  
*4* Temporarily reserved [or restricted] airspace [or area].  
*5* Terrain-referenced avionics.  
*6* Thrust-reduction altitude.
- TRAAMS** Time-referenced angle-of-arrival measurement system.
- TRAC, Trac** *1* Telescoping-rotor aircraft.  
*2* Trials recording and analysis console, giving immediate video-tape of fire-control system performance.  
*3* Tactical radar correlator.  
*4* Terminal radar approach control.  
*5* Tradoc Analysis Center.  
*6* Transit research and attitude control (satellite).
- Traca, Trac-A** Total radar aperture-control antenna.
- Tracals** Traffic-control approach and landing system (USAF).
- Trace** *1* Test equipment for rapid automatic checkout and evaluation.  
*2* Taxiing and routing of aircraft co-ordination equipment (US 1960s).
- trace** *1* Line on CRT and many other displays made by electron beam, successive sweeps being linked by retraces.  
*2* Line of data on any linear graphic printout visible to eye (thus, not applicable to magnetic tape).  
*3* EDP (1) diagnostic technique which analyses each instruction and writes it on an output device as each is executed.
- trace ice** Rate of accretion just exceeds sublimation.
- Tracer** Tactical reconnaissance and counter-concealment enabled radar [for UAVs].
- tracer** *1* Ammunition whose projectiles leave bright visible trails.  
*2* Substance added (usually in very small proportion) to main flow in order latter may be followed accurately through process, living organism etc; \* may be physical, chemical or, often, radioactive.
- tracer display** True historic display on Hudwac or similar sight system featuring tracer line and other symbology for snapshooting, normally with real target scene through combiner glass.
- tracer line** Bright line on sight system showing locus of points where a projectile would now be had it been fired during preceding few seconds, ie where projectiles from continuous burst would now be. A range marker, usually a ring, is superimposed at actual target range. Pilot must then place this ring over target in order to hit it, or arrange for target to pass through ring.
- track** *1* Path of aircraft over Earth's surface from take-off to touchdown.  
*2* At any time in flight, angle between a reference datum, and actual flightpath of aircraft over Earth's surface, measured clockwise from 000° round to 360°. Magnetic \* is referred to magnetic N; true \* is referred to true N and is \* normally used in plotting; required \* is that desired; \* made good is that found by inspection to have been achieved; great-circle and rhumbline \* are those which are thus represented on chart.  
*3* To observe or plot a \* (1), eg by radar or on plotting board.  
*4* Series of related contacts on plotting board.  
*5* To display or record successive positions of moving object.  
*6* To lock on to source of radiation and obtain guidance therefrom.  
*7* Path traced by tips of propeller, rotor or similar rotating radial-arm assembly.
- Symbol W** Distance measured as straight line between centre of contact area of left mainwheel, or geometric centre of left main-gear bogie, and corresponding centre on right; in case of aircraft with centreline gears and outriggers, measured between outriggers; if landing gears are skids, measured between lines of contact; if main gears are skis, measured between centrelines; if gears are inflatable pontoons, measured between centres of ground contact area; not normally applied to marine aircraft, but would presumably be distance between CLs of two floats.
- 9** As plural, rails along which travel area-increasing flaps or certain translating leading edge slats, carrying these surfaces out approx. in direction normal to leading or trailing edge.  
*10* To keep device aimed at moving target.  
*11* Conductive path on printed-circuit board.  
*12* DME mode after lock-on, when pulse-pair rate is reduced.  
*13* Position and velocity of aircraft estimated from correlated surveillance data (TCAS).
- track angle** See *track* (1).
- track ball** Basic human interface with electronic displays, either for inputting data or calling up portion of display for any reason; comprises ball recessed into console rolled by operator's palm in any direction to generate either stream of digital pulses or analog voltage about two co-ordinate axes to achieve desired place, eg particular aircraft on display.
- track beacon** See *NDB*.
- track clearance** Clearance to fly stated track (1) as far as particular fix.
- track correlation** Correlating track information using all available data, for identification purposes.
- track crossing angle** *1* Angular difference between tracks of interceptor and target at time of intercept (DoD).  
*2* Generally, angle between two flight paths measured from tail of reference aircraft.
- tracker** Hand-held electronic reader of coded information on parcel or letter, which is then automatically sent by radio (satellite if necessary) to management displays.
- track handover** Process of transferring responsibility

## tracking

for production of air-defence track from one track-production area to next (NESN).

**tracking** 1 Air intercept code: "By my evaluation, target is steering true course indicated" (DoD).

2 Precise and continuous position-finding of targets by radar, optical or other means (NESN). Hence synonymous with track (5).

3 Measure of correct rotation of separate blades of helicopter main rotor in that each should follow exactly behind its predecessor, ie all tips should lie in common tip-path plane.

4 Procedure to ensure \* (3) by holding paper or fabric against painted blade tips and adjusting hub settings until a single spot results.

5 Correct holding of frequency relationships between all receiver circuits tuned from same shaft to maintain constant intermediate frequency in superhet or constant difference frequencies.

6 Keeping device, eg fighter aircraft, aimed at target; hence synonymous with track (10).

7 Flight path in horizontal plane, especially along ILS glidepath.

**tracking station** Fixed station for tracking (2) objects in air or space.

**track initiator** Person responsible for taking decision on appearance of unknown blip on air-defence or other surveillance radar that it represents a target whose track is to be determined and assigned an identity.

**track intervals** Convenient time/distance divisions between checkpoints when navigating visually.

**track lock lever** Hand lever locking flight-crew seat in desired position.

**track made good** See *track* (1).

**track marker** Symbolology on display indicating track, eg straight black or bright line, with or without arrowhead, cross, ring or square, depending on type of display; absent when display is auto track-oriented.

**track oriented** Aligned with current track at 12 o'clock position, eg hand-held map, projected map display, etc.

**track prioritization** Order of threat priority can be manually or automatically assigned to several targets, usually on basis of TTG.

**track production** Function of air-surveillance organization in which active and passive radar inputs are correlated into coherent position reports together with historic positions, identities, heights, strengths and direction of flight (NESN).

**track-production area** Area in which tracks are produced by one radar station.

**track repetition** Time between exact overflights of spot on Earth by satellite.

**track separation** 1 Lateral distance between aircraft tracks imposed by ATC.

2 Distance (often at Equator) or angular longitude difference between successive passes of Earth satellite.

**track symbology** Symbols used to display and identify tracks on radar or data-readout console or other electronic display.

**track telling** Process of communicating air-defence, surveillance and tactical-data information between command and control systems and facilities: back tell, transfer from higher to lower echelon of command; cross tell, between facilities at same level; forward tell, to higher level; lateral tell, across front at same level; overlap tell, to

## traffic alert and collision-avoidance system

adjacent facility concerning tracks detected in latter's area; and relateral tell; via third party.

**track via missile** SAM or AAM guidance system based on multirole electronically scanned radar [eg, Patriot].

**trackway** Standard prefabricated military track for land vehicles, quickly laid for recovery of force-landed aircraft or across infilled bomb crater on airfield, esp. to speed reopening of bombed runway.

**track-while-scan** Radar/ECM scan produced by two unidirectional sector scans simultaneously scanning in two planes, usually one vertically and one horizontally, allowing target common to both to be accurately tracked in az/el as well as (medium PRF) range/V. Target is not alerted as subject to special interest.

**Tracon** Terminal radar approach control (FAA).

**Tracs** 1 Terminal radar and [or approach] control systems (Canada DND).

2 Test and repair control system, automated data retrieval (TRACS).

3 Tool[s] for rapid advances in cockpit simulation.

4 Transportable radar and communications simulator.

5 Tactical radio countermeasures system.

**traction wave** Generated on tread surface of under-inflated tyre at high speed.

**tractor** Adjective meaning pulling, hence \* aeroplane is pulled by propeller[s], not pushed; \* propeller is in front of engine and driven by shaft in tension. Converse is pusher.

**tradcom** Transportation R&D Command (USAF, defunct).

**trade** 1 Targets, eg a plurality of hostile aerial targets.

2 Of fighter, to encounter hostile aircraft.

**tradeoff** Generalized term for fair exchange between inter-related variables; thus in aircraft design there are numerous and continuing examples of \* between wing area, thrust, fuel consumption, gust response, structure weight and many other parameters; in aircraft flight management pilot can \* (used as verb) speed for height, etc.

**trade winds** Persistent winds blowing from NE around 30°N and SE around 30°S. At higher altitude are anti-trades.

**Tradoc** Training & Doctrine Command (USA); possible confusion with Tadoc.

**traffic** 1 Quantity of vehicles, eg aircraft, in operation; measured as number in flight in region at one time, number under positive control, or general number in vicinity, or as number in given period. For control purposes includes \* on movement area.

2 Number of landings and take-offs at airport in given period, eg one calendar year.

3 One aircraft in flight as reported to or noticed by another in vicinity.

4 Output of commercial or military air transport operator, measured in such units as number of pax or mass of cargo carried multiplied by mean distance each is transported, eg passenger miles or tonne-km (standard units compatible with SI are needed).

5 Number or frequency of messages on telecom system.

"**traffic**" Repeated, aural warning of midair (TCAS).

**traffic advisory** Information [without comment] sent to pilot about other traffic within ± 1,200 ft FL and [at existing closure speed] 45 s in time.

**traffic alert and collision-avoidance system** As initially

conceived, exists in two levels. TCAS I is the baseline system which merely senses potentially conflicting traffic and warns crew [by traffic advisory]. TCAS II additionally provides traffic information within c30 nm [55 km], and two conflicting equipped aircraft are manoeuvred apart.

**traffic circuit** See *Circuit*.

**traffic density** The number of xpdr-equipped aircraft [excluding one's own] within R nm [1.85R km]  $\div \pi R^2$ .

**traffic information, radar** Information issued to alert aircraft to radar target observed on ground radar display which may be in such proximity to its position or intended route as to warrant its attention.

**traffic lights** Any red/amber/green presentation, especially that by a radar altimeter referenced to a pre-selected low (minimum safe) height setting.

**traffic pattern** See *circuit*; \* usually used for tracks/profiles of arrivals and departures of non-GA traffic, ie military or commercial.

**traffic situation display** TMS (3) tool for monitoring position of traffic to determine demand on airports and sensors.

**TrAG** Training air group (RN, WW2).

**trail** 1 Relative motion of dropped store, eg free-fall bomb, behind aircraft flying at constant V, broken down into \* distance, cross-\*<sup>2</sup>, range component of \*, \* angle, cross-\* angle, and range component of cross-\*<sup>2</sup>.

2 Distance between centre of tyre contact area with ground and intersection with ground of free castoring axis; not relevant to power-steered aircraft.

3 To shadow another aircraft or hostile ship(s).

4 Tendency of freely hinged (ie, not irreversible) control surface to align itself with relative wind. Normally negative, surface 'floating' in line with wind, but an overbalanced surface has positive \* and unless restrained will be blown to limit of its deflection.

5 To fly a tanker behind potential receivers.

6 To extend tanker's hose.

**trail angle** 1 Angle between vertical and line joining bomb impact to aircraft at time of impact.

2 Several angles in landing gear, including acute angle between bogie beam and aircraft horizontal plane (negative when front axle is lower than rear) and acute angle between local aircraft vertical and axis of main-gear oleo strut (often not relevant because of gear geometry).

**trail blade** That immediately following in same stage of engine fan, compressor or turbine, especially following a blade that breaks off.

**trail distance** Horizontal distance between point of bomb impact and point vertically below aircraft at time of bomb impact.

**trailer** 1 Aircraft following and keeping under surveillance a designated airborne contact (DoD).

2 General US term for towed road vehicle, esp. for human occupancy.

**trail formation** In direct line-ahead, each aircraft or element being directly in front of those following.

**trailing aerial** Aerial [antenna] in form of long wire, usually with weight or drogue on end, capable of being wound in or out from underside of aircraft.

**trailing area** Area of flight control or other pivoted surface on aircraft downwind of hinge axis.

**trailing blade** Trail blade (US usage).

**trailing edge** 1 Rear edge of aerofoil or streamlined strut.

2 Outline of pulse as amplitude falls from peak to zero or minimum positive value.

**trailing finger** Extra electrode in piston-engine magneto distributor which transmits large current from booster magneto to cylinder next in firing order when engine is started.

**trailing flap** Not a normal term but could be applied to Junkers double wing.

**trailing link** Landing gear in which axle [or pivot of bogie beam] is carried by arm pivoted to rear of leg. Also called levered suspension.

**trailing sweep** Sweep (5) when deviation is towards trailing edge.

**trailing vortex** Vortex extending downstream from point on body.

**trailing vortex drag** See *lift-induced drag*.

**trail length** Length of cable connecting aircraft to braking parachute, anti-spin parachute or other drag device.

**trail line** That between aircraft in level flight and bomb released from it. Projected, it reaches *trail point*.

**trail point** Where trail line reaches Earth's surface.

**trail rope** 1 Trailed by balloon over ground to reduce groundspeed and assist in regulating height.

2 Carried in airship for ground handling.

**train** 1 Bombs dropped in short intervals or sequence (DoD).

2 Single tug towing several gliders on single towrope or series of ropes.

**train bombing** Two or more bombs released at pre-determined interval from one aircraft as result of single actuation of release mechanism (USAF).

**trainer** Aircraft for training flight personnel, esp. pilots.

**training aids** Items whose primary purpose is to assist instruction and growth of operator skill/familiarity, such as publications, tapes, films, mimic boards, systems rigs, procedure trainers and simulators.

**training package** Self-contained arrangement to train personnel (eg of an air force or of purchaser of GA aircraft) for fixed fee or fixed outlay per month; may include design of trainer, construction of facilities as turnkey contract or part of larger programme.

**trajectory** Flightpath in 3-D of any object, eg aeroplane or electron or other particle, with exception of orbits and other closed paths. Can be ballistic, acted on only by atmospheric drag and gravity, or controlled by various external forces.

**trajectory band** Webbing strip round top of aerostat envelope to reduce distortion.

**trajectory plotting** A particular meaning is using a wreckage field and knowledge of winds at all relevant altitudes to establish point in sky at which an aircraft broke up.

**trajectory scorer** Instrument carried by aerial target which continuously defines position of intercepting missile in sphere whose centre coincides with origin of target's co-ordinate axes; readout is time-history record of missile range and angular position commensurate with scoring requirements.

**trajectory shift** Distance or angular measure of deviation of missile from ballistic trajectory under influence of a thrust mechanism (ASCC).

## Trakmat

**Trakmat** UV-stabilized polypropylene overlain by mesh of galvanised-steel rods and wires.

**TRAM, Tram** Target-recognition attack multi-sensor; DRS adds 'detection and ranging set'.

**tram** Trammel bar, or as verb to use same (colloq.).

**T<sub>ram</sub>** Ram-air temperature.

**tramline pointer(s)** Twin parallel lines or bars between which is to be aligned instrument needle.

**tramlines** Guidance lines on flight deck for V/STOL aircraft proceeding under own power.

**trammel and adjust** Traditional procedure for rigging airframe c1910–35.

**trammel bar** Hand gauge in form of straight bar, set-square, triangle or other shape provided with precision locating feet; used in checking dimensions, angles and alignments of large structures; abb. tram or tram bar.

**trammung** Use of trammel bar.

**tramping** 1 Uncommanded oscillation of rudder [less often, other control surfaces].

2 Oscillation or vibration of aircraft in vertical plane.

3 Zigzag flight path as result of (1).

**tranche** Production batch, not all aircraft necessarily being to same standard (UK).

**trans, TRANS** 1 Transmit, transmitter, transmitting.

2 Transition; ALT adds altitude, LEV level.

**transatmospheric** Operating between upper atmosphere and sub-orbital regime. Thus, a \* aircraft would combine attributes of aircraft and spacecraft.

**transatmospheric vehicle** Also called aerospace plane, spacecraft capable of atmospheric flight with full propulsion, lift and control, and recovery at base similar to that of aeroplane. Launch may be either by vertical rocket or horizontal takeoff.

**transattack period** From initiation of NW attack to its termination (DoD).

**transborder** Crossing frontier, eg airborne pollution, fallout, virus etc.

**transceiver** Radio transmitter and receiver sharing common case and subcircuits, precluding simultaneous transmission and reception.

**transcowl** Translating (fore/aft-moving) structure of fan reverser.

**transducer** Device for translating energy from one form to another, eg mechanical strain to electrical signal (straingauge), temperature to electrical signal (thermocouple), or electrical signal into sound (earphone or loudspeaker).

**transducer gain** Ratio, usually expressed in dB, of power delivered to transducer load (output) to available power input.

**transductor** Any magnetic device, eg saturable reactor or magnetic amplifier, in which non-linear characteristic controls circuit.

**Transec** Transmission security.

**transerter** Device for sampling unknown surface material, eg on planet other than Earth; hence \* auger, tube containing spiral auger which carries sample material to various instruments and experiments.

**transfer** 1 Transport between airport and ultimate destination.

2 Movement of fuel from main tank[s] to collector, or [civil aircraft] to redistribute fuel.

**transfer duct** Air duct between front and rear fans in

## transistor

tandem-fan engine, containing shut-off valve and auxiliary inlet system for rear fan and core in lift mode.

**transfer ellipse** See *transfer orbit*.

**transfer loader** Wheeled or tracked vehicle with platform positioned at any convenient height and with horizontal adjustment, used in transfer of cargo or casualties between modes of transport.

**transfer function** Mathematical treatment of ratio of output response to input signal, usually a Laplace transform, expressible as plot of frequency and in closed-loop systems controlling sensitivity of output to system error.

**transfer of control** Action whereby responsibility for provision of separation of an aircraft is transferred from one controller to another (see *handover, handoff*).

**transfer orbit** Elliptical orbit linking two other orbits, eg one round Moon and one round Earth; for minimum energy invariably tangential to both linked orbits (see *Hohmann*).

**transfer pump** Tank-mounted pump for moving fuel between tanks or from tank to collector.

**transfer punch** Centre punch for transferring positions of template holes to sheet beneath.

**transferred position line** PL redrawn to slightly later time, parallel to original but displaced by calculated ground distance.

**transformation** Methods (Laplace, Fourier) of simplifying solution of differential equations; hence Laplace or Fourier transform or inverse transform.

**Transformation[al]** Revolution in application of armed force brought about by netcentric warfare.

**Transformational Communications** Future global system based on laser links and Internet protocols (DoD, especially USAF).

**transformer** Device for transferring energy from one electrical circuit to another, usually with change of voltage, by magnetic induction.

**transformer/rectifier** Device for converting a.c. to d.c. at a different voltage; can be rotary machine or solid state.

**transient** 1 Temporary surge or excursion of variable, eg on first switching on.

2 Short-duration electrical impulse having steep leading edge and repeated irregularly.

3 Awaiting orders, or staging through en route to another destination.

**transient distortion** Inability of equipment to reproduce very brief signals.

**transient peak ratio** Peak value of phugoid parameter divided by that of immediate predecessor.

**transient performance** Air-combat performance sustainable for a few seconds only (eg by trading height for speed or vice versa, or allowing speed/energy to decay).

**transient response** Response to sudden changes in demand, eg hydraulic system or liquid rocket engine, where this factor is significant.

**transient trimmer** Short-duration input to longitudinal trim system to counter known disturbing moment, eg when extension of rocket pack under F-86D caused pitch-attitude changes affecting aiming.

**Transire** Single-sheet document stamped by Customs on entering country, or different island within country.

**transistor** Electric/electronic device for amplification or control consisting of semiconductor material to which are attached metal electrodes. Name comes from transfer resistor, and in simplest form one electrode is emitter,

connected to p-type material, separated from other p-type electrode (called collector) by layer of n-type.

**transistor amplifier** Amplifier employing one or more transistors arranged in any of several configurations, eg common-emitter, common-collector or common-base.

**transit** 1 Passage of celestial body across meridian.

2 Passage of one aircraft through controlled airspace.

3 Instrument used to determine (1).

4 Apparent passage of celestial body across face of another.

5 Condition in which three points are aligned, eg observer and two objects on Earth's surface, prefaced by 'in' (ie said to be in \*).

6 Period spent on ground by passenger between arriving on one flight and departing on another, hence \* area, \* trolleys etc.

7 A passenger in transit (6).

8 Period spent on ground by aircraft, especially commercial transport, between flights; the most frequent interval written into schedules for maintenance. Also defined as turnaround stop enroute.

9 Motion of landing gear during retraction or extension.

**transit bearing** Measuring time at which two surface features have same (measured) bearing from aircraft in flight.

**transit mode** Configuration of mobile system, eg SAM missile, radars and support facilities, for moving on ground to new location with radars folded, missiles packed, launchers at 0° elevation and doors closed, etc.

**transition** 1 One meaning in aerospace is change from jet-supported VTOL flight to wing-borne translational flight and vice versa.

2 Another is sudden switch from blind instrument approach to visual on first sighting ground, e.g. runway lights.

3 Another is SID to airway and thence to Star.

**transitional surface** Specified surface sloping up and out from edge of approach surface and from line originating at end of inner edge of each approach area, drawn parallel to runway centreline in direction of landing (ICAO).

**transition altitude** QNH, altitude in vicinity of airfield at or below which aircraft control in the vertical plane is referred to true altitude; e.g., in London TMA, 6,000 ft. (see *transition level*).

**transition distance** Ground distance covered in transition (1 or 2).

**transition down** Change in helicopter flight level to dunk sonobuoy in sea in ASW operation.

**transition envelope** That portion of flight envelope in which trimmed controllable flight is possible in powered flight regime, bounded by airspeed, height, ROC, power, conversion angle, AOA, control margins, etc (USAF).

**transition flight** Flight at TAS below power-off stall speed, where lift is derived from both wing and powerplant.

**transition height** QFE, at or below which altitude is referred to that of airfield.

**transition layer** Airspace between transition level and transition altitude (NESN).

**transition level** QNE, lowest flight level available for use above transition altitude (DoD).

**transition lift parameter** For jet VTOL,  $L/T \times A_j/S$ ,

where L is wing lift, T is jet lift,  $A_j$  is jet area (total) and S is wing area.

**transition manoeuvre** Aeroplane manoeuvre linking two glidepaths or approach trajectories; unusual except at airports where approach has to be on instrument runway and actual landing on a parallel runway.

**transition point** Point on 2-D aerofoil or other surface at which boundary layer changes from laminar to turbulent, extremely sensitive to surface roughness, temperature difference, steadiness of upstream flow and other factors, and difficult to locate accurately in model testing.

**transition strip** Area of airfield adjacent to runway or taxiway suitably paved to allow aircraft to taxi across it in all weathers.

**transition temperature** Many meanings in which particular temperature-dependent change takes place, but esp. temperature range in which metal ductility or fracture mode changes rapidly.

**transition up** Change in helicopter flight level to pull sonobuoy out of water.

**transition zone** 1 Narrow atmospheric region along front where characteristics change rapidly, values lying between those of dissimilar air masses on either side.

2 Short section of glidepath within which average pilot makes transition from IFR to visual.

**transitron** Pentode oscillator with negative resistance and near-constant sum of anode/screen current.

**transit time** 1 Elapsed time between instant of filing message with AFTN station for transmission and instant it is made available to addressee.

2 Elapsed time between electrodes in valve or other device for any electron.

**translating** Moving in straight line relative to surroundings.

**translating centrebody** Supersonic-inlet centrebody able to move linearly into or out of inlet under control of automatic control system.

**translating nozzle** Jet engine nozzle which in reverse mode moves to rear, further from engine, opening gap in jetpipe for gas deflected by reverser clamshells.

**translation** Motion in more or less straight line, from A to B, with no rotation about any axis.

**translational flight** Flight at sensible airspeed, such that wing generates lift; loosely from A to B, moving under power from one place to another.

**translational lift** Additional lift gained by helicopter in translational flight resulting from induced airflow through main rotor(s) gained from forward airspeed.

**translation bearing** Mechanical bearing permitting sliding motion, eg air-cushion pad or oilfilm bearing.

**translation rocket** Separation or staging rocket.

**translatory resistance derivatives** Those expressing moments and forces caused by small changes in translational velocity.

**transloader** Vehicle for transporting missiles [invariably SAMs] and loading them on or into launchers.

**Transloc** Transportable (ground station) Loran-C.

**translucent** Permitting EM radiation, esp. light, to pass through but diffused in direction.

**translucent rime** See *glazed ice*.

**translunar** Different definitions; most authorities agree word means extending from Earth to just beyond Moon, but a minority claim it excludes all space inside lunar orbit.

## transmission

**transmission** 1 Process by which EM radiation or any other radiated flux is propagated, esp. through tangible medium transparent to such radiation.

2 Process of sending signal via telecom network.

3 Signal or message thus sent.

4 Mechanism transmitting mechanical energy or power, eg between helicopter engine(s) and rotors.

**transmission anomaly** Deviation from inverse-square-law propagation, esp. in underwater sound; symbol  $A_s = H - 20 \log R$  where  $H$  is transmission loss in dB and  $R$  is horizontal range in m.

**transmission coefficient** Radiant energy which remains after passage through a layer, medium interface or other intervening material, relative to that incident upon it; expressed as fraction or percentage; symbol  $\tau = e^{-\sigma}$ .

**transmission factor** Ratio of dose inside shielding material or hard shelter to that received outside in NW attack.

**transmission grating** Diffraction grating ruled on transparent substrate.

**transmission level** Ratio, usually expressed in dB, of signal power at any point in network to power at reference point.

**transmission limit** Particular frequency or wavelength above or below which almost all power is absorbed or diffused by medium.

**transmission line** Conductor conveying electrical power or signal, esp. wire, coaxial cable or waveguide carrying information signals.

**transmission loss** Decrease in power, usually expressed in dB, between energy sent and that received; in radio propagation through space, ratio expressed in dB of power received by aerial to that sent out by identical transmitting aerial; in underwater sound, symbol  $H_s = S - L$  where  $S$  is sound level (dB) and  $L$  is SPL in dB above reference rms value (traditionally 1 dyne/cm<sup>2</sup>).

**transmission modes** Possible configurations of electric and magnetic field patterns in waveguide; TM (transverse magnetic) has magnetic vector perpendicular to direction of travel; TE (transverse electric) has electrical vector perpendicular to direction of travel; TEM has both vectors perpendicular to direction of travel. There are an infinite number of modes, but each cannot function below a particular cutoff frequency, and two parallel wires send nothing but DC.

**transmission rate** Of xpdr, average number of pulse pairs per second.

**transmissivity** Ratio of radiation transmitted through medium, or through unit distance of it, to that incident upon it, usually expressed as %. In some usages transmission coefficient is synonymous.

**transmissometer** Invariably, synonymous with visibility meter, telephotometer; instrument for measuring atmospheric extinction coefficient and determination of visual range.

**transmittance** 1 Ratio of EM radiation transmitted through medium to that incident upon it,  $T = I/I_0$  (essentially synonymous with transmissivity).

2 Ratio of luminance of surface at which light leaves medium to illuminance of incident surface (provided units are compatible).

**transmitter** Equipment for converting code, sound or video signals into modulated RF signal and amplifying and broadcasting latter.

## transponder sierra

**transmitter chain** Klystron with TWT driver.

**transmitter/receiver** See *transceiver*.

**transmutation** Conversion of atoms into different element(s) by nuclear radiation.

**transom** Traditional name for near-vertical transverse bulkhead at stern of boat; occasionally present in seaplane float or flying-boat hull.

**transonic** General term for fluid flow in which relative velocity around immersed body or surrounding duct is subsonic in some places (seldom below M 0.8) and supersonic in others (seldom above 1.2). Thus \* range depends on shape of body, being very narrow and close to M 1.0 for slender body with pointed nose of small semi-angle and very thin wings. A purist would argue should be transsonic.

**transonic blading** Rotating blading whose surrounding fluid has subsonic relative velocity at root and supersonic at tip.

**transonic transport** Aircraft designed to cruise at about M 1.15 without producing sonic bang at ground level.

**transonic tunnel** Wind tunnel whose working section can operate at Mach numbers close to that of sound, say 0.8 to 1.2.

**transosonde** Balloon, normally for meteorological purposes, designed to maintain constant pressure level.

**transparency** 1 Portions of airframe optically transparent, eg windows, canopies, moulded noses, etc; also called glazing.

2 Imagery fixed on transparent base for viewing by transmitted light, often synonymous with diapositive.

**transparent** 1 One aerospace meaning is that no special maintenance is required.

2 Another is that making a major change, such as fitting a different type of engine, will be undetectable by either the pilot or the aircraft systems.

**transparent plasma** Plasma through which EM radiation, esp. that used by communications system, can pass; generally plasma is transparent to frequencies higher than its own.

**transpiration** Flow of fluid through passages very long in relation to diameter (eg interstices of porous solid) yet large enough for flow to depend chiefly on pressure difference and fluid viscosity.

**transpiration cooling** Cooling of hot solid by fluid, eg air, passed under pressure through its porous wall.

**Transply** Sandwich of two metal sheets each chemically etched to form passageways linking holes perforating both sheets (holes not in line, forcing cooling air to flow within sheet).

**transponder** Transmitter/responder; radio device which when triggered by correct received signal sends out pre-coded reply on same (rarely different) wavelength; received signal usually called interrogation, and reply usually coded pulse train. ATC allocates Modes A and B four-digit numbers to provide identification; Mode C gives auto reading from encoding altimeter. Used in many systems, eg telemetry, DME, SSR, IFF; abb. xpander, XPDR, TPDR.

**transponder india** Code for ICAO SSR (DoD).

**transponder landing system** Closed-loop approach aid which uses aircraft xpdr to give aircraft position and transmits guidance on normal G/S and localizer frequencies to ILS instrument.

**transponder sierra** Code for IFF Mk X/SIF (DoD).

**transponder tango** Code for IFF Mk X basic (DoD).  
**transport** Aircraft designed for carrying ten or more passengers or equivalent cargo and having MTOW greater than 12,500 lb (5,670 kg). Note: this was originally US usage, where \* British meaning is called transportation, which also means ticket.

**Transportation Security Administration** Formed after 9–11 [2001] as part of DoT but separate from FAA (US).

**transport equation** Complicated integral/differential equation by Boltzmann for distribution function in fluid, eg gas at low pressure, subject to flow and intermolecular collision.

**transporter** 1 Land vehicle, usually large and for off-road use, for carrying large missile or other mobile system or system element.

2 Airside vehicle for ULD.

**transporter/erector** Transporter for ballistic missile or large radar which also erects its load into firing or operating position. Hence \*\*/launcher, which also fires missile.

**transporter mast** See next.

**transporter tower** Airship mooring mast on mobile base.

**transport joint** Joint between major portions of structure, eg between centre section and outer panel, dismantled for transport (US transportation) in another vehicle.

**transport support** Airborne delivery of stores and/or personnel by airdrop.

**transport wander** See *apparent wander*.

**transputer** Transmitter plus computer with integrated signal-processing architecture.

**trans-sonic** See *transonic*.

**transuranium elements** Also called transuranic, those of atomic number higher than 92 (uranium); not occurring in nature but produced by nuclear reactions.

**transverse** Though this means athwartships or sideways it is often related not to basic vehicle axes but to major axis of local part; thus in wing it is common to consider spar as longitudinal and ribs as \*.

**transverse axis** OY, pitch axis, parallel to line through wingtips.

**transverse bulkhead** See *bulkhead*.

**transverse electric** See *transmission modes*.

**transverse-flow effect** In helicopter translational flight air passing through main rotor is initially at higher level and that passing through rear of rotor disc is accelerated as it passes across top of rotor; \*\* is differential lift caused by this difference in relative wind, causing blades in rear part of disc to flap upward. Note: in this usage transverse means longitudinal.

**transverse load** One acting more or less normal to major axis of member, thus tending to bend it; thus weight of fuselage forms \*\* on wing.

**transversely isotropic** Materials having uniform elastic properties in one plane, independent of axis of testing.

**transverse magnetic** See *transmission modes*.

**transverse member** Structural member running across from side to side; in wing and other aerofoils often interpreted as in chordwise direction.

**transverse Mercator** Map projection in which meridian is used as false equator; map is that produced by light source at Earth centre projecting on to cylinder wrapped round Earth touching along selected meridian, if necessary passing across pole. Parallels near pole almost

circular but become ellipses of increasing elongation until Equator is straight line; great circles are straight lines parallel to selected meridian, otherwise complex curves.

**transverse pitch** Perpendicular distance between two rows of rivets.

**transverse wave** Displacement direction of each particle is parallel to wave front and normal to direction of propagation; includes EM waves and water-surface waves.

**Trap, TRAP** 1 Terminal radiation airborne measurements program; note, not Tramp.

2 Tactical related applications.

3 Tactical recovery, aircraft and personnel (USAF).

**trap** 1 Radio receiver, subcircuit which absorbs unwanted signals.

2 In ultrahigh-vacuum technology, device which prevents vapour pressure of mercury or oil in diffusion pump from reaching evacuated region.

3 Rare filter in solid-propellant rocket to prevent escape through nozzle of unburned propellant.

4 Hollows in piston-engine rotating components in which oil sludge collects by centrifugal action.

5 See *flame trap*.

6 Verb, to make arrested landing on carrier.

7 Landing made as in (6).

**Trapatt** Trapped-plasma avalanche-triggered transit device.

**trapeze bar** 1 Transverse bar linking balloon basket suspension to riggings attached to envelope, permitting relative pitch but not yaw or roll; also called suspension bar.

2 Transverse bar on underside of airship or large aerodyne for attachment (including inflight release and recovery) of aeroplane or other aircraft.

**trapeze beam** General name for beam pivoted to two swinging parallel arms; also called bifilar suspension.

**trapezium distortion** Distortion of basic rectangular image on CRT or other display, eg caused by unbalanced deflection voltages.

**trapezoidal modulation** Involves changing waveform from sinusoidal to near-trapezoidal, with 95% modulation straight-top.

**trapezoidal section** Supersonic wing section looking like extremely flat shallow rhombus with flat top and bottom joined by wedge leading/trailing edges both on upper surface.

**trapezoidal wing** Usually means one whose plan is \*, not section; in most cases leading and trailing edges are both at 90° to flightpath, joined by tips with straight rake which is usually negative and at Mach angle.

**trapped fuel** That fuel always remaining in tanks, in worst case on ground using booster pumps for defuelling and switching off immediately associated LP warning lights illuminate.

**trapper** CFS examiner (RAF colloq.).

**trapping** Process by which particles are caught in radiation belts.

**trap weight** Maximum weight permitted for arrested carrier landing.

**TRASR** Tactical remote assessment/surveillance radar [through-wall sensor].

**travel[li]ng wave** A transverse structural deflection which moves along a linear structure in various modes defined by string theory.

## travelling-wave aerial

**travelling-wave aerial** One in which sinusoidal waves travel from feeder to terminated end.

**travelling-wave amplifier** Microwave amplifier depending on interaction between slow-wave field (eg travelling along wire helix) and electron beam directed along axis.

**travelling-wave magnetron** Usual type of modern multi-cavity magnetron in which TWT-type amplification is used at high power.

**travelling-wave tube** Various species of microwave amplifiers in which interaction takes place between electron beam and RF field travelling in same or opposite direction or in other arrangement; abb. TWT.

**travel pod** Streamlined external pod carried on normal pylon or hardpoint of fighter for pilot or crew personal baggage [rarely, for aircraft support equipment].

**traverse** 1 To rotate in azimuth.

2 To take set of readings along line, either discrete readings (eg pitot pressure) at selected points or forming continuous plot, eg from point well below trailing edge of wing to point well above (in this case called pitot \*).

3 Surveying method based on accurate distance/angle measures between fixed points.

4 Aircraft track made up of large number of straight legs linked by turns usually of 90° or 180°; used in search, patrol or EW duties (US term).

**traverse flying** Flying along traverse (4).

**trawling** Free-ranging search for targets of opportunity.

**TRB** Transportation Research Board [Washington, DC20418] (US).

**TR box** Transmit-receive switch in system (eg radar) using one aerial for emitting and reception; prevents emitted signal from being passed to receiver.

**TRC** 1 True track.

2 Thrust rating computer.

3 Traffic counts.

**TRCS** Techniques for determining near-field radar cross-section of space vehicles, eg RVs.

**TRCV** Tri-colour VASI.

**TRD** 1 Western rendering of turbo-reaktivny dvigatel, Russian for turbojet.

2 Torsional resonance damper.

3 Test requirements document.

4 Towed radar decoy.

5 Transit routing domain.

**TRDI** Technical Research and Development Institute (JDA).

**TRE** 1 Has been used in classified ads to mean transmitter/receiver equipment, transponder equipment, tactical receive equipment.

2 Telecommunications Research Establishment, Malvern, later RSRE.

3 Type-rating examiner.

4 Target-rich environment.

**tread** 1 Track (8) (US usage).

2 Normal meaning for \* of tyre.

**T<sub>rec</sub>** Recovery air temperature[s].

**Trecom** Transportation Research Command (USA).

**T-Recs, TRECS** Tactical radar electronic combat system.

**TREE, Tree** 1 Transient radiation effects on electronics.

2 Test and repair of electronic equipment.

**TREF** 1 Transient Radiation Effects Laboratory (USAF).

## triangulation balloon

2 Transportable [RAF] or tactical [RNethAF] reconnaissance exploitation facility.

**trefoil** Cluster of three parachutes.

**Trek** Telescience research kit, ground-based workstations.

**trellis control** See *lattice fin*.

**trenched** 1 Of rotating shaft, provided with multiple grooves forming labyrinth seal.

2 Of passenger-transport aisle, lower than rest of floor on which seats are mounted.

**TREND** Conditions [eg, for landing] in next two hours.

**Trends** Tilt-rotor engineering database system.

**trepanning** 1 Traditionally, using a cutter carried on the end of a rotating arm in order to cut a hole.

2 Using a high-power laser to cut a small hole and then expand it using a rotary motion.

**TRES** Tactical radar and ESM system.

**TRF** 1 Tuned radio frequency.

2 Threat radar frequency (US adds 'spectrum utilization').

3 Tactical replay facility.

**TRG** 1 Tuned rate-gyro.

2 Training.

**TRGB** Tail-rotor gearbox.

**TRI** Type-rating instructor.

**TRIA** 1 Tungsten-reinforced iron alloy.

2 Tracking range instrumented aircraft (USAF).

**Triac** 1 Test Resources Improvement Advisory Council (AFSC).

2 Without initial capital, semiconductor gate (switch) similar to silicon rectifier but triggered by either positive or negative pulse.

**Triad** 1 US deterrent concept based on simultaneous demonstration of hard land missiles, SLBMs and recallable bombers.

2 Triple air defense (USA).

3 Technique for reading an integrated air defense (US); S adds system, but see next.

**Triads** Tri-wall air delivery system, containers which glide down under lift from their yellow plastic packaging (USAF).

**triage** Urgent investigation of casualties of NW attack to determine which need, and will respond to, medical treatment.

**triagraph** Three-digit (numeral/letter) callsign used by whole formation or squadron (often changed), each aircraft having two-number suffix. To launch NW strike each aircraft would have had unique \*, previously subject to frequent change (RAF).

**triangle of velocities** Basic triangle in DR navigation with sides representing heading (course) and TAS, track and G/S, and wind velocity.

**triangular parachute** One whose canopy is approximately triangular when laid out flat.

**triangular pattern** Regular repeated flight pattern flown by aircraft with radio failure: equilateral triangle with sides 1 min (jet) or 2 min (others); flown left or right-handed depending on whether transmitter and receiver failed or only transmitter.

**triangulation** Mensuration technique, eg in sheet metal-work, in which whole area is divided into equal adjoining triangles.

**triangulation balloon** Small balloon used as sighting mark in triangulation survey.

## triangulation station

## trimming tanks

**triangulation station** Point on land whose position is determined by triangulation; also called trig point.

**triboelectrification** Electricity produced by frictional processes.

**tribology** Study of solid surfaces sliding over one another, with or without interposed fluid.

**tribometer** Instrument for measuring sliding friction, usually small-scale between smooth surfaces (ie not of runway).

**tri-camera photography** Simultaneous exposures by fan of three overlapping reconnaissance cameras.

**trichlorethylene** Common solvent and cleaner,  $\text{CH}_2\text{HCl}_4$ .

**trichromatic** Three-colour, eg TV or electronic display.

**tricycle** Though nearly all aeroplane landing gears support at three points (ignoring different number of wheels at each point) this adjective means use of nose-wheel instead of tailwheel. Becoming redundant, adj. today being needed only to distinguish tailwheel-type aircraft.

**Tridop** CW Doppler trajectory measurement using three fixed receivers.

**tri-ethyl borane** TEB, volatile pyrophoric [spontaneously igniting on contact with air] ignition liquid.

**Tri-fluid fuel** Rocket propellant comprising liquid hydrogen peroxide, decomposed peroxide and JP-7.

**Trifom** Trilateral fibre-optic missile (France/Germany/Italy).

**triform** Structural member, usually an extruded section, providing attachment faces along three planes passing through same line, e.g. a broad-arrow or a Y shape.

**Trigatron** Pulse modulator having DC-charged hemispherical electrode discharged by pulse from hemispherical trigger in gas-filled envelope.

**tri-gear** Fitted with nosewheel.

**trigger** 1 Pulse used in electronic circuits to start or stop an operation.

2 To initiate action using pulse of EM energy, eg leading edge of first pulse in SSR pulse train begins \* of transponder.

3 Sharp strip, usually on leading edge, to initiate stall.

**triggering transformer** Extra-high-voltage transformer connected in series with high-energy igniter to ionise gap and allow triggering spark to occur.

**trigger motor** Linear actuator in pressure circuit (usually pneumatic), or driven electromagnetically, to fire gun.

**trihedral** Having three plane faces meeting at junction of three interior angles [e.g., in corner reflector].

**trijet** Aeroplane propelled by three jet engines.

**trike** 1 Microlight using trike unit.

2 Trike unit.

**trike unit** Three-wheel chassis, usually with engine and seat(s), forming basic body and landing gear of microlight or ULA.

**trillion**  $10^{12} = 10,000,000,000,000$ .

**Trim** 1 Trail/roads interdiction multisensor.

2 Time-related instruction management.

**trim** 1 Basic measure of any residual moments about aircraft c.g. in hands-off flight.

2 Condition in which sum of all such moments is zero.

3 Condition in which aircraft is in static balance in pitch (BSI).

4 To adjust trimmers or other devices to obtain desired

hands-off aircraft attitude (according to BSI, in pitch only).

5 Angle between longitudinal axis (OX) and local horizontal, esp. of airship, marine aircraft or seaplane float on water.

6 To make fine adjustment to value of any variable, eg velocity at cutoff of ICBM, fuel flow to engine or capacitance deposited on circuit.

7 To make fine adjustments to flap, LG door, external access panel or other part of aircraft surface so that when closed there are no surface discontinuities.

**trim aid device** Patented add-on to eliminate need for rudder to counter torque and gyro effects.

**trim air** Hot bleed air added downstream of ECS pack(s) to achieve desired cabin air temperature.

**trim angle** Trim (5), positive when bow is higher than stern.

**trim cord** Short length of cord doped above or below trailing edge of control surface of simple aircraft to adjust trim.

**trim curve** Plot of elevator or tailplane angle ( $\eta T$ ) against airspeed or Mach for each c.g. position, altitude etc.

**trim die** Die which trims to final dimensions.

**trim drag** 1 Sustained increment of induced drag caused by need to increase wing lift to counter download on tailplane, plus the induced drag of the tailplane itself, plus component parallel to downwash on tailplane.

2 Sustained increment of drag caused by need to deflect pivoted surface continuously in order to achieve required trim, eg to deflect elevons or tailplane up to counteract rearward shift in CP as aeroplane accelerates to supersonic cruise speed. Normally eliminated in SST by pumping fuel aft to shift c.g.

**trimetric drawing** 3-D perspective.

**trimetrogon** Reconnaissance camera installation of three cameras in which one is vertical and others take high obliques at  $90^\circ$  to line of flight at inclination of  $60^\circ$  from vertical.

**trim for takeoff** Automatic or manual trimming of flight-control system to correct settings for takeoff; abb. TFT.

**trimmed** 1 In correct trim; also called trimmed-out.

2 The \* position of a flight-control surface or other inceptor may not always be at the neutral or zero position.

**trimmer** Trimming system about any axis (as plural, about all axes); normally trim tab(s).

**trimmeron** Small auxiliary irreversible surface used for roll trim.

**trimming moment** Moment about reference point, usually c.g., exerted by trimming system or by seaplane float or hull when held in water at particular fixed trim angle.

**trimming strip** Strip of metal (occasionally length of cord or wire) attached to trailing edge of control surface and adjustable on ground to achieve desired trim.

**trimming system** Flight-control subsystem through which pilot inputs bias controls about all axes to obtain desired trim; in most cases \*\* operates via hinged trim tabs but in supersonic fighters inputs are separate irreversible actuators driving into surface power units and in simple lightplanes often a spring-loading device in cockpit.

**trimming tab** See trim tab.

**trimming tanks** Fuel tanks (occasionally for other

## trimode scanner

liquids) located as far as possible from c.g. between which fuel can be pumped to achieve desired trim in pitch, eg in SST at subsonic or supersonic speed.

**trimode scanner** Circular aerial (antenna) using three EM modes in microwave cavity to move amplitude distribution in azimuth to scan 360°.

**trim size** Finished size of map or chart sheet.

**trim speed** Precise value of  $N_2$ , adjusted to ISA sea level, for particular engine; recorded by many manufacturers on data plate. It can correspond to MIL, rated thrust or some other power.

**trim tab** Small hinged portion of trailing edge of primary flight-control surface whose setting relative to surface is set by pilot via screwthread, powered trimmer actuator or other system preventing subsequent rotation under air loads and whose effect is to hold main surface in desired neutral position for trimmed flight.

**trim tank** See *trimming tanks*.

**trim template** Template used for marking finished shape of part already formed (eg in press) but not trimmed.

**trinitrophenol** Yellow crystalline high explosive.

**triode** Thermionic valve containing cathode, anode and control grid.

**trip** 1 One complete flown sector; hence \* time, \* fuel.

2 To activate an electrical circuit-protection system, or action thus triggered, eg overvoltage \*.

**triplane** 1 Traditionally, aeroplane with three main lifting surfaces, in practice superimposed but not required by definition.

2 In modern usage, aeroplane with foreplane and tailplane.

**triple** Triple seat unit.

**triple-A** Anti-aircraft gunfire or defences, from AA artillery (colloq.).

**triple display indicator** Shows Mach, KEAS and altitude.

**triple ejector rack** Rack for carrying and forcibly ejecting three dropped stores.

**triple-H** Hot, high, humid (all reduce takeoff performance).

**triple modular redundancy** Majority-vote redundancy by three parallel systems.

**triple-output GPU** Normally means electrical supply offers three voltages, eg 28 V DC, 115 and 415 V AC.

**triple point** 1 Unique thermodynamic equilibrium value of temperature/pressure at which substance can exist as solid, liquid and vapour.

2 In any diametral vertical section through NW air burst, intersection of incident, reflected and fused (Mach) shock fronts; height above surface (called Mach stem) increases with distance from GZ (DoD).

**triple pressure gauge** On British aircraft 1932–60 showed pneumatic brake system pressure and actual pressure at each main wheel.

**triple release** Release of three free-fall bombs at short intervals, with middle one intended to be on target (suggest arch.).

**triple seat** Passenger seat unit for three persons side-by-side.

**triple-tandem** Actuator of tandem type with three actuation sections.

**triple torque indicator** Vertical scales on AMLCD show engine output and main/tail-rotor torque.

**triplex** Among many meanings, use of three parallel

## tropical air mass

systems with minimal or zero interconnection to provide majority-vote redundancy; such triple redundancy provides for continued operation after single failure (SFO/FS operation). In \* detection/correction system one channel may be a model.

**triplexer** Dual duplexer allowing one aerial to feed two radar receivers simultaneously, both isolated during transmission of each pulse.

**trip line** Cable or thin rope attached to far end of sea-anchor drogue which when pulled spills out contents to allow drogue to be wound back on board.

**tripod** Vectored-thrust turbofan with one hot and two cold nozzles.

**TriSar** Triple-mode synthetic-aperture radar.

**TRIT** Turbine (usually HP) rotor inlet temperature.

**Tri-Tac** Tri-service tactical communications (DoD).

**tritium** Unstable radioactive isotope of hydrogen of mass number 3, crucial component of NW fusion materials such as Pu, Li-6 and deuterium.

**TRIXS** Tactical reconnaissance intelligence exchange system, or service.

**TRJ** Tactical radar jammer.

**TRK, Trk** Track.

**TRL** 1 Tyre rolling limit; upper right boundary of aeroplane takeoff performance carpet.

2 Thrust-reduction limit in flexible takeoff.

3 Transition level.

4 Technology readiness level.

**TRM** 1 Technical requirements manual.

2 Training and readiness manual (US).

3 Team resource management.

4 Tow-reeling machine.

**T/RM** Transmit and receive module, or manifold.

**Tr(M)** Magnetic track.

**TRML** Terminal.

**TRMM** Tropical-rainfall measuring , or measurement, mission.

**TRN** 1 Terrain-reference(d) navigation [S adds system].

2 Terminal radar numeric.

**TRO** Technical resources operation.

**trochoid** Path traced by point on circle which rolls along straight line. Commonest RC engine pistons are of related profiles.

**TROF** Trough.

**troland** Unit of retinal illuminance; that produced by viewing surface whose luminance is 1 cd/m<sup>2</sup> through artificial pupil of 1 mm<sup>2</sup> area centred on natural pupil. E (in \*) = LA (in nits × mm<sup>2</sup>).

**trolley-acc** Pronounced trolley-ack, 12-V or 28-V accumulator on two-wheel mount for starting aircraft.

**trolley dolly** Stewardess (colloq., suggest derogatory).

**troll(ing)** Flying of random pattern by EW/Elin/ECM aircraft to try to trigger and detect hostile emissions.

**trombone** Adjustable U-shaped length of waveguide or co-axial line used for phasing.

**trombone lever** Cockpit lever with linear trombone-like movement, eg F-111 wing sweep.

**tromboning** See *path stretching*.

**troop carrier** Aircraft designed or converted for carrying troops, with or without provision for other loads, or for departure by parachute.

**TROP** Tropopause.

**tropical air mass** Warm air originating at low latitudes, esp. in subtropical high-pressure system.

## tropical conditions

## true bearing

**tropical conditions** Various standardized conditions normally including ambient temperature at least 30°C (usually higher) and 100% RH, ie hot and moist.

**tropical continental** T<sub>c</sub>, air mass characterized by high temperature and low humidity; usually unstable and associated with clear sky.

**tropical cyclone** Rotating storm: tropical depression, winds <63 km/h; tropical storm, <118.5 km/h; typhoon, cyclone or hurricane, 120+ km/h. See *tropical revolving storm*.

**tropical maritime** T<sub>m</sub>, air mass characterized by high temperature and humidity.

**Tropical Maximum Atmosphere** One of many artificially averaged atmospheres.

**tropical revolving storm** Largest and most violent form of thermal depression, generally less than 800 km (500 miles) diameter but with pressure falling in centre to about 960 mb, originating in ITCZ in 5° to 15° N or S; called cyclone (Bay of Bengal, Arabian Sea), hurricane (S Indian Ocean and W Indies), typhoon (China Sea) and willy willy (W Australia).

**tropical trials** Trials under tropical conditions, for most equipments simulated exactly to specification but for aircraft by flying to actual hot/high airfield; for aircraft low atmospheric density more important than high humidity specified for, say, avionics.

**tropical year** Period of revolution of Earth round Sun with respect to vernal equinox (with respect to stars, 359°9' 59.7"); 365 d 5 h 48 min 45.85 s in 1990, increasing 0.0053 s per year.

**tropopause** Boundary between troposphere and stratosphere characterized by abrupt change in lapse rate (except at high latitudes in winter when change almost undetectable); height fixed in ISA at 11 km (36,089.3 ft), at pressure about 230 mb and relative density about 30%. In practice much higher over Equator (about 15–20 km) than over poles (about 8–10 km).

**troposphere** Lowest portion of atmosphere, extending from surface to stratosphere; characterized by lapse rate, humidity, vertical air movements and weather. Subdivided into surface boundary layer, Ekman layer and free atmosphere.

**tropospheric scatter** OTH radio propagation by reflection or scattering from irregularly ionised regions of troposphere; using forward scatter at about 25–60 MHz, ranges of about 1,400 km (870 miles) are possible.

**tropospheric wave** Radio wave propagated by reflection from place of rapid change in dielectric constant (high ionisation gradient).

**troubleshooting** Process of investigating and detecting cause of hardware malfunction (US usage; UK = fault diagnosis).

**Tro/Tri** Tactical reconnaissance optical, tactical reconnaissance IR day/night.

**trough** 1 Long but narrow region of low atmospheric pressure, opposite of ridge, with curving isobars at apex and absence of recognizable front.

2 Point in space where gravitational fields (eg Earth/Moon) cancel out (colloq.); neutral point but has implication of vagueness in location.

3 Repeated low portions of sine-wave flight 115–132K ft.

**trouser** Fairing for fixed landing gear in form of con-

tinuous streamline section round leg and upper part of wheel, usually tapering in chord and thickness.

**Trowal** Trough of warm air aloft (suggest arch.).

**TRP** 1 Threat-recognition processor (USN).

2 Tuition-refund program(me).

3 Thrust-rating panel.

4 Terminal rendezvous point (usually TRV).

5 Time-response parameter.

6 Timed reporting point [operational squadron = time on target].

7 Mode-S transponder.

**TRR** 1 Total removal rate.

2 Tyre (tire) rolling radius.

3 Test, rejection and repair.

4 Throttleable ram-rocket.

5 Test readiness review.

**TRRAP** Technology readiness risk assessment programme.

**TrReq** Track required.

**TRRN** Terrain.

**TRRR, TR<sup>3</sup>** Trilateration range and range-rate.

**TRS** 1 Tropical revolving storm.

2 Tactical reconnaissance system [or sensor, or squadron].

3 Teleoperator retrieval system.

4 Track reporting system.

5 Triple-redundant system.

6 Tail-rotor swashplate.

7 Training research simulator.

8 Terminal-radar simulator.

9 Technology-readiness support.

10 Training and rehearsal system[s].

**TRSA** Terminal radar service area.

**TRSB** Time-referenced scanning beam MLS.

**TRSR** Turbo-rogue space receiver; uses GPS to determine satellite position by triangulation.

**TRT** Terec remote terminal.

**Tr(T)** True track.

**TRTD** Treated (runway).

**TRTG** Tactical radar threat generator.

**TRTO** Type-rating training organization.

**TRTT** Tactical-record traffic teletypewriter.

**TRU** 1 Transformer/rectifier unit, eg for converting raw a.c. into low-voltage d.c.

2 Transmitter/receiver unit.

3 True.

4 Thrust-reverser unit.

**Truce** Tracking of reliability, utilization and census experience [of jet engines].

**truck** Bogie of main landing gear (US usage); same word also used for four MLGs of B-52, which are twin-wheel, one axle.

**truck-bed height** Commonly accepted average height of payload bed of road truck (UK, lorry), usually taken as 41 in (1,030 mm).

**TRUD, trud** Time remaining until dive; count of time from launch of upper-atmosphere or other vertical ballistic rocket vehicle and time at which it reaches apogee and begins dive; hence \* count.

**true airspeed** See *airspeed*.

**true altitude** 1 Actual height above SL; calibrated altitude corrected for air temperature.

2 Observed altitude of body.

**true bearing** Angle between meridian plane (referred to

## true course

true N) at observer and vertical plane through observer and observed point.

**true course** Angle between aircraft longitudinal axis OX and plane of local meridian (referred to true N).

**true heading** See *true course*.

**true-historic display** One showing what would have happened, eg line showing locus of impact points where bullets would have hit had they been fired.

**true meridian** Great circle through geographical poles.

**true north** Direction towards N pole of meridian through observer.

**true position** Position of celestial body or spacecraft computed from orbital parameters of Earth and body without allowance for flight time.

**true power** Actual ( $I^2R$ ) power of a.c. electrical circuit.

**true prime vertical** Vertical circle through true E and W points of horizon.

**true stress** That computed as force divided by true area normal to the load, as distinct from Engineering stress.

**true Sun** Sun as it appears to Earth observer, as distinct from mean, dynamic mean.

**true track** Angle between true N and aircraft path over ground.

**true vertical** Local vertical, line passing through observer and centre of Earth.

**Tru-Loc** Flight-control cable end-fitting swaged on by machine with tensile rating equal to breaking strength of cable.

**truncation error** EDP (1) error resulting from use of only finite number of terms of infinite series, or from other simplifying techniques, eg calculus of finite differences.

**trunk** 1 Large-section lightweight air-conditioning duct, or duct between gasbag valve and gas hood.

2 Major route, with or without surrounding box conduit, for large number of controls, services, cables, wire looms and other lines.

3 \* route or operator.

4 Compartment for baggage or general storage in GA aircraft (US usage derived from cars).

**trunk route** 1 Most important type of commercial route, eg between largest cities in country or countries, offering highest traffic. Hence \* operator, domestic \*, \* traffic.

2 Established air route along which strategic moves of military forces can take place (NATO).

**truss** Rigid load-bearing planar structure of spaceframe type, usually comprising essentially horizontal upper and lower chords linked by various vertical and diagonal members.

**trusted** Generalized description of network elements meeting specific measures of security.

**truth table** EDP (1) technique where coded signals are allocated to particular addresses, comprising series of adjacent address codes and output codes.

**TRV** 1 Terminal rendezvous point (army helicopters).

2 Tower restoral vehicle (USAF).

3 Thermal relief valve.

**TRVR** Touchdown runway visual range.

**TRW** 1 Tactical Reconnaissance Wing (USAF).

2 Thundershower (ICAO).

**TRX** Threat ready X-ray [airport security].

**try-again missile** Conceptual AAM of 1950s which, finding initial interception was outside design manoeuvre limits, made programmed turn for second attempt.

**tryptique** See *carnet*.

## TsENTROSPAS, TsentroSpas

**TS** 1 Thunderstorm (ICAO).

2 Transport, or Training, Squadron, or service.

3 Transattack survivability, i.e. a post-strike system.

4 Thunderstorm sensor.

5 Track system (UAV).

6 Torpedo-bomber/scout (USN 1943).

7 Two-stroke.

8 Transmitter segment.

9 Turbosupercharged (Satcom).

10 Time source.

**Ts** 1 Static temperature.

2 Note: Russian 'Ts' in this dictionary is rendered as C.

**Ts** 1 Total noise of radar system.

2 System equivalent noise temperature.

3 Sampling interval time.

**T-S** Graphical plot of absolute temperature (ordinate)—against entropy per unit mass of fluid S. Fundamental diagram in thermodynamics.

**TSA** 1 Training systems acquisition.

2 Tail-strike assembly (USAF).

3 Transportation Security Administration (US, from 2001).

4 Traffic separation assurance (NASA Ames).

**TSAAC** TSA(3) Access Certificate, required by Pt 91 operators in order to fly to airports normally accessible only to scheduled carriers.

**TSAFE** TSA4 flight environment.

**TsAGI** Common Western rendition of Central Aero and Hydrodynamics (research) Institute (USSR, R).

**TSAM** Tri-Service Attack Missile (US).

**T<sub>s</sub> and P<sub>s</sub>** Temperatures and pressures.

**TSAP** Transport service access point.

**TSAR, Tsar** 1 Tactical and strategic advanced reconnaissance.

2 Theatre search and rescue.

**TSAS** Tactile situation-awareness system.

**TSAT, T-sat** Transformational [communications] satellite.

**TSB** Transportation Safety Board [Québec K1A 1KB] (Canada).

**TSC** 1 Transportation Systems Center (US DoT).

2 Triple store carrier.

3 Tactical Support Center (USN).

4 Term service commitment.

5 Training system contract.

6 Terrorist Screening Center [FBI and other agencies] (US).

7 See *TSCP*.

**TSCM** 1 Technical surveillance countermeasure(s).

2 Tactical-strike coordination module (Tamps).

**TSCSS, TSCS3** Transformational satellite communications system space segment (USAF).

**TSCP** Transport security collaboration program[me]. (US + European defence and aerospace).

**TSD** 1 Tactical situation display.

2 Traffic situation display.

3 Time/speed/distance.

**TS diagram** Plot of temperature against entropy, a closed 4-sided figure.

**TSDIU** Transport service data-interface unit.

**TSDS** Telemetry storage and display system (UAV).

**TSE** Total system error.

**TsENTROSPAS, TsentroSpas** English renditions of

ministry for civil defence, emergencies and natural disasters (R).

**TSF** 1 Technical Supply Flight (RAF).

2 Originally telegraphie sans fil, = radio, now Télécoms sans Frontières (F).

3 Terascale Simulation Facility (LLNL).

**tsfc, TSFC** Thrust specific fuel consumption; SFC of air-breathing jet engine.

**TSFE** Thermally stimulated field emission.

**TSGR** Thunderstorm plus hail (ICAO).

**TSGT** Transportable satellite ground terminal.

**TSHWR** Thundershower.

**TSI** 1 Turn and slip indicator.

2 Track-situation indicator.

3 Transportation Safety Institute (US, from 1971).

4 Training Systems Integrator.

5 Trading Standards Institute (UK).

6 Total-sky imager.

**TsIAM** Common Western rendition of Central (research) Institute for Aviation Motors (USSR, R).

**TSIC** Touch-screen interactive control.

**TSIO** US piston-engine code: turbosupercharged, direct injection, opposed; now called TIO.

**TSIP** Trimble Standard interface protocol.

**TSIR** Total system-integration responsibility (AFSC).

**TsKB** Common Western rendition of Central Construction (design) Bureau (USSR, closed).

**TSM** 1 Autothrottle servo mount.

2 Trouble-shooting, or technical-support, manual.

**TSMO** Time since major overhaul.

**TSMP** Terminal-segment master plan.

**TSMT** Transmit.

**TSMTR** Transmitter (alternative to XMTR).

**TSN** Time, or total, since new.

**TsNII** English rendition of CSRI, Central Science Research Institute (R).

**TSNM** Transportation Sector Network Management (TSA3).

**TSNT** Transient.

**TSO** 1 Time since overhaul.

2 Technical service order (FAA).

3 Technical standard(s) order (CAA, from 1947).

4 Also interpreted as technical standing order.

5 Transportation Screening Officer (TSA).

**TSOC** Touch-screen operator console.

**TSOM** See Tom.

**TSOR** Tentative specific operational requirement.

**TSP** 1 Turret stabilized platform.

2 Transonic small perturbation.

3 Thermal scanning polygon [M adds motor].

4 Time/space position [I adds indication or information].

5 Total support package (industry/RAF).

6 Transmitted signal power.

7 Twisted shielded pair.

8 Transmitter/responder.

9 Tailstrike protection.

**TSPG** Training Systems Product Group (USAF).

**TSPR** Total system-performance, or program, responsibility (AFSC).

**TSQSL** Thundersqualls.

**TSPI** Time/space position information.

**TSR** 1 Torpedo spotter reconnaissance.

2 Tactical strike/reconnaissance.

3 Twin side-by-side rotors (helicopter).

**TSRA** Thunderstorm plus rain.

**TSS** 1 SST (F).

2 Tunable solid-state (laser).

3 Tethered satellite system.

4 Tacco sub-system.

5 Tactical surveillance sonobuoy, or supervisor.

6 Tail-strike sensor.

7 Target sight system.

8 Tangential signal sensitivity.

9 Technology support and services.

10 Tactical satcom system.

**TSSA** 1 Thunderstorm plus duststorm or sandstorm (ICAO).

2 Transport Salaried Staff Association (UK trade union).

**TSSAM** Tri-Service stand-off attack missile.

**TSSC** 1 Technical supply subcommittee (AEA).

2 Training System Support Center (F-22).

3 Technical and Safety Standing Committee.

**TSSR** Total-systems support responsibility.

**TSSTS** Tactical sight system training simulator.

**TST** 1 Transonic transport (usually M 1.1–1.2).

2 Threshold sampling time.

3 Technical support team.

4 Time-sensitive target, or targeting.

**TSTA** Takeoff safety training aid.

**TTSM** Time-source transition module.

**TSTM|S|** Thunderstorm[s].

**TSTO** Two stage to orbit.

**TSU** Telebrief-[ing] switching unit.

**tsu** Total wheel spin-up time on landing.

**TSUS** Tariff schedules of the US.

**TSV** 1 Time since shop visit.

2 Through-sight video.

**TWSW** 1 Tactical Supply Wing (RAF).

2 Transverse shear-wave.

**TT** 1 Total time.

2 Dry-bulb [total] temperature.

3 Teletypewriter (ICAO).

4 Turnround time.

5 Target towing (role prefix, UK, defunct).

6 All-weather (F).

7 Threat transmitter.

8 Twin-tandem landing gear.

9 Torpedo tube.

10 True track.

11 Test tools.

**TTA** Total-terrain avionics.

**TTAE** See *TTAF/E*.

**TTAF** Total time on airframe.

**TTAF/E, TTAF&E** Total time, airframe and engine.

**TT&C** Telemetry, tracking and control, or command.

**TT&L** Tracking, targeting and locating (USA).

**TTB** 1 Tanker/transport/bomber (USAF aircrew).

2 Target-triggered burst.

**TTBT** Threshold Test-Ban Treaty.

**TTBTS** TTB(1) training system.

**TTC** 1 Tracking, telemetry and command.

2 Technical Training Center (USAF), or Command (RAF, formerly).

3 Tape-transport cartridge.

4 Top-temperature control.

5 Temperature trim control.

**TTCP**

**TTCP** The Technical Co-operation Program[me] (US/UK).

**TTCR** 1 Time/temperature cycle recorder, or recording.

2 Triangular trihedral corner reflector.

**TTCS** Tactical terminal, or target-tracking, control system.

**TTD** Tactical-threat display.

**TTDF** Tip-turbine-driven fan.

**TTE** 1 Tooling and testing equivalency working group (AMC).

2 Total time on engine.

**TTEMP** Temperature test and evaluation master plan.

**TTF** 1 Time to first fix.

2 Tanker task force.

3 Threat training facility (US).

4 Target-towing flight.

5 Torpedo Training Flight.

**TTFF** Time to first fix.

**TTG** Time to go, range divided by closing speed.

**t<sub>θ</sub>** T-theta, panel thickness required to avoid buckling in torsion.

**T<sub>θ2</sub>** T-theta-2, numerator time-constant.

**TTI** 1 Triple torque indicator.

2 Time/temperature indicator.

**TTL** 1 Transistor/transistor logic; IC adds integrated circuit.

2 Torpedo-tube launch.

**TTLS** Transportable-transponder landing system.

**TTM** Tape-transfer magazine.

**TTNT** Tactical-targeting network technology, or technologies.

**TPP** 1 Time to protection, measured from firing chaff, aerosol, flare or other dispensed payload to time aircraft can be judged protected.

2 Through-thickness pinning.

3 Time-triggered protocol.

4 Tactics, techniques and procedures (USA).

**TRR** 1 Target-tracking radar.

2 Twin tandem rotors (helicopter).

3 TCAS-II transmitter/receiver.

4 Tonopah Test Range, Utah.

**TTRJ** Thermally throated ramjet.

**TTS** 1 Time to station; time in minutes to fly to tuned DME station. Often a selectable mode on DME panel instrument.

2 Technology Transfer Society (US).

3 Thin-tape system.

4 Total technical service (MRO), or support.

5 Total training system.

**TTSMOH** Total time since major overhaul.

**TTSN** Total time since new.

**TTT** 1 Tactical technical requirement(s), basis of each military specification (USSR, R).

2 Tailplane trim[ming] tank.

3 Template-tracing technique.

**TTTD** Tactile torso display device [not TTDD] (USAF Academy).

**TTTO, T<sup>3</sup>O** Two stage[s] to orbit.

**TTTS** Tanker/transport training system.

**TTU** 1 Triplex transducer unit feeding height, TAS and Mach to CSAS.

2 Torpedo Training Unit (RAF).

**TTW** Time of tension to war, or transition to war.

**TTWL** Twin-tandem wheel loading.

**T<sup>2</sup>CAS** Combined TCAS/TAWS.

**TTWS** Terminal threat warning system.

**TTY** Telephone/teletypewriter.

**TU** Towed unit.

**T<sub>u</sub>** Ultimate value of torque.

**TuAF** Turkish air force [UK usage].

**TUAV** Tactical unmanned air, or aerial, vehicle [R adds radar].

**tub** Tub section has been used to describe lower rear half of main fuselage structure of pod/boom helicopters.

**Tuballoy** Depleted uranium.

**tube** 1 Vacuum tube (UK = thermionic valve).

2 Large modern jetliner (colloq.).

**tube oil** Liquid primer for hot-coating interior of inaccessible workpieces.

**tube yawmeter** Array of four (or five if one in centre) pitot tubes each inclined at about 45° to flow and radially spaced at 90° so that dP across each opposite pair gives flow inclination in that plane; provides complete picture of local flow direction, little affected by yaw up to 15°.

**Tubitak** Scientific research board [acronym] (Turkey).

**tubo-annular** Gas-turbine combustor of annular type within which are separate tubular flame tubes. Latter are sometimes linked into common turbine NGV ring.

**tubular combustor** Gas-turbine combustion chamber whose upstream part is of essentially circular cross-section with central fuel burner. Engine may have one or more (early turbojets had as many as 16 because true annular technology unknown).

**tubular rivet** Rivet whose shank is a tube, usually inserted on central mandrel which on withdrawal closes upset head.

**tubulators** Numerous open tubes in surface of sailplane wing in hope of sustaining a laminar boundary-layer.

**tuck, tuck in** 1 Tendency to tighten turn, without pilot command.

2 At high Mach numbers, uncommanded nose-down pitching moment, also called Mach \*; could be violent to point of causing structural failure [the opposite of (1)].

**tuck derivative**  $C_{mv}$ , mathematical expression for tuck2, numerically equal to  $M(\delta C_m/\delta M)$ .

**tuck-under** Strong tendency to dive, especially at high Mach number.

**tufting** Covering aircraft, model or portion thereof with tufts.

**tufts** Short pieces of wool, thread or other very light, flexible and easily visible material which give qualitative picture of local airflow direction and (from steadiness or oscillatory motion or turbulence) vorticity or turbulence. Mounted on aircraft or model skin or at varying distances from it.

**tug** 1 Self-contained propulsion system for long-term use in space tasked with taking payloads, satellites, spacecraft and portions of station structure, propellants and other supplies (eg delivered by Shuttle Orbiter) and placing them in desired locations or trajectories. Intention is to attach \* to all types of payload, in various ways giving thrust without rotation, and to replenish propellants in space.

2 Aeroplane for towing glider, target or other unpowered object. Hence \* pilot, \* queue, \* landing area.

**tugging** Towing a target (colloq.).

**TUGRIT** Turkey, Greece, Italy radar assistance service.

**tulip** Spray of fuel from gas-turbine airspray-type

## tulip valve

burner at fuel pressure not high enough to atomize continuous film but too high for it to converge as bubble.

**tulip valve** Piston-engine exhaust valve shaped in side elevation like tulip.

**Tumav** Tactical unmanned multirole air vehicle.

**tumble** 1 To rotate about lateral axis, ie end over end; rare in aircraft but not uncommon in spacecraft.

2 To rotate metal parts in drum, often with powder abrasive, to remove flash or burrs and obtain polished surface.

3 Of gyro wheel, to precess to limit after toppling.

**tumblehome** Distance measured parallel to transverse axis from vertical line through widest extremity of seaplane or flying-boat hull to any point on skin above.

**tumblehome line** Abrupt change of curvature of mould line, buttock line or water-level contour at end of contour [marine aircraft].

**tumble limit** Angular displacement in pitch or roll at which traditional gyro instrument is on gimbal stops.

**tumbler** Drum in which metal parts are tumbled (2).

**tumbler switch** Snap-action electrical switch with short operating lever.

**tumbling** To tumble (1, 2, 3); to be in that condition.

**tunable beam approach** Pre-ILS landing system (BABS, SBA) in which pilot tuned receiver to particular airfield (arch.).

**tundra tyre** Low-pressure tyre suitable for operations from snow.

**tuned-bandpass transformer** Typically, primary winding forms anode load of one stage and secondary drives grid of succeeding stage.

**tuned circuit** Oscillatory circuit with capacitance and inductance selected or tuned to resonate at frequency of applied signal.

**tuned-grid circuit** Parallel resonant circuit linking grid and cathode with maximum response at resonant frequency; similar resonant response for tuned anode circuit.

**tuner** Subcircuit or device in RF receiver which selects desired frequency and rejects all others.

**tungsten** Silver-grey metal, symbol W, density 19.3, MPt 3,407°C; one of densest, hardest, strongest and most refractory metals known.

**tungsten inert-gas welding** DC current is passed through cathode of 4% thoriated tungsten and through workpiece with high-purity argon fed to both sides of weld and to form gas lens from torch.

**Tungum** Corrosion-resistant alloy of copper with 14.6% zinc and small amounts of other metals.

**tuning** 1 Fine adjustment over continuous analog range of values to obtain that desired, eg RF frequency/wavelength or optimum operating condition of engine or other device.

2 See *airframe* \*.

**tunnel** 1 See *wind tunnel*.

2 Axial fairing along body, eg to cover pipes, cables and other lines routed outside skin.

3 Channel along which baggage passes through screener.

**tunnel diode** Semiconductor device having single p-n junction across which electrons flow by quantum tunnelling; when biased to centre of a negative-resistance mode can operate as amplifier, oscillator or switch.

**tunnel shock** That occurring immediately downstream

## turbine temperatures

of supersonic working section in wind tunnel when Mach number falls below unity; intense if no second throat.

**tunnel vision** Inability to perceive anything outside an extremely small angular range of FOV, as if one were in a tunnel; caused by disease or high g.

**TUP** Technology utilization program (NASA, technology transfer).

**turb, TURBC** Turbulence (ICAO).

**turbidity** Any condition of atmosphere which reduces its transparency to radiation, esp. optical; term normally applied to cloud-free sky where \* is caused by suspended matter, scintillation and other effects.

**turbine** 1 Gas-turbine shaft power, ie turboshaft or turboprop; eg helicopter can be said to have \* power.

2 Prime mover whose power is obtained by action of working fluid (water, steam, cold or hot gas, etc) to give tangential circumferential forces reacting on blades or shaped passages which rotate a shaft. At redline speed a modern turbofan blade can move at 460 m (1,500 ft) s<sup>-1</sup>, under 60,000 g. One or more are source of power in all gas-\* engines and in turbochargers, turbopumps and many other rotary machines.

**turbine-airscrew unit** See *turboprop*.

**turbine bearing** Bearing supporting turbine shaft.

**turbine blade** Radial aerofoil mounted in edge of turbine disc whose tangential force rotates turbine rotor. Each turbine stage has many blades, occasionally fabricated in groups of two or more. Called bucket in US. Inwards-radial turbine does not have \*.

**turbine disc** Central member upon which turbine rotor blades are mounted; in some modern engines the blades and disc are monolithic. In many multistage turbines there are no flat discs, first and last stages being conical and intervening stages being rings gripped between them.

**turbine entry temperature** See *turbine temperatures*.

**turbine gas temperature** See *turbine temperatures*.

**turbine rotor** Complete turbine rotating assembly with 1–6 stages; stators are excluded.

**turbine shroud** Shroud around periphery of turbine rotor stage, formed by \* section on tip of each blade.

**turbine stage** Single turbine disc or ring with inserted blades; for completeness should be associated with preceding stator (IGV) stage.

**turbine stator** Ring of fixed blades, also called inlet guide vanes, upstream of each turbine rotor stage, on to whose blades \*\* directs gas with optimum distribution of V and pressure for maximum turbine work and efficiency (eg changes radial pressure/V, previously uniform, so that with increasing radius pressure increases while V falls).

**turbine temperatures** This entry describes temperatures in gas-turbine engines. Alphabetically, these are: CET, CIT, COT, EGT, RIT, SOT, TDT, TET, TGT and TIT. Following a particle through an engine, CIT is compressor inlet temperature, which is that of the ambient atmosphere corrected for any ram effect. COT is compressor outlet temperature, measured immediately behind the final stage of compression. CET, combustor exit temperature (also called combustion chamber outlet temperature, giving a second meaning for COT) is the temperature of the gas at the entry to the first-stage turbine stator. SOT is stator (first-stage) outlet temperature. The gas is then cooled 20°–120°C by injection of cooling air from the turbine disc (whose temperature TDT is cooled by the airflow) and other sources to give the RIT

(rotor inlet temperature), also called TET (turbine entry temperature) and TIT (turbine inlet temperature). In a single-shaft engine the gas leaves the turbine at EGT (exhaust gas temperature). In a two-shaft engine the gas leaving the HP turbine upstream of the LP turbine first-stage stator is measured as TGT (turbine gas temperature). Having passed through the LP turbine, the gas is reduced to EGT.

**turbine vane** US term for turbine stator blade.

**turbine wheel** US usage for either one complete stage or complete turbine, possibly of several stages.

**Turbinlite** Airborne searchlight for night interception experiments (RAF, WW2).

**turbo** 1 Turbocharger.

2 Generalized prefix meaning driven by or associated with gas turbine, eg \*-supercharger, \*-ramjet.

**turboblower** Air blower driven by exhaust-gas turbine to sweep burnt mixture from cylinders of two-stroke diesel. (Today also often used, esp. with diesels, to mean turbocharger).

**turbocharger** Piston-engine supercharger driven by exhaust-gas turbine.

**turbofan** Most important form of propulsion for all except slow aeroplanes (say, below 600 km/h, 375 mph); comprises gas-turbine core engine, essentially a simple turbojet, plus extra turbine stages (usually on separate LP shaft) driving large-diameter fan ducting very large propulsive airflow round core engine and generating most of thrust. For given fuel consumption generates much more takeoff thrust than turbojet, with many times less noise, but performance falls off more rapidly with forward speed. A few \* engines have *aft fan* whose blades form outward extensions of those of the compressor turbine.

**turbofan pressure ratio** This invariably means the pressure ratio across the fan, not including any part of the core.

**turbofan-prop** Turbofan driving propfan mounted ahead of inlet and acting as fan booster stage to give jet as well as shaft power.

**turbojet** Simplest form of gas turbine, comprising compressor, combustion chamber and turbine, latter extracting only just enough energy from gas flow to drive compressor. Most of energy remains in gas, which is expanded to atmosphere at high velocity through constricting propelling nozzle. In supersonic aircraft often fitted with afterburner.

**turbojet-based combined cycle** Propulsion system mating turbojet and scramjet, with separate [not valved] flow paths.

**Turboline** FS100 fuel additive to improve high-temperature stability.

**turboprop** Gas turbine similar to turbofan but with extra turbine power geared down to drive propeller. Difference between two forms of engine is of degree only; fan of turbofan is invariably shrouded, running inside profiled case, while propeller (but not propulsor) is always geared and normally operates unshrouded and unducted. In general \* has much higher bypass ratio than turbofan, and is tailored to slower aircraft.

**turbopump** Pump driven by turbine turned by gas, e.g. from rocket propellants.

**turboramjet** Combination of turbojet and ramjet as integrated propulsion for supersonic aircraft. In theory

afterburning turbojet or turbofan can be classed as \*, but in practice true \* is large ramjet within or upstream of which is turbojet for starting from rest and acceleration to ramjet lightup speed. In some forms large valves or duct-diversion doors are needed to change internal flows between turbojet and ramjet modes.

**turborocket** Various combinations of gas turbine and rocket in one engine.

**turboshaft** Gas turbine for delivering shaft power, eg to power helicopter, ACV or other non-flying vehicle. Essentially a turbofan or turboprop with fan or propeller removed. Often can deliver power at either end, and usually has at least one stage of speed-reducing gearbox.

**turbostarter** Main-engine starter driven by turbine turned by gas from cartridge, IPN or other fuel.

**turbosupercharger** See *turbocharger*.

**TURBT** Turbulent.

**turbulator** See *vortex generator*.

**turbulence** Time-variant random motion of fluid in which velocity of any particle, or at any point, is characterized by wild and unpredictable fluctuations which are extremely effective in conveying heat, momentum and material from one part of fluid to others. Called isentropic if rms velocity is same in all directions. US NWS defines light \* as wind varies 0–19 ft/s and moderate as 19–35 ft/s. (5.79–10.67 ms<sup>-1</sup>).

**turbulence cloud** Cloud formed because of atmospheric turbulence, usually distinctive layer above condensation level about 30 mb (say, 300 m, 1,000 ft) thick in otherwise stable air.

**turbulence control structure** Gigantic ‘golf-ball’ with numerous planar porous walls attached to inlet of engine on outdoor test to eliminate effect of wind.

**turbulence number**  $R$  (4) at which  $C_d$  of smooth sphere becomes 0.3.

**turbulence plot** Term has been used for plotting wake turbulence behind aircraft, building or other bodies, and also for recording geographical locations of severe atmospheric turbulence, including CAT, over a long period.

**turbulence screen** Screen across wind tunnel to reduce turbulence, usually rectilinear array of crossing sharp-edged strips.

**turbulent boundary layer** One that is no longer laminar, characterized by gross random lateral motions, and Reynolds stresses much larger than viscous; all boundary layers become turbulent at  $R = 250,000+$  unless surface unusually smooth, though apart from rise in skin-friction drag there should be no other significant effect and no separation.

**turbulent bursts** Microscopic eruptions which occur constantly over aircraft (or other) surface, beginning at surface; responsible for most of skin-friction drag and nearly half total aerodynamic drag.

**turbulent flow** Flow having turbulence superimposed on main movement, measured as velocity increments about all three axes expressed as fraction or % of mean flow velocity.

**turkey** 1 Badly designed aircraft, especially aeroplane, with sluggish or dangerous handling.

2 Aircraft with performance so poor as to be useless.

**turn** 1 Angular change of track; thus 30° \* does not mean 30° bank. See \* *rate*.

2 Of marching column, to make abrupt individual 90° turn, thus changing from column of route to line abreast.

**turn and bank**

**turn and bank** Traditional flight instrument, at bottom right in the *Basic 6*: one centre-pivoted needle moves L/R around the upper arc to indicate slip, while a second moves round lower arc to indicate rate of turn; straight and level or at rest both needles are vertical.

**turn and slip** Traditional flight instrument indicating rate of turn by a needle moving L/R around upper arc, and slip/skid by a ball in a lateral tube in lower arc. Alternatively, the needle is in the lower arc and the upper is a curved tube with a bubble.

**turnaround** Elapsed time between aircraft parking at stopping point and moving off to continue flight or carry out fresh mission.

**turnaround cycle** Comprises loading time at home base, time to/from destination, unloading/loading time at destination, unloading time at home, planned maintenance and where applicable, time awaiting facilities (DoD).

**turnaround time** See *turnaround, turntime*.

**turnback** Abandonment of scheduled sector and diversion to alternate or to starting point, 80% [2002] for reasons not related to the aircraft.

**turnbuckle** Double-ended threaded barrel for adjusting wire/cable tension.

**turn co-ordinator** Rate gyro which senses rotation about both roll and yaw axes (US).

**turndown** Inability of a company flight department to provide an executive aircraft at the time needed.

**turn errors** See *turning errors*.

**turn indicator** Gyroscopic flight instrument indicating rate of turn about aircraft vertical axis, almost always combined with slip/skid.

**turning** 1 General term for operation on a lathe in which workpiece is rotated.

2 Manoeuvre by which parachutist rotates to face direction of drift.

3 Rotating engine by means other than own power; also called cranking.

**turning centre** Notional, vertical axis about which aircraft turns when manoeuvring on the ground. Inner wingtip can move forwards or backwards.

**turning errors** Those due to instrument deficiencies, eg due to acceleration; see *acceleration error*.

**turning moment** See *couple, torque*.

**turn-in point** Point in space at which aircraft starts to turn from approach direction to line of attack (DoD, NATO, becoming arch.).

**turnoff** Point at which aeroplane leaves runway to taxi to parking place, normally also junction of runway and paved taxiway; high-speed\* is configured with gentle turn radius to avoid overstressing landing gear laterally.

**turnoff lights** Flush lights at 15 m (50 ft) intervals defining curved path from runway centreline to taxiway centreline.

**turnover assembly** Added at tail of vertical-launch missile to rotate towards target, then jettisoned.

**turnover structure** Strong structure intended to protect aircraft occupants in event of overturn on ground, eg crash arch., crash pylon.

**turnover voltage** Reverse V of point-contact semiconductor device (corresponding to reverse breakdown V of junction device) beyond which control over reverse current is lost.

**turn radius** Half lateral distance required to change

heading 180°. Radius is determined by TAS and bank angle:  $R = \frac{V^2}{g \tan \phi}$ .

**turn rate** By convention, aircraft change of heading rate is measured as Rate 1 = 360° in 2 min., Rate 2 in 1 min., Rate 3 in 32s, Rate 4 in 20s. Symbol  $\Omega$ .

**turnstile aerial** Crossed dipoles, equal quadrature-phase signals.

**turntime** Time a transport aircraft is out of revenue service for heavy maintenance [US usage].

**turpentine** One of terpenes, BPt 155°C; solvent, thinner and (in France) rocket fuel.

**turret** Enclosure for airborne gun(s) able to rotate in azimuth and with provision for gun rotation in elevation; manned or remotely controlled, but in latter case merged indefinitely into barbette. Later forms (c1955) exactly resembled sting of wasp and did not fit traditional configuration. Today found mainly on helicopters, always with remote control.

**turret lathe** Equipped with rotating toolholder for six (occasionally more or less) tools, indexed to work in sequence; large capstan with power operation and turret on main bed-slides.

**turtleback** Top of fuselage, esp. aft of cockpit.

**TUSA** Tactical unmanned surveillance aircraft.

**Tuslog** The US Logistics Group (USAFE).

**TUT** Targets under trees (AC<sup>2</sup>ISRC).

**TUV** Tactical unmanned vehicle.

**TV** 1 Television.

2 Terminal velocity.

3 Theatre of war (USSR, R).

4 Thrust vectoring.

5 Transfer vehicle (cargo).

6 Test vehicle.

**TVA** 1 Thrust vector angle (of gross thrust vector).

2 Tuned vibration absorber.

3 Target vector analysis.

**T-VASI, T-Vasis** See *VASI*.

**TVAT** Television air trainer; carried on external pylon.

**TVBC** Turbine vane and blade cooling.

**TVBS** Television broadcast satellite.

**TVC** 1 Thrust-vector control (S adds system).

2 Turbine vane cooling.

**TV command** Guidance by human operator watching TV picture from camera in nose of controlled vehicle.

**TVCR** Tower visual control room.

**TVD** 1 Turboprop (USSR, R).

2 Theatre(s) of military operation (USSR, R).

**TVDS** Tactical-video distribution system.

**TVDU** Television display unit.

**TVE** Total vertical [separation] error.

**TVGS** Text-to-voice generation system.

**TV homing** Automatic homing guidance by comparing TV picture with sequence stored in missile memory.

**TVI** 1 TV interference.

2 Trials verification and installation.

**TVIT, T-VIT** Tactical video imaging terminal.

**TVLA** Tuned vertical line array (sonobuoy).

**TVM** Track-via-missile.

**T-VOR, TVOR** Terminal VOR.

**TVP** Technology validation program[me] (AIGT).

**TVPM** Time-varying pulse manipulation.

**TVR** 1 Track-via-missile radar guidance.

2 Trajectory/velocity radar.

- 3** Tactical video link.
- TVRS** *1* Tactical voice-recognition system.  
**2** Tactical video receiving system.
- TVS** *1* Target value structure.  
**2** Thermal video system.
- TVSU** Television sight unit.
- TVT** *1* TV tracker.  
**2** Thermal vacuum testing.
- TV/TR** Thrust vectoring, thrust reversing.
- TW** *1* Threat warning.  
**2** Training, water-cooled (USA 1919–24).  
**3** Tare weight.
- T/W** Thrust/weight ratio.
- T<sub>w</sub>** Torque applied at wing root.
- TWA** *1* Trailing-wire antenna.  
**2** Tare-weight allowance.
- TW/AA** Tactical warning and attack assessment (Norad).
- TWACN** Theatre-wide area communications network [Cormorant].
- TWATN** Theater-wide area telecommunications network, not same as above.
- TWC** *1* Tungsten-wire composite.  
**2** Tailwheel conversion [of pilot].
- TWCC** Threat warning and countermeasures control.
- TWD** *1* Touchwire display.  
**2** Toward[s].
- TWDL** *1* Two-way data-link.  
**2** Terminal-weather data-link.
- TWDR** Terminal weather Doppler radar (TDWR is more usual).
- TWE** Threat-warning equipment.
- TWEB** Transcribed weather broadcast.
- 12-5** Rule limiting MTOW to 12,500 lb.
- 1250** Paybook for RAF airmen in which career details are recorded.
- 20-minute rating** A-h rating of battery indicating current required to discharge from maximum to zero in 20 min.
- TWF** Tail warning function (ECM).
- TWG** *1* Treaty Working Group (JAA).  
**2** Technical Working Group (US/NATO Stanags).
- TWI** *1* Threat- (or tail)-warning indicator.  
**2** The Welding Institute (UK).
- TWIC** Transport Workers Identification Credential (TSA, 2004+).
- Twids** Taut-wire [perimeter] intrusion detection system.
- twilight** Designated civil \*, nautical \* or astronomical \* at Sun zenith angles of 96°, 102°, 108°, respectively.
- twilight band** Strip, about one aircraft span in width, where radio range A/N just detected against steady note (obs.).
- twilight effect** Faulty indications of radio navaids of pre-1950 (occasionally, later) during twilight, ascribed to ionospheric distortions.
- twilight zone** Bi-signal radio range zone where only A or N heard (obs.).
- twin** Aircraft, usually aeroplane, powered by two similar engines; arguably, one powered by two different engines, eg jet plus prop.
- twin-aisle aircraft** Usually synonymous with widebody, transport whose passenger seating is divided by two axial aisles.
- twin-array VASI** One located ahead of desired touch-down point, the other beyond.

- twin-boom aircraft** Aeroplane [airplane] whose tail is carried on left/right booms (1) symmetric about centreline.
- twin cable** Plastic extrusion containing two side-by-side untwisted conductors.
- twin-contact tyre** See *twin-tread*.
- twin-float seaplane** One supported on water by two similar floats side-by-side.
- twin-gyro platform** Platform housing two gimballed gyros providing precision heading and attitude reference for military aircraft; additional input, eg Doppler, is needed for position readout.
- twinkle roll** Has been used to mean flick roll, but normally maximum-rate slow aileron roll performed by two or more formating aircraft simultaneously, each about own axis.
- twin paradox** See *time dilation*.
- twin-row engine** Piston engine of radial type with two rows each occupying one plane and each driving on one crankpin.
- twin-shaft** *Two-shaft engine*.
- twin-spool** *Two-spool*.
- twin tail** Conventional tail with twin vertical surfaces, often at or close to extremities of tailplane in slipstream from engines, esp. with single fuselage.
- twin-tread tyre** Contacting ground around two circular treads separated by deep groove; intended to reduce shimmy, esp. of tailwheels.
- twin-tub aircraft** Two-seater, especially with open cockpits.
- twin-wing aircraft** *1* Term currently in use for diamond-wing aircraft; especially when tips are joined by vortex-generator endplates.  
*2* Since 2002 also used to mean a UAV biplane.
- TWIP** Terminal weather information for pilots.
- twist** *1* Variation in angle of incidence along aerofoil, always present in rotating blades. In wing, normally subdivided into aerodynamic (defined as variation in no-lift direction along span) and geometric (variation in angle between chord and fixed datum along span). Positive called washin, negative washout.  
*2* Roll about longitudinal axis, as in \* and steer.
- twist and steer** Control method for fixed-wing aerodynamics in which it is necessary first to roll to (normally large) bank angle and then pull round on to desired heading. Only possible method on aircraft (eg missiles) with no control surfaces other than main wings, which pivot independently for twist and together for steer. Not applicable to conventional aeroplanes, which make simultaneous harmonized movements about all axes.
- twister** *1* Device twisting electric component of EM, especially coherent radar.  
*2* Tornado (colloq.).
- Twisteron** Idea for continuously optimising L/D ratio by twisting under torsional loads L/R wings in unison (Utah State Univ.).
- twitch factor** Unquantified factor degrading flight-crew (esp. pilot) performance in terms of accuracy or incidence of errors, resulting from fear or high workload. In simplest case \*\* magnifies task of adding 2+2.
- twizzle** Various manoeuvres adopted by combat pilots, esp. of large aircraft, to throw fighter off aim or effect escape; always involved steep climb and/or dive, combined with limited rolling manoeuvres (WW2).

**TWL** Twin-wheel loading.

**TWMS** Tactical-weapons management system.

**Twng** Towering.

**TWO** Tare-weight objective.

**Two, 2** 1 The partner in a formation-display duo; his role is to keep his eyes glued on Lead and position accordingly.

2 Two aircraft in a tactical formation: major variations are finger 2, fluid 2, deuce, loose deuce, pair, Rotte.

**2½-axis machining** Continuous-path machining (invariably with NC) on x, y axes, usually intermittent on z.

**two-axis autopilot** Simple autopilot having authority in roll and yaw only.

**two-axis homing head** Scans in az and el.

**two-bay biplane** One with wing assembly comprising two bays on each side of fuselage, each comprising rectangular cellule of inner and outer interplane struts with points of attachment linked by diagonal wires. Loosely, biplane with interplane struts at two different spanwise locations on each side of fuselage (discounting any struts near fuselage).

**two-colour pyrometer** High temperature is measured at two wavelengths.

**two-control aircraft** Aeroplane or glider with flight-control system in two axes only, invariably ailerons and elevator; thus no rudder or pedals.

**two-crew** Misnomer; what is meant is that flight crew comprises two persons; \* operation is often matter between airline employers and ALPA, and largest transports frequently have flight crew of at least three.

**two-cycle** See *two-stroke*.

**2-D** 1 Two-dimensional.

2 Position defined by lateral guidance only in Satnav.

**2-DCD** Two-dimensional convergent/divergent (nozzle).

**2-D flow** Flow which can be described completely in one plane, eg around wing of infinite span.

**two-dimensional matrix** Code for marking parts for identification, small area containing 100 times more information than bar code.

**2-D inlet** Two-dimensional inlets are in theory ideal for operation over wide range of Mach numbers but because of end and corner effects and mechanical complexity are in practice inferior to axi-symmetric.

**2-DM** Two-dimensional matrix.

**2-D nozzle** Jet nozzle of rectangular cross-section and constant longitudinal profile which can vector thrust in vertical plane. Studied for future US fighters. Also called platypus.

**2 DOF** Two degrees of freedom.

**2-D radar** Radar giving target position in two dimensions, eg az/el, or range/bearing; only a few can pinpoint body's location in 3-D space.

**2-D wing** Usually one of infinite span, whose tip effects can thus be ignored; for some purposes constant-section wing joined at each end to tunnel wall is approximation.

**twofold flocking** Turbofan test for birdstrikes over whole area of fan and spinner.

**two-frequency** Glidepath and/or localizer having two unrelated radiation patterns.

**2 Gims** Two-gimbal INS (colloq.).

**2H-2E** Hybrid architecture of secondary power systems comprising two hydraulic and two electrical circuits.

**two-inceptor control** Fundamental control strategy for

pilot of jet STOVL aircraft in which left hand controls speed only (including forward acceleration from hover) and right hand controls flight trajectory (including hover height).

**two-level bridge (jetway)** Passenger bridge whose land-side end can be raised or lowered to mate with either arrival or departure floor level.

**2LM** Second-level maintenance.

**two-man rule** Philosophy under which no individual is allowed unaccompanied access to NW or certain designated components or associated system interfaces.

**two-meal service** Two meals served on one sector.

**2-minute turn** Rate 1 turn; also called standard turn or procedure turn.

**two-moment equation** Relates simple-beam loading to shear and BM.

**2 on 1 injector** Rocket liquid injector spraying two streams of liquid A on to one stream of liquid B, the three meeting at various angles depending on design.

**2-place** Two-seater.

**2.5-D** Describes advanced synthetic vision systems which give important information on 3-D shapes.

**2.5-engine aircraft** Twin-engine aircraft certificated to use APU [or other centreline auxiliary engine] to give propulsive thrust, especially at takeoff.

**2-point landing** See *wheeler*.

**2-point suspension** Bifilar, hung from two points at same level on two filaments or cables.

**two-point tanker** Fitted with two HDUs which can be used simultaneously.

**2-pole switch** Opens or closes both sides of same circuit or two separate circuits simultaneously.

**two-position propeller** One having only two settings, fine and coarse.

**two-pulse rocket** Motor, usually solid propellant, comprising two stages (eg, boost and sustain fired in series).

**two-rate oleo** Normally, first part of travel is at low rate (ie, large deflection per unit load); after loading to given limit, often close to static position at gross weight, high-rate law applies. Common on naval helicopters.

**two-tow radial** See *twin-row engine*.

**two-segment approach** Two angles, usually 6°/3°.

**two-shaft engine** Gas turbine with mechanically independent LP and HP sections each running at its own speed, or a free-turbine turboshaft or turboprop.

**two-speed supercharger** Driven by step-up gearbox which, usually automatically at given pressure height, changes ratio to increase impeller speed at high altitudes.

**two-spool** Gas turbine of two-shaft type, originally confined to engines having two axial compressors (LP and HP) in series. Also called split-compressor engine.

**two-stage** Adjective, achieved in two parts. A turboprop may have a \* compressor through the parts of which the air flows consecutively, whereas the propeller is driven by a \* gearbox in which both stages operate simultaneously.

**two-stage amber** Synthetic day/night pilot training aid in which pilot wears blue goggles and flies trainer with amber transparencies (or vice versa) which effectively eliminates external cues while allowing view of instruments.

**two-stage igniter** Generally, one that first ignites a local flame, burning main fuel, which in turn is used to ignite main combustion (gas turbine or rocket but now rare).

**two-stage supercharger** One having two impellers in

**2-star red**

series, either both driven by crankshaft or with first (LP impeller) driven by exhaust turbo.

**2-star red** Standard distress pyrotechnic, fired without pistol.

**two-step supercharge** Throttle is gated below rated altitude, thereafter being free to move to maximum position; used with or without two drive ratios.

**2-stick** Dual-control aircraft (colloq.).

**two-stroke** Piston-engine cycle in which every upstroke expels exhaust and compresses mixture and every down-stroke provides power. Often abb. 2T. Not normally certificatable for unrestricted aviation use.

**2-view drawing** Orthographic projection drawing comprising two views, usually left-side elevation and plan.

**TWP** *1* Two-way programme.

2 Technical-work programme.

**TWR** *1* Threat-warning receiver (formerly sometimes rendered as tail-warning radar).

2 Tower (or twr); suffixes: INC, in cloud; INH, in haze; INK, in smoke; INP, in precipitation; INUN, in unknown obscuration.

3 Turbulence weather radar.

**twr** Tower; one definition = aerodrome control.

**T/W ratio** Thrust/weight ratio.

**TWRG** Towering.

**TWS** *1* Tail-warning set or system.

2 Track-while-scan.

3 Threat-warning system.

4 Through-wall surveillance.

5 Thermal weapon sight.

6 Tactical work station.

7 Terminal weather system.

**TWSC** Thin-wall steel case.

**TWSRO** Track-while-scan in receive mode only.

**TWSS** *1* TOW weapon subsystem.

2 Track-while-scan system.

**TWT** *1* Travelling-wave tube.

2 Transonic wind tunnel.

**TWTA** TWT amplifier.

**TWU** *1* Tactical Weapons Unit (RAF).

2 Transport Workers Union, now Transport Workers of America (US).

**TWX** *1* Theatre war exercise.

2 Teletypewriter exchange.

**TWY**, **twy** Taxiway.

**TWYL** Taxiway link.

**TX**, **tx** Transmitter, transmit, transmission.

**T<sub>x</sub>** Horizontal component of thrust.

**TXP** Transponder (also TPDR, XPDR etc).

**TXT** Text.

**TYD**, **TY\$** Then-year dollars, ie based on a selected historic monetary value.

**TYP** Type of aircraft (ICAO).

**type** *1* Particular type of aircraft, ignoring marks or subdivisions.

2 Human being, especially adult male (as 'a good \*', 'a quiet \*', colloq. RAF usage, WW2).

**type approval** Issue of type certificate.

**type certificate** Legal document, in US issued by FAA, allowing manufacturer to offer item (eg aircraft, engine) for sale.

**type certificate data sheets** Official specifications to which each unit (aircraft, engine, propeller) commercially offered for sale must conform (FAA).

**type conversion** Clearance of qualified pilot to fly additional type of aircraft.

**Typed Air Station** Establishment assigned task of providing full support for particular aircraft type, even though based elsewhere or embarked (RN).

**Type Rating** Endorsement on licence specifically qualifying holder to fly or maintain particular type of aircraft. These are required if MTOW exceeds 12,500 lb (5,670 kg).

**type record** Various books or document dossiers, some of which have legal status, but basically complete record of all decisions made regarding particular type of hardware, esp. including all modifications, service difficulties, airworthiness directives and alterations made locally, eg on owner's initiative.

**type test** Basic government test clearing engine or other machine for production and acceptance by government customers (UK).

**TYPH** Typhoon.

**typhoon** *Tropical cyclone, revolving storm.*

**typical** In structures and structural components, arithmetical mean structure calculated by measuring sections of all members actually produced.

**Tyranno** A Japanese high-modulus ceramic fibre.

**Ty-Rap** Patented nylon strap for tying and identifying bundles (looms) of electrical wiring.

**tyre** Specifically for landing-gear wheels; US = tire.

**tyre sizes** Usual sequence of three numerical values is overall diameter, section width (undeflected) and (if present) inner diameter or bead size. Other measures include Types III and VII, radial and metric. There is a need for a uniform scheme.

**Tyro** Callsign prefix, when calling military or D&D: I am inexperienced.

**Tyuratam** Soviet test centre for ICBMs, various other missiles and FOBs, and launch centre for Cosmos military satellites; location 45.8°N, 63.4°E.

**T<sub>z</sub>** Vertical component of thrust.

**TZD** True zenith distance.

**TZM** Titanium, zirconium, molybdenum.

**TZP** Ceramic comprising mix of tetragonal zirconia in fine-grained polycrystalline zirconia.

# U

- U**
- 1 Overall heat-transfer coefficient.
  - 2 Linear acceleration (archaic usage).
  - 3 Internal or intrinsic energy.
  - 4 Aircraft has 4096-code transponder with altitude encoding.
  - 5 With appropriate suffix, flow velocity component [along orthogonal axes, radial or tangential], or vehicle speed, eg  $U_o$ .
  - 6 Designation prefix, aircraft, unpiloted (USN 1946–55), RAF (from 1956), or utility (USAF from 1952), USN (from 1955).
  - 7 Modified mission, prefix and suffix, utility (USN).
  - 8 Designation first letter, missile, underwater-launched (DoD).
  - 9 Designation second letter, missile, attack on underwater target (DoD).
  - 10 Airfield is unlicensed.
  - 11 Upgravelyemaya, = guided (R).
  - 12 *Umriſt*, = factory modification (G, WW2); -B or *Bausatz* added conversion kit.
  - 13 Upper (wing or flight level).
  - 14 Identity unknown.
  - 15 Until.
  - 16 Unicom.
  - 17 Uranium.
  - 18 Aircraft category UAV (FAI).
  - 19 Unidirectional [runway].
  - 20 Other meanings include unmanned, unwatched, unverified, upward and user-fee.
  - u**
    - 1 Force in structural member due to unit load; also [quite different] uniform load per unit length or area.
    - 2 Tangential velocity, or linear velocity of point in rotating structure, e.g. compressor rotor blade or aeroplane in roll.
    - 3 Also used for translational velocities.
    - 4 Surface unpaved.
    - 5 Unit of atomic mass.
    - 6 Specific internal energy.
    - 7 Velocity along X [body] axis, alternative to U(5).
    - 8 Subscript, upper surface.  - (U) 243.0 Hz available on request.
  - U-alpha** Free-stream fluid velocity, usually written  $U_\alpha$ .
  - U-code** See *U* (4).
  - U-index** Monthly mean of differences between consecutive daily mean values of horizontal component of Earth's magnetic field.
  - u-index** Value of U-index divided by sine of magnetic co-latitude multiplied by cos of angle between magnetic meridian and horizontal component.
  - U-joint** Universal joint.
  - U-tail** Aeroplane tail with twin verticals attached to fuselage (can be inclined outwards but not applicable to butterfly tail).
  - U-235** Fissile uranium, isotope typically 0.71 per cent of natural metal, nearly all the rest being U-238.
  - UA**
    - 1 Uncontrolled airspace.
    - 2 Unit of account; standard accounting unit (EEC).
    - 3 Until advised.
    - 4 Airep, upper-air pirep.  - 5 Unnumbered acknowledgement.
  - 6 Unit of Action (USA).
  - 7 Unmanned aircraft.
  - UAA**
    - 1 Up and away (JSF).
    - 2 University Aviation Association [office, Cahokia IL] (US).
    - 3 Upper advisory area.
    - 4 Unusual aerial activity (CAA, UK).  - UAAA** Ultralight Aircraft Association of Australia.
  - UAB** Until advised by (ICAO).
  - UAC**
    - 1 Upper-air computer, or center (FAA).
    - 2 Upper-airspace control (CAA).
    - 3 Upper-area control centre.
    - 4 Universal avionics computer.  - UACC** See *UAC* 3.
  - UACCV** Unit of action command and control vehicle.
  - UACO** Unamnned autonomous collaborative operations (USA, USAF).
  - UA/cS** Unmanned aircraft system. including supporting infrastructure.
  - UAD**
    - 1 Unidirectional aligned discontinuous.
    - 2 Upper advisory (route).  - UADA** Upper advisory area.
  - UADE** Ultralightweight aerial diesel engine [usually Ulade].
  - UAI** Union Astronomique Internationale [office, Paris] (Int.).
  - UAJ** Unattended jammer.
  - UAL**
    - 1 Unidirectional approach light[ing].
    - 2 Unit authorization list.  - U $\alpha$**  See *U-alpha*.
  - UALV** Unmanned airlift vehicle.
  - UAM** Underwater-to-air (missile).
  - UANC** Upper-airspace navigation chart.
  - U&L** Upper and lower (wings).
  - UAOS** Unmanned aerial, or aeronautical, observation system.
  - UAP** Unidentified aerial phenomena.
  - UAPP** Unified adapative planning (or preplanning) program.
  - UAR**
    - 1 Upper air route.
    - 2 Unattended radar.  - UARS**
    - 1 Unattended radar station.
    - 2 Unmanned air reconnaissance system.
    - 3 Upper-atmosphere research satellite [NASA, 1991–2001].  - UART** Universal asynchronous receiver/transmitter.
  - UAS**
    - 1 University Air Squadron(s). (UK).
    - 2 Upper airspace service.
    - 3 Unamnned, or uninhabited, air, or aerial, system.
    - 4 User aircraft system.
    - 5 User application software.
    - 6 Ulster Aviation Society [1968–; Newtonabbey BT36 6PE] (UK).
    - 7 Unassigned (Telabs).
    - 8 Unavailable service (Sprint).
    - 9 Urea ammonium sulphate.  - UASA** Upper-airspace service area.
  - UASO** Unmanned Air Systems Office (FAA).

## UASTAS

**UASTAS** Unmanned airborne surveillance and target-acquisition system(s) (DND).

**UASV** Uninhabited, or unmanned aerial surveillance vehicle.

**UAT** 1 Universal-access transceiver.  
2 Unidentified air traffic.

**UATI** Union des Associations Techniques Internationales (Int.).

**UATP** Universal air travel plan (Int., US-based).

**UAV** Unmanned, or uninhabited, air, or aerial, vehicle; B adds battlelab, S systems, Note: US official abb. is now UMV.

**UB** Utility bus.

**UBE** Ultra-bypass engine.

**Ubée, ubie** Alternatives to UBE.

**UBEP** UK bomb enhancement programme.

**UBF** Underground baggage facility.

**UBI** Uplink block identifier.

**Ubicomp** Ubiquitous computing.

**UBRE** Unit bulk refuelling equipment, 4 × 4 truck.

**U/c, u/c** 1 Undercarriage, ie landing gear.  
2 Under construction.

**UCA** Undefined contract[ing] action (US).

**UCAR, Ucar** Uninhabited [or unmanned] combat armed [or air] rotorcraft [previously called R<sup>2</sup>W] (USA/Darpa).

**Ucars** Unmanned air vehicle common automatic, or automated, recovery system.

**UCAS** Unmanned combat air system.

**UCAV** Unmanned, or uninhabited, combat air vehicle.

**UCC** Ultra-compact combustor.

**UCCEGA** Union des Chambres de Commerce et Établissements Gestionnaires d'Aéroports (F).

**UCD** Urine collection device.

**Uchinoura** Rocket launch site, Kagoshima prefecture (J).

**UCI** 1 Unit construction index; measure of flotation (ability of landplane to use soft airfields) based on MTOW, tyre pressure and gear geometry.  
2 User computer interface.

**UCIIR** Uncooled imaging IR; SAL adds semi-active laser.

**UCIMU** Unione Costruttori Italiani Macchine Utensili.

**UCL** Up command link; opposite of DDL.

**UCLA** University of California at Los Angeles [CA90024–2883] (US).

**UCNI** Unified com/nav/ident.

**UCP** Ultrasonic capacitance probe.

**UCR** Uniform commercial rate[s].

**UCS** 1 Utilities control system.  
2 Uniform chromaticity scale.  
3 Universal control station (NATO).

**UCSD** University of California at San Diego [CA92093–0524] (US).

**UCWA** Urgent center weather advisory (Sigmet).

**UD** 1 User data.  
2 Upper deck.  
3 Unaligned discontinuous.  
4 Unambiguous Doppler.

**UDA** Upper advisory area [usually UADA].

**UDACS** Universal display and control system.

**UDCS** Universal drone control system.

**UDDF** Up- and down-draughts.

**u<sub>DE</sub>, U<sub>DE</sub>** Gust vertical speed [design case].

**Udet buoy** Open-sea tethered buoy to assist downed aircrew (G, WW2).

**U-deta** Unsymmetrical diethyltriamine.

**UDF** 1 U.h.f. direction-finding.  
2 Unducted fan engine (GE trademark).  
3 Unit development folder (software).  
4 User data file [G adds generator].

**UDI** Unrestricted digital interface.

**UDL** Universal or unclassified, data-link.

**UDM** Universal docking module.

**UDMH** Unsymmetrical dimethylhydrazine rocket fuel.

**UDMU** Universal decoder memory unit (Gpats).

**udometer** Rain gauge.

**UDP** User Datagram protocol.

**UDR** Upper advisory route.

**UDS** 1 Unidirectional solidification.  
2 Unsupported (or unstocked) dispersed (or dispersal) site.

**UDT** Unidirectional transducer.

**UDTE** Upgraded data-transfer equipment.

**UE** Unit equipment, or establishment, list of aircraft or other items serving with combat units.

**UE, u/e** Under-excitation.

**UECNA** Union Européenne Contre les Nuisances des Avions (Int.).

**UEDP** Uncontained engine debris pattern.

**UEET** Ultra-efficient engine technology (NASA).

**UEJ** Unattached expendable jammer.

**UEO** Western European Union (F).

**UER** Unscheduled engine removal, or unplanned engine-removal rate.

**UESA** U.h.f. electronically scanned array, or array antenna.

**UEU** Universal exciter upgrade.

**UEWR** Upgraded early-warning radar.

**UF** Uplink format.

**UFA** Until further advised.

**UFC** 1 Unified fuel control.  
2 Up-front control; D adds display, P panel.

**UFCM** Uncommanded flight-control movement.

**UFCP** Up-front control panel.

**UFD** 1 Up-front display.  
2 Ultra-flat display.

**UFDR** Universal flight-data recorder.

**UFH** Union Française d'Héicoptères [2003–] (F).

**UFIR** UAV-to-fighter imagery relay (USAF).

**UFL** Upper flammability limit.

**UFN** Until further notice.

**UFO** 1 Unidentified flying object.  
2 U.h.f. follow-on (DoD satellites, to be replaced by Muos).  
3 United Flying Octogenarians (US).

**UFPA** Uncooled focal-plane array.

**UFS** Ultimate factor of safety.

**UFTAS, Uftas** Uniform flight-test analysis system (AFFTC).

**UGAI** Unione Giornalisti Aerospaziali Italiani. (I)

**Ugine-Séjournet** Method of extruding steel using molten glass as lubricant.

**UGM** US prefix, underwater-launched surface-attack missile.

**UGS** 1 Upgraded silo.  
2 Unattended ground sensor(s).

<b>UGSS</b>	Unmanned global strike system.	<b>3 Uplink</b>
<b>UGV</b>	Unmanned ground vehicle, usually controlled from air.	<b>ULA</b> <i>1</i> Uncommitted logic array. 2 Ultra-light aircraft.
<b>UH</b>	UDMH	3 Fairbanks, AK, tracking station.
<b>UHB</b>	Ultra-high bypass engine.	<b>ULAA</b> Ultra-Light Aircraft Association (Australia; in UK became PFA in 1952).
<b>UHC</b>	Unburned hydrocarbons.	<b>Ulade</b> Ultralight aeronautical diesel engine.
<b>UHCA</b>	Ultra-high-capacity aircraft.	<b>ULAIDS</b> Universal locator airborne integrated data system.
<b>UHD</b>	Ultra-high density.	<b>Ulana</b> Unified local-area network architecture.
<b>UHDT</b>	Unable higher, due traffic.	<b>ULB</b> Underwater locator beacon.
<b>UHE</b>	Ultra-high energy; CR adds cosmic rays.	<b>ULC</b> Unit load container.
<b>u.h.f.</b>	Ultra-high frequency, see Appendix 2.	<b>ULCE</b> Unified life-cycle engineering.
<b>UHH</b>	Ultra-high hardness [steel].	<b>ULCS</b> Unit-level circuit switch.
<b>UHPT</b>	Undergraduate helicopter pilot training.	<b>ULD</b> <i>1</i> Unit load device. 2 Underwater locating device.
<b>UHR</b>	Ultra-high resolution.	<b>ULDB</b> Ultra-long-duration balloon.
<b>UHS</b>	Ultra-high-speed (logic).	<b>ULD Carrier</b> See <i>Dolly</i> .
<b>UHV</b>	Ultra-high vacuum.	<b>ULEA</b> Ultra-long-endurance aircraft.
<b>UI</b>	Unnumbered information.	<b>ULEV</b> Unmanned long-endurance vehicle.
<b>UIAA</b>	See <i>IUAI</i> .	<b>ULH</b> Ultra-long-haul., generally taken to mean 8,000+ n.m. (14,816 km).
<b>UIC</b>	Upper-airspace/information centre (ICAO).	<b>ULL</b> Ullage (NASA).
<b>UIF</b>	Unfavourable information file.	<b>ULLA</b> Ultra-low-level airdrop.
<b>UIL</b>	User interface language.	<b>ullage</b> Volume above liquid in a tank; occasionally misused to mean last dregs of liquid itself remaining in tank.
<b>UIP</b>	Upgrading instructor pilots.	<b>ullage engine</b> Rocket motor fired in ullage manoeuvre.
<b>UIR</b>	Upper-airspace flight-information region.	<b>ullage manoeuvre</b> Applying axial thrust to space-launcher stage or other liquid propellant tank(s) that are nearly empty in order to collect remaining propellants around delivery pipe connection.
<b>UIS</b>	Upper-airspace/information service, or system.	<b>ullage motor</b> See <i>ullage engine</i> .
<b>UIT</b>	<i>1</i> Union Internationale des Télécommunications. 2 UV imaging telescope.	<b>ullage space</b> See <i>ullage</i> .
<b>UJT</b>	Unijunction transistor.	<b>ullage washing</b> Injecting gaseous nitrogen from ground supply before takeoff.
<b>UK</b>	Training centre (USSR, R).	<b>ULM</b> Ultra-leger motorisé = ultralight aircraft (F). MTOW (1 seat) 300 kg (661.4 lb), (2 seat) 450 kg (992 lb), stall $\leq 35$ kt (65 km/h).
<b>UKAATS</b>	UK Advanced Air Traffic System.	<b>ULMS</b> <i>1</i> Undersea-launch (or long-range) missile system. 2 Unit-level message switch.
<b>UKAB</b>	UK Airprox Board (CAA).	<b>ULN</b> Ultra-low Nox.
<b>UKACC</b>	UK Air Cargo Club.	<b>ULP</b> Upper-level protocol.
<b>UKACIS</b>	UK air command and control information system.	<b>ULR</b> Ultra-long-range; loosely = ULH.
<b>UKAdge</b>	UK air-defence ground environment.	<b>ULS</b> Unimproved landing strip.
<b>UKADR</b>	UK air-defence region.	<b>ULSA</b> Ultra-low-sidelobe antenna.
<b>UKAG</b>	UK Airports Group [organisations and suppliers; office, Rugby CV21 1BU] (UK).	<b>Ultem</b> Fire-blocking furnishing materials based on PEI, seen as replacement for Lexan (GE).
<b>UKAPE</b>	The UK Association of Professional Engineers [office, Bromley, Kent].	<b>ultimate factor of safety</b> Number by which limit (or proof) load is multiplied to obtain ultimate load; purely arbitrary factor of safety, usually varying from 1.5 to 2, representing best humanly attainable compromise between economic structure weight and aircraft that will not break.
<b>UKAS</b>	UK Accreditation Service.	<b>ultimate load</b> Greatest load that any structural member is required to carry without breaking; that at which it may legally be on verge of breaking, and permanently deformed. Usually, limit load $\times$ UFS.
<b>UKATS</b>	UK Air Traffic Services, part of Nats.	<b>ultimate strength</b> Strength required to bear ultimate loads, or product of greatest load considered possible in service multiplied by UFS. Gust requirements, in which structure oscillates, can be superimposed on maximum static load to demand even greater design strength in
<b>UKcEB</b>	UK Council for Electronic Business.	
<b>UKF</b>	Urbemanntes Kampfflugzeug = UAV (G).	
<b>UKFSC</b>	UK Flight Safety Committee [office, Fairoaks Airport, GU24 8HX] (UK).	
<b>UKIRCM</b>	UK IR countermeasures.	
<b>UKISC</b>	UK Industrial Space Committee [FEI + SBAC, office, Wisbech PE13 1JZ] (UK).	
<b>UKLF</b>	UK land forces.	
<b>UKMF</b>	UK Mobile Force.	
<b>UKMCS</b>	UK military satellite communications system.	
<b>UKN</b>	Unknown.	
<b>UKOOA</b>	UK Offshore Operators' Association.	
<b>UKRAOC</b>	UK Regional Air Operations Centre.	
<b>UKSCC</b>	UK Satellite-navigation Co-ordinating Committee.	
<b>UKSEDS</b>	UK Students for the Exploration and Development of Space (RAeS).	
<b>UKTI</b>	UK Trade and Investment; DSO adds Defence and Security Organisation [1 April 2008] (UK).	
<b>UKWMO</b>	UK Warning and Monitoring Organization.	
<b>UL</b>	<i>1</i> Ultralight. 2 Unleaded.	

## **ultimate stress**

"flappable" parts of structure, esp. wing. Hence, ultimate bending/compressive/tensile/torsional strength.

**ultimate stress** That in a member or piece of material at moment of fracture; in theory that in structural member loaded to ultimate strength.

**Ult-Join** Unit-level trainer, joint operations integrated network.

**ultra-bypass engine** One name of unducted propfan, with BPR from 20 to 50 (Boeing).

**ultra-high bypass** UHB, alternative to above (McDonnell Douglas).

**ultra-high-density seating** Seating configuration for maximum number of passengers (invariably greater than original certification limit) with minimal pitch and no galley.

**ultra-high frequency** 300–3,000 MHz, see Appendix 2.

**ultra-high magnetic field** Generally, greater than 10 T (100 kG).

**ultra-high-speed photography** Rate higher than  $10^4$  images/s.

**ultra-high vacuum** Previously below  $10^{-13}$  torr (not apparently yet defined in SI, but this is  $13.33 \times 10^{-11}$  N/m<sup>2</sup>); density  $3.2 \times 10^3$  mol/cc, mean free path (air 25°C)  $3.8 \times 10^{10}$ .

**ultralight aircraft** Categories of small aeroplane. In USA, 1-seat with empty weight  $\leq 254$  lb (115.2 kg); in Australia, 1 or 2 seats, MTOW 540 kg (1,190.5 lb). France, see *ULM*, UK, see *microlight*, *SLA*.

**ultra-long-haul** FDP exceeding 16 hours.

**ultra-low airdrop** Below 15 m (50 ft) AGL.

**ultramicroscope** Instrument for observing extremely small particles by intense illumination causing diffraction rings on dark background.

**ultra-short takeoff** Use of short forward run by aircraft capable of VTO, normally called merely STO. Can involve pilot-selectable operating modes.

**ultrasonic** Mechanical vibrations, eg sound waves, of frequency too high to be audible to humans (opposite = infrasonic). Generally frequencies above 15 kHz, usually generated by electro-acoustic transducer and propagated through solids, liquids and gases.

**ultrasonic bonding** Techniques of joining materials with ultrasonic energy, in some cases to cause local melting (ultrasonic welding) and in others to cause either enhanced local diffusion or merely heating to accelerate curing or setting of adhesive.

**ultrasonic cleaning** The item to be cleaned is immersed in liquid [water or various proprietary fluids] and surrounded by small bubbles created by magnetostrictive transducers. The collapse of the bubbles [implosion] bombards the surface with shockwaves.

**ultrasonic inspection** NDT method in which cracks are revealed by discontinuity in propagation of ultrasonic waves through metal.

**ultrasonic machining** Techniques for shaping solids, esp. those too hard or for any other reason not machinable by conventional means. Most common method uses shaped tool oscillated vertically above work at frequency about 20 kHz, with space between tool/work fed with hard powder abrasives.

**ultrasonic rolling** Transducer (typically 20 kHz) placed inside one (rarely both) of rolls in rolling mill with objective of reducing rolling energy needed, reducing required

## **UMTS**

temperature of metal being rolled and rolling to thinner gauges.

**ultrasonic welding** Techniques in which ultrasonic vibrations are used to join two metal (rarely, either or both is non-metal) surfaces brought into contact. Surfaces usually well mating, atomically clean and pressed together under pressure. In some techniques ultrasonic rearrangement of atoms is sufficient to cause melting at interface, while in others there is diffusion between the two faces.

**ultrasonic wind sensor** Most have three sources exchanging pulses between each pair, times being precisely measured.

**ultrasound** Sound of ultrasonic frequency.

**ultra-violet** Band of EM radiation of frequency just too high (ie wavelength too short) to be visible; links visible violet at about  $3.8$  to  $4 \times 10^{-7}$  m to limiting wavelength put at from 1 to  $1.36 \times 10^{-8}$  m (next major part of spectrum is X-ray at appreciably shorter wavelength).

**ultra-violet detector** Material, eg single-crystal silicon carbide, not triggered by sunlight or other incident radiation but instantly responsive to UV.

**ultra-violet imagery** That produced by sensing UV reflected from target (DoD).

**ULV** 1 Upper limit of video (HUD).

2 Ultra-low volume (crop spraying).

**UM** Rhymes with 'come', an unaccompanied minor [passenger under 16].

**UMA** 1 Unmanned aircraft, = drone or RPV.

2 Uffici Meteorologici Aeronautica (I).

3 Unusual military activities.

**Umark** Unit maintenance aerial recovery kit.

**umbilical** 1 Connection between vehicle, esp. space launcher, missile (esp. large ballistic) or RPV, and ground, along which pass all necessary supplies and signals up to moment of liftoff or launch, eg computer data-link, telemetry, guidance programming, topping-up liquid propellants, electrical/hydraulic/pneumatic power and instrumentation. Generally grouped into one large multiple conduit with pull-off connector. Occasionally plural, when two serve one vehicle.

2 Jetway, loading bridge (colloq.).

**umbilical cord** See *umbilical* (1).

**umbilical tower** Tower carrying umbilical lines and connector to an upper stage of a ballistic vehicle; often called umbilical mast.

**UMC** Upgraded main computer.

**UMD** 1 Unrefuelled mission distance.

2 Unit manning document.

**UMG** Universal message generator.

**umkehr** Anomaly of relative zenith intensities of scattered sunlight near UV as Sun nears horizon, often cap U.

**UML** Unified modelling language.

**UMLS** Universal MLS.

**UMR** Unrefuelled mission radius.

**umrust** Modified, modification (G).

**UMS** 1 Unified message switch.

2 Utilities management system.

**UMT** 1 Universal military training.

2 Universal mount.

**UMTE** Unmanned threat emitter.

**UMTS** Universal mobile telecommunications system, providing all previous facilities plus TV and video-conferencing on mobile devices (2004 on).

**UMV** Unmanned vehicle, from 2004 standard term in US military.

**UN** United Nations, many suffixes.

**UNA** Unable.

**unaccelerated flight** Flight without imposed acceleration, but there are several conflicting definitions and term needs redefining to avoid ambiguity; (1) flight along straight-line trajectory at constant V, thus no imposed acceleration; (2) rectilinear flight (eg straight and level) with no imposed acceleration normal to flightpath other than Earth gravity; (3) weightless flight with not even gravitational acceleration, thus curvilinear around Earth. Definition (2) allows acceleration along line of flight, thus speed can vary.

**unaccompanied baggage** Not carried on same aircraft with pax or crew to which it belongs; DoD definition adds 'not carried free on ticket used for personal travel'.

**unanimity rule** Basic IATA principle that fare from A to B is same as from B to A and same for all carriers offering identical service; can be relaxed.

**UNAP** Unable to approve.

**unapproved** Not tested to established requirements, thus flown on special dispensation, eg VW engines with single ignition.

**unapproved part** Can physically be installed but does not fulfil requirements. See *counterfeit*.

**unaugmented** In case of turbojet or turbofan, not equipped with afterburner, or not using afterburner.

**unavbl** Unavailable.

**Unavia** Italian national organization for study and development of aircraft technology.

**unbalanced cell** Cell of Ni/Cd battery which has discharged more than others; first step to thermal runaway.

**unbalanced field** Any takeoff in which accelerate/stop distance is not the same as for normal takeoff to 35 ft.

**unbalanced turn** One with slip or skid.

**unblown** 1 STOL aircraft with USB, IBF, EBF or other powered blowing system in flight mode with blowing inoperative.

2 Of piston engine, not equipped with supercharger.

**unburnt hydrocarbons** Essentially unburnt fuel, contaminant emitted by engines and subject to emissions legislation.

**UNC** United Nations command; followed by various force initials.

**uncertain** Category of aircraft whose safety is not known, normally applied when 30 minutes have elapsed since arrival message or ETA and not answering radio call; hence uncertainty phase.

**Uncertificated** Aircraft category; airworthiness not established.

**UNCL** 1 Unified numerical-control language.

2 Unclassified.

**Unclassified** 1 Security category for official matter which requires no safeguards but may be controlled for other reasons.

2 Performance category for aircraft, usually civil transports, in service prior to 1951 and thus not built to CAR.4(b), BCARs or SR.422A/B.

**uncontrolled airspace** Airspace where no ATC service is provided.

**uncontrolled mosaic** Made up of uncorrected images matched from print to print without ground control or

other orientation, giving mosaic on which distances and bearings cannot be accurately measured.

**uncooled** Descriptive of turbine blade devoid of internal or transpiration cooling.

**uncooperative** Generalized adjective for vehicle of essentially passive nature, devoid of helpful emissions and not responding when electronically challenged; applied to aircraft, usually means not equipped with transponder.

**uncoupled** Vibration mode wholly independent of others at same time.

**UNCTAD** UN Conference on Trade and Development.

**unctld** Uncontrolled airspace (FAA).

**undamped** Vibration of free nature dependent only on internal mass and elastic and inertia forces.

**UNDB** U.h.f. non-directional beacon.

**underbreathing** See *hypoventilation*.

**undercarriage** Landing gear (UK usage; original BSI definition included main wheels, skids or floats and support and explicitly excluded tail wheel or skid). Hence \* door, indicator, same as landing gear door, indicator. Note: floats are usually called alighting gear.

**undercast** Solid cloud cover seen from above.

**underdeck spray** Pad deluge directed up at underside of launch pad (in some cases deliberately including underside of base of launched vehicle).

**undergraduate** Aircrew (esp. pilot) pupil who has not yet qualified, ie won his/her wings.

**underlay** Lowest stratum of layered defence.

**undershoot** 1 Faulty approach by aerodyne, usually fixed wing, which if continued to ground results in landing short of desired area, eg before threshold; normally corrected by go-around (overshoot).

2 To fail to capture desired flight condition, eg altitude, IAS, by falling short when approaching value from below, normally through small lack of aircraft energy.

**under the hood** Instrument flight training in which pupil is prevented from seeing outside aircraft, originally by unfolding opaque hood, later by two-stage amber or other method.

**under the radar** Flight levels as close as possible (see *lo*) to ground in attempt to thwart hostile attempts to obtain positive track by defensive radars; becoming pious hope.

**underwater missile** Launched below water surface.

**under way** Marine aircraft, moving on water [some authorities: under weigh, from weighing the anchor].

**underwedge bleed** Secondary airflow extracted from location on underside of variable wedge above supersonic airbreathing inlet, usually from point of maximum wedge depth at throat.

**under wing** In service [engine possibly hung on rear fuselage], thus  $30,000 \text{ h}^* = \text{total time}$ .

**undevelopable** 3-D curvature, which cannot be drawn accurately on flat sheet and can be made only by some type of sheet forming.

**undk** Undock(ing).

**undock** 1 To separate two vehicles in space previously joined and with intercommunication but not necessarily sharing common atmosphere.

2 To remove airship from hangar.

**unducted fan** Engine in which gas-turbine core drives fan blades external to cowled engine. Blades can be mounted on ring of turbine blades in gas flow, or driven via gearbox (tractor or pusher) from separate turbine.

**unduplicated** Generalized term meaning that in

## unfactored

assessing airline or other route network each sector is counted once only, in one direction only, despite fact it is used in both directions and may form part of from 2 to 48 distinct routes; hence \* route mileage, \* network.

**unfactored** Not multiplied by a factor, eg factor of safety; hence \* load = limit load. See next.

**unfactored performance** That expected from average aircraft, flown by average pilot, with no safety factors.

**unfavourable unbalanced field** One whose clearway allows takeoff at increased weight at which TOD to 35 ft exceeds accelerate/stop distance.

**UNFCCC** United Nations Framework Convention on Climate Change [1994–] (Int.).

**unfeather** To restore propeller from feathered state to normal operative state with engine transmitting power and blades in positive pitch.

**unfeathering accumulator** Source of stored fluid [liquid or gas] pressure to guarantee ability to unfeather after failure of primary propeller control system.

**unfilmed** IIT not coated with protective ion barrier in order to improve resolution and SNR.

**Unfo** Undergraduate Naval Flight Officer (USN).

**UNGA** 1 United Nations General Assembly.

2 Unione Nazionale Giovanile Aeronautica (I).

**UNICE, Unice** Union of the industrial federations of the EEC countries (English translation).

**Unicom** Private radio communications service on five frequencies based at airports, heliports etc, with or without tower in addition; used for various advisories other than ATC purposes (US).

**unidentified aerial phenomena** UAP, the official British term for UFOs.

**unidentified flying object** UFO, something seen in the sky which, by virtue of shape or behaviour, cannot be identified as something known to humanity.

**unidirectional aerial** Single well-defined direction of maximum gain.

**unidirectional composite** All fibres are parallel, usually aligned with direction of applied load.

**unidirectional current** Flowing in one direction only, eg signal pulses or d.c. with superimposed a.c.

**unidirectional solidification** Techniques for obtaining strongly preferred direction of crystalline grains on solidification of alloy from melt such that each crystal forms long string or column aligned with maximum applied load, transverse intercrystalline joints being rare. In most applications, eg turbine rotor blades, a step on route to single-crystal material.

**Unido** UN Industrial Development Organizations.

**unified control** This usually means unified flight control, which in turn usually means governing the trajectory of a fixed-wing aerodyne via a single three-axis joystick, typically a wheel or cycle-type handlebar. Blériot (1908) has been followed by 60+ schemes, several of which have been flown (Clark, de Valroger, Chrislea, Ercoupe, Davis).

**unified fuel control** Control system for supersonic airbreathing engine governing engine acceleration, pilot input response, Mach, nozzle and Plap.

**unified system** Generalized term for TTC (tracking, telemetry and command) system handling all digital, video and voice signals in integrated system for larger or complex air vehicle or space payload. Also applied to simpler satellites, missiles and RPVs, eg unified-pulse systems in which each command pulse train comprises

## unit deformation

vehicle address, message ident and message, synchronized with radar ranging pulses; thus one \*\* handles all vehicles.

**Unified thread** Standard 60° screwthread (US, UK, Canada).

**uniform acceleration** Time-invariant, giving straight line on V/T plot.

**uniformly distributed load** One imposing constant force on each unit area of horizontal floor.

**uniformly varying load** Magnitude varies directly with distance along straight-line axis from reference point.

**uniform photo-interpretation report** Third-phase machine-formatted intelligence report of particular objective containing detailed information extracted from photo sensor imagery (USAF).

**uniform velocity** Time-invariant speed and direction.

**Unihedd** Universal head-down display; standardized cockpit display of information from many sources and sensors with high brightness.

**unijunction transistor** Bar of doped semiconductor with p-n junction near centre, normally forward-biased, giving sharp peak of emitter V for small emitter current; used in pulse generators and sweep circuits. Also called double-base diode.

**unilateral instrumentation** In unyawed flight each half-aircraft behaves as mirror image of other and, therefore, full information can be obtained by fitting pressure-sensing heads, transducers, and other experimental equipment on one half only; \*\* should not be used during yawed flight.

**unipole** Hypothetical aerial radiating equally in all directions.

**Unishear** Fixed or portable high-speed shear for thin sheet.

**unison ring** Ring linking and driving all IGVs or stator blades [vanes] in one stage of a variable-stator engine.

**Unisor** United Nations International Strategy for Disaster Reduction.

**unit** 1 Fundamental subdivision of any numerical measure. Nearly all industrial countries have in theory adopted SI system. Base \* of seven fundamental quantities are: length, metre (m); mass, kilogram(me) (kg); time, second(s); electrical current, ampere (A); thermodynamic temperature, kelvin (K); luminous intensity, candela (cd); and amount of substance, mole (mol). SI \* of electricity and of charge is coulomb. For payment of electricity supply, kWh.

2 Military element whose structure is prescribed by component authority; normally applied only to small organizations at field level, eg squadron, or to element of airborne force, eg two or three aircraft.

3 One complete item from production, eg production \*, \* sales.

**unit aircraft** Those provided to an aircraft unit for performance of a flying mission (DoD).

**unit area** That equal to square of unit length on each side.

**unitary** Having a single warhead, as distinct from dispensed or clustered munitions.

**unit cost** 1 Airline's total costs divided by generated RPKs or RTKs.

2 See Average flyaway \*, average procurement \*, program acquisition \*.

**unit deformation** Deformation divided by original

length or other undistorted measure; ie deformation per unit of original length.

**Uniter** Secure survivable fixed telecom network, part of DFTS and particularly linking UKAdge (RAF).

**unit hydraulic tail** Power unit driving tailplane (horizontal stabilizer, taileron).

**unit load** Also called unitized load, any collection of cargo items packaged to fit a unit load device.

**unit load device** Platform or container for cargo, of standard ISO dimensions and interfacing with handling and restraint systems, e.g., LD3 container or 88×125 pallet.

**unit of action C<sup>2</sup> vehicle** Provides situational awareness to land and air component commanders, sending high-resolution targeting via AOC9 by datalink.

**unit of issue** Measure in which commodity (esp. military) is issued, eg by number, dozens, metres, feet, US gal etc.

**units of measurement** See *unit (1)*. In most practical flying SI is still unattained, distances being in nautical miles, pressures in lb/sq in, atmos, bar and various other units (hardly ever Pa), acceleration in g, and volumes in litres, US gal or Imp. gal instead of m<sup>3</sup> (but fuel mass generally in kg).

**unit stress** Usually load divided by cross-section area normal to applied force direction.

**unit training device** Simulator.

**universal gas constant** See *gas constant*.

**Universal Metrics** A set of six performance measures designed to be applicable across the UK [and thus probably any other] aerospace industry, launched in 2002 by the SBAC Lean Aerospace Initiative. The objective is to enable companies to measure their performance and that of their supply chain.

**universal motor** Electric motor operative on a.c. or d.c.

**universal polar stereographic** Grid for regions from 80° latitude to poles.

**universal receiver** Operative on a.c. or d.c., with various protective devices.

**Universal Safety Oversight Audit** Inspection by ICAO-led team of safety and security measures taken by 187 member states to counter terrorism.

**universal shunt** Resistor in parallel with ammeter to increase range of currents measured as FSD is approached.

**universal tester** Usually, hand meter for measuring a.c./d.c. current, a.c./d.c. volts and resistances.

**universal time** Defined by rotation of Earth, and thus not absolutely uniform; \*\* 1, corrected for polar motion; \*\* 2, corrected for seasonal variation in rotation.

**universal timing disc** Disc graduated 000°/360° with associated pendulous pointer, attached to piston-engine crankshaft.

**universal transmission function** Attempts to describe mathematically IR propagation in atmosphere.

**universal transverse Mercator** Grid co-ordinate system from 84°N to 80°S.

**UNK, unk, unkn** Unknown.

**unknown traffic** Flight details not known to the ATSU with which you are in contact.

**UNL** Unlimited (altitude, ceiling).

**unlgtd** Unlighted (FAA).

**Unlimited** 1 Air race class for piston-engined aircraft: no restriction on engine capacity.

2 Aerobatic class: no restriction is imposed on flight manoeuvres apart from airframe strength limits.

**unlimited ceiling** Traditionally, less than 50% cloud, base 9,750+ft (2,972 m) AGL (FAA).

**unload** To reduce g (normal acceleration), usually to restore lost speed.

**unloading** See *pump unloading*.

**unlocked** Automatic-gun action in which at moment of firing breech is not locked (eg to barrel or case) but is of sufficient mass (inertia) for pressure to have fallen to safe level before breech opens significantly; usually synonymous with blowback action.

**unltd** Unlimited.

**unmanned** Aircraft has no pilot on board [but may have one in another aircraft or on ground].

**unmask** Point at which vehicle becomes visible to defending surveillance systems.

**unmkd** Unmarked (eg obstruction) (FAA).

**Unmovic** UN Monitoring, Verification and Inspection Commission.

**UN No** Four-digit number identifying a particular dangerous material in cargo.

**UNOSC** UN Outer Space Committee.

**unpaired channel** DME channel without a corresponding VOR or ILS frequency.

**unprepared airfield** Usual meaning is without permanent paved runway.

**unpumpable fuel** That fuel deliberately designed to be unpumpable, through levels of sumps and booster-pump inlet sills, to avoid ingestion of any water.

**unrefuelled range** Range on fuel carried at takeoff; usually applied to aircraft with provision for inflight refuelling.

**unreinforced ablator** Without honeycomb filling or backing.

**unrel** Unreliable.

**unreliability coding** Series of (usually five) dots following transmissions made by unusable Tacan for calibration or test purposes, indicating not to be used.

**unrotated projectile** Original name for unguided air and ground-launched rockets (UK, WW2).

**UNRSTD** Unrestricted.

**UNSA** Unmanned naval strike aircraft [projects].

**unscheduled maintenance** Those unpredictable maintenance requirements not previously planned or programmed but which require prompt attention and must be added to, integrated with or substituted for previously scheduled workloads (USAF).

**unsealed strip** Runway with no waterproof coating; normally means compacted earth, gravel or other substrate with or without top layer of rolled material or prefabricated mat of mesh or steel planking.

**unshielded** A major meaning is that portion of aerodynamic surface in full slipstream, not in wake of another part of aircraft, especially that part of rudder not in wake from horizontal tail in established spin. The URVC is based on this multiplied by its moment arm.

**Unspec** Unspecified.

**unstable aerofoil** Generally means one with extensive CP travel.

**unstable air** Air in which temperature decreases with height at rate greater than DALR or SALR; thus a parcel given a small vertical movement (up or down) will continue with increasing speed.

## unstable aircraft

**unstable aircraft** General meaning is one which, when diverted [even slightly] from straight/level flight, will diverge in uncontrolled manner.

**unstart** Explosively violent breakdown of correct (ie started) airflow through supersonic inlet to airbreathing engine, notably with expulsion of shockwave(s) and temporary reversal of flow. All highly supersonic (M3+) engines have such a large contraction ratio and constricted throat that any yaw, spillage from neighbouring engine, gunfire or other disturbance can cause \*.

**UNSTBL** Unstable air mass.

**UNSTDY** Unsteady.

**unstick** Point at which fixed-wing aerodyne leaves surface of land or water; hence \* run = ground or water run; \* speed = that at which aircraft becomes airborne, usually about 25% of way from  $V_R$  to  $V_2$  symbol  $V_{us}$ .

**unstick-speed ratio**  $V/V_{us}$ , ratio of aircraft speed to unstick speed either as % or as fraction. Usually plotted as abscissa on takeoff performance graph, esp. of marine aircraft.

**unstressed** Not bearing significant external load.

**unsupported site** Possible operating site for V/STOL aircraft but devoid of prestocked supplies, eg POL, ammunition etc.

**Unsvc** Ground facility is unserviceable.

**unsymmetrical** Generalized chemical description of molecular structure where left is not mirror image of right; eg in 1, 2 dimethylhydrazine each N has an H and a  $\text{CH}_3$  attached (symmetrical), but 1, 1 dimethylhydrazine has left N joined to two H atoms and right N joined to two  $\text{CH}_3$  methyl molecules and is unsymmetrical (UDMH).

**unsymmetric flight** Condition in which aircraft (aeroplane or glider) is not balanced about longitudinal axis, due to roll, roll/yaw or other rotary manoeuvre causing gross alteration to normally symmetric wing lift. Hence unsymmetric load, that in unsymmetric flight.

**unsymmetric thrust** Thrust with one failed engine away from centreline; normally called asymmetric.

**UNT** Undergraduate navigator training (S adds system) (USAF).

**UNTSO** UN Truce Supervisory Organization.

**unusable fuel** Fuel that cannot be used in flight with wings level and at cruise AOA (or nose 3° up). *Trapped fuel* is that fuel remaining in worst case on ground using booster pumps for defuelling and switching off immediately associated LP warning lights illuminate. See *Unpumpable fuel*.

**UNUSBL** Unusable.

**unwarned exposed** Friendly troops are in open when NW detonates on near enemy.

**UOC** Underwing ordnance capacity.

**UOES** User operational evaluation system.

**U-174** Standard headset jack plug (US, NATO).

**UOR** Urgent Operational Requirement (UK).

**UOS** UCAV operational system.

**UP** 1 Unrotated projectile (1938–1944 name for British rockets, virtually all air/ground).

2 Unguided projectile.

3 Unruly passenger.

4 Unknown precipitation.

5 Universal platform.

**U<sub>p</sub>** Helicopter rotor-blade out-of-plane velocity normal to plane of disk.

## upper baseplate

**UPA** Union of Professional Airmen [affiliated ALPA, office Washington, DC] (USA).

**up and away** 1 Descriptive of all powered-lift systems capable of giving VTO.

2 The operative mode giving VTO, as distinct from (e.g.) STOVL.

**uparmour** To improve armour protection.

**UPB** Unruly passenger behaviour, also called *air rage*.

**UPC** Unit production cost.

**UPCF** Union des Pilotes Civils de France.

**up-chaff** Normally, between chaff cloud or stream and target; hence \* interception, with good radar view of target.

**up-conversion** Move to a higher EM frequency band.

**update** To refresh memory, radar picture or other electronic device with later information; hence \* rate, rate (possibly as often as kHz) at which a system or input is scanned for new or changed values.

**UPDFTS** Updraughts.

**updraught carburettor** One fed by duct conveying air upwards from below; in US updraft carburetor.

**UPDTS** Updates.

**Uped** UV pre-initiation electrical discharge (laser).

**up-45 line** Straight sustained climb at inclination of 45°.

**up-front control** Single small panel in fighter cockpit giving complete control of all CNI functions.

**up gear** US voice command or check for raising landing gear.

**upgrade** To rebook passenger into higher class.

**UPI** Undercarriage position indicator (UK).

**Upkeep** Water-skipping dambusting bomb (UK, 16–17 May, 1943).

**upkeep** Generalized US term for all tasks aimed at preventing deterioration of hardware, eg GA aircraft; less used for commercial and military.

**UPL** AOPA (Luxembourg).

**uplift** 1 Total disposable load of cargo aircraft, or cargo taken on board.

2 Fuel taken on board, esp. away from home base.

3 Fuel taken aboard from air-refuelling tanker aircraft.

**uplink** 1 Telemetry, command, data or other electronic link between Earth and spacecraft.

2 Com. link from ground to aircraft, especially telephone call to passenger.

**upload** Load acting vertically upwards, or vertical component of loads, eg airloads due to lift.

**unlock** Mechanical lock securing device, eg landing gear, in up or housed position.

**UPM** 1 Universal processor module.

2 Ultra-portable multiplexer.

**upper air** Portion of atmosphere above lower troposphere, normally (eg for synoptic purposes) that above pressure height 850 mb. Hence, \* chart. See next three entries.

**upper-air observation** Observation of upper air, above effective range of surface measures; also called sounding.

**upper airspace** Normally all FLs above 250 (7,620 m/25,000 ft).

**upper atmosphere** Not strict term, normally interpreted as above tropopause, but also as above 30 km or 20 miles.

**upper baseplate** Triangular or hexagonal frame on which cabin of flight simulator is mounted.

**upper branch** That half of meridian or celestial meridian passing through observer or observer's zenith.

**Upper Flight Information Region** Same geographic areas as FIR but imposes special rules above 24,500 ft (7468 m) [in US, 25,000 ft, 7,620 m].

**upper limb** That half of limb of celestial body having greater altitude.

**upper sideband** USB = carrier frequency + modulation frequency; it carries the information.

**upper stage** Second or subsequent stage in multistage rocket, in most vehicles not fired in atmosphere.

**upper-surface aileron** Split surface forming part of upper surface of wing only, used for roll or, in some cases, as spoiler (rare).

**upper-surface blowing** Discharge of main propulsive jets (flattened laterally to cover more span) across top of wing; in high-lift mode deflected down by Coanda-effect attachment to upper surface of large trailing-edge flaps to give augmented lift. Can achieve  $C_L$  up to about 12 but reduces cruise efficiency.

**upper-tier technology** That required for exo-atmospheric ballistic-missile defence.

**upper wing** Top wing of biplane; hence \*\* pylon, pylon attached above top plane of biplane.

**UPPL** Undergraduate private pilot's licence.

**UPR** 1 Upper airspace.

2 User-preferred routing [air route].

**uprated** Cleared to deliver more power, usually but not necessarily after incorporation of improvements; eg \* gas turbine may operate at higher TGT or incorporate more efficient blades with reduced tip clearance; hence uprating, process of authorizing greater output from existing or improved machine.

**uprig** To adjust neutral position of spoiler or airbrakes (normally recessed in upper surface of wing) to provide up/down direct lift control.

**UPRM** Universal platform resource management.

**UPS** 1 Uninterruptable power supply, or supplies.

2 UV photoelectron spectroscopy.

**upset** 1 Sudden externally imposed or undesired disturbance to flightpath, eg by violent gust. Classed as moderate if not worse than zero-g, severe if vertical acceleration is strongly negative. Usual definition of severe includes speed varying anywhere from  $V_S$  to  $V_{DF}$ , bank  $\pm 60^\circ$  and pitch  $\pm 30^\circ$ .

2 Metalworking process akin to forging in which rod or other slender workpiece is heated and placed under axial compression to reduce length and increase diameter, usually at particular place and to attain particular longitudinal profile.

**upset rate** Frequency of problems suffered by computer[s] due to radiation.

**UPSLP** Upslope.

**UPSMS** UPS(1) management system.

**upstage** In a direction towards nose of multistage ballistic vehicle; \* and downstage can refer to positions of items within same stage or to items in different stages.

**upstairs** 1 Aloft, ie flying (colloq.).

2 High altitude, especially as distinct from low.

**upstream injection** Fuel is sprayed in opposite direction to engine airflow.

**UPT** Undergraduate pilot training (S adds system.)

**uptime** Time when equipment is available for use.

**UPU** Universal Postal Union (Int.).

**upward Charlie** Upward roll (UK colloq.).

**upward ident** Upward identification light; white light visible from hemisphere above aircraft and usually provided with manual keying from cockpit, eg to send aircraft callsign or other message.

**upward roll** Roll while in steep climb, usually zoom after fast low pass.

**upwash** 1 Upward movement of air around outside of trailing vortex behind wing giving positive lift, usually curving over to become downwash on inner side of vortex.

2 Upward movement of air ahead of leading edge of subsonic wing giving positive lift.

3 See fountain.

**upwind** Towards the direction from which the wind is coming: G/S = TAS - W/V.

**UQ** Ultra-quick (fuze).

**UR** 1 Unsatisfactory report.

2 Unscheduled removal.

**UR** Helicopter rotor-blade radial velocity along blade at plane of disk.

**Ur** Gust reference velocity.

**URA** 1 Unrestricted article.

2 Ultra-reliable aircraft.

**uranium** U, silvery radioactive metal, density 19.0, MPt 1,132°C. See *nuclear weapon, depleted* \*.

**URAV** Uninhabited, or unmanned, reconnaissance air vehicle.

**URCS** Unmanned radar and communications station.

**URD** User requirement[s] document.

**URE** Unintentional radiation exploitation.

**UREA** Universities Research Assessment Exercise (UK).

**urea**  $\text{CO}(\text{NH}_2)_2$ , traditional runway deicer, also used in some plastics.

**URET** User-request evaluation tool; CCLD adds core-capability limited deployment (FAA/FFP-1).

**Ureti** University research, engineering and technology institutes (NASA-DoD).

**URG** Underway Replenishment Group.

**urinal** Same word can mean an overboard tube or a sealable bladder.

**URIPS, Urips** Undersea radioisotope power supply.

**Urits** USAF rangeless instrumentation [originally interim] training system, not compatible with Actions and Raids, which are not compatible with each other.

**URR** 1 Ultra-reliable radar.

2 Ultimate recoverable reserve [petroleum].

**URS** User-requirements specification.

**Ursi, URSI** Union Radio Scientifique International (Int., pronounced as word).

**URTA** Upset recovery training aid.

**URV** Unmanned research vehicle.

**URVC** Unshielded rudder volume coefficient.

**US** 1 Under instruction.

2 Ultrasonic (sometimes U/S).

**U/S, Us** Unserviceable.

**u/s** Unsubstantiated intelligence.

**U<sub>s</sub>** Gust velocity at distance s into the gust.

**USA** 1 United States Army.

2 Useful screen area (HDD).

3 United Space Alliance, a linking of US industrial firms.

**usa** Usable screen area [meaning same as USA (2)].

**USA AVS** USA Agency for Aviation Safety.

- USAAC** USA Air Corps (1926–42).
- USAADS** USA Air Defense School.
- USAAF** USA Air Force (1941–47).
- USAARL** USA Aeromedical Research Laboratory.
- USAAS** USA Air Service (1918–26).
- USAAVSCOM** USA Aviation Systems Command.
- usability factor** Percentage of time a runway has cross-wind within published limits.
- usable fuel** Not defined, but usually means fuel actually available, with no reserve, typically 95–98% of system capacity.
- usable lift** 1 Thermal worth using (sailplane).  
2 See *useful lift*.
- USABMD** USA Ballistic Missile Defense Agency.
- USAC** Urban Systems Inter-Agency Advisory Committee (US).
- USAEC** USA Electronics Command.
- USAETL** USA Engineering Topographical Laboratory.
- USAF** US Air Force [see entries beginning AF].
- USAFA** USAF Academy.
- USAFE** USAF Europe.
- USAFFS** USAF Security Service.
- usage** Usually means hours flown.
- USAID** US Agency for International Development.
- USAIRE, US Aire** US Aerospace Industry Representatives in Europe [70+ member companies; address F-92100 Boulogne] (Int.).
- USAMICOM** USA Missile Command.
- USANCA** USA Nuclear and Chemical Agency.
- US&RAeC** United Service and Royal Aero Club (UK, formerly).
- USANG** US Air National Guard.
- USARA** US Air Racing Association, became *PRPA* (US).
- USAS** United States Air Service of the Army Signal Corps (1918–20, when it became USAAS).
- USASF** USA Special Forces.
- USASMDC** USA Space and Missile Defense Command.
- USATA** US Air Tour Association [office, Calverton MD] (US).
- USATCO, USAtco** Air-traffic Controller's organization [office, Washington, DC] (US).
- USB** 1 Upper-surface blowing; T adds technology.  
2 Upper sideband.  
3 Universal serial bus.  
4 Unified S-band.
- USCBP** US Customs and Border Protection Agency [2005–].
- USCG** US Coast Guard.
- USCS** US Customs Service.
- USD** 1 Unmanned surveillance drone.  
2 US dollars.
- USDAO** US defense attaché offices.
- USDOC, Usdoc** US Department of Commerce.
- USR&R&E** Under-SecDef for Research & Engineering.
- use** Workpiece metallurgically flawless and suitable for forging (UK trad.).
- useful lift** Difference between fixed weight of aerostat and gross weight, available for fuel, oil, consumables and payload.
- useful load** For any aircraft, difference between empty weight and laden weight; for certificated aircraft, differ-
- ence between OEW and MTOW (or MRW if separately authorized). Note: OEW includes many items previously loosely included in \*\*.
- user data** N-user data may be transferred between peer network [OSI Model] members, as necessary.
- USERS, Users** Unmanned [microgravity] space-experiment recovery system.
- user segment** World population of GPS receivers.
- USET** Upper-stage engine technology.
- USFE** Upper-stage flight experiment.
- USFQIS** Ultrasonic fuel-quantity indication system.
- USFS** US Forest Service.
- USG, US gallon** Non-SI unit of volume =  $3.785411784 \times 10^{-3} \text{ m}^3 = 0.83267 \text{ Imp. gal}$ .
- USGPM** US gal/min.
- USGPO** US Government Printing Office.
- USGS** US Geological Survey.
- USGW** Underwater-to-surface guided weapon.
- USHGA** US Hang Gliding Association.
- USIA** US Information Agency.
- USIAS** Union Syndicale des Industries Aéronautiques et Spatiales, became Gifas (F).
- Uσ** U-sigma, true RMS value of gust velocity.
- USJFCOM** US Joint Forces Command.
- USL** Underslung load.
- USM** Utility-systems management.
- USMC** US Marine Corps.
- USMDA** US Missile Defense Agency.
- USMS** Pronounced uz'ms, utility systems management system, software programmed into six microprocessors which control a complete fighter.
- USMTF** US message text format[ted]; ACO adds airspace-control order[s].
- USMV** Unmanned space maneuvering vehicle.
- USN** US Navy.
- USNI** US Naval Institute.
- USNO** US Naval Observatory.
- USNSC** US Naval Safety Center [NAS Norfolk, VA 23511] (USN).
- USNR** US Navy Reserve[s].
- USNTPS** USN Test Pilot School, Patuxent River.
- USOA** Universal Safety Oversight Audit [P adds Program] (ICAO).
- USOC** User Support and Operations Center[s], in Germany [Oberpfaffenhofen], managed at many European centres].
- USP** Universal serial platform.
- USPA** 1 US Parachute Association.  
2 US Pilots Association [office, St Louis, MO] (US).
- USPS** 1 US Postal Service.  
2 US Planetary Society.
- USR** Special work control (USSR).
- USRA** Universities Space Research Association.
- USS** United States [Naval] Ship.
- USSC** United States Space Command, merged 2002 with Strategic Command.
- USSF** United States Space Foundation [office Colorado Springs CO 80906–4184] (US).
- USSOCOM** US Special Operations Command.
- USSOF** US Special Operations Forces.
- USSP** Universal sensor signal processor.
- USSRC** US Space & Rocket Center, adjacent to MSFC.
- USSTAF** US Strategic Air Forces.
- UST** Upper-surface transition, location of shockwave.

<b>USTB</b>	Unstabilized.	
<b>USTC</b>	United States Transportation Command.	
<b>USTDA</b>	United States Trade and Development Agency.	
<b>USTO</b>	Ultra-short takeoff.	
<b>US ton</b>	Short ton (see <i>ton</i> ).	
<b>USTS</b>	Uhf satellite-tracking system.	
<b>USUA</b>	US Ultralight Association.	
<b>USV</b>	Überschall Verkehrsflugzeug = SST (G).	
<b>US/VTOL</b>	Ultra-short or VTOL.	
<b>USW</b>	1 Undersea warfare. 2 Ultrasonic welding.	
<b>USWB</b>	US Weather Bureau.	
<b>UT</b>	1 Under training (often u/t). 2 Universal time. 3 Ultrasonic. 4 Update time.	
<b>UT</b>	Helicopter rotor-blade in-plane velocity parallel to plane of disk.	
<b>UTA</b>	1 Unit training assembly. 2 Upper-airspace control area (CAA).	
<b>UTC</b>	1 Universal time, co-ordinated [previously GMT, and see Zulu]. 2 University Technology Centre/Center.	
<b>UTCS</b>	1 Universal tactical control system (aerial targets). 2 Universal target control station.	
<b>UTD</b>	Unit training device.	
<b>UTE</b>	Unmanned threat emitter.	
<b>UTIAS</b>	University of Toronto Institute for Aerospace Studies.	
<b>Util</b>	Utilities, utility system.	
<b>utilidor</b>	Thermally insulated, heated conduit (above or below ground level) conveying water, steam, sewage and fire pipes between buildings (USAF).	
<b>utilities control system</b>	In a complete reversal of meanings, the UCS connects flight-control system, landing-gear computers, fuel computers, right glareshields, computer symbol generators and power generators.	
<b>utility</b>	1 Generalized adjective for aircraft intended for, or assigned to, variety of missions mainly of transport nature but with limited payload; usually denotes odd-job status but occasionally equipped with mission interfaces, eg for photography, target towing or even surface attack in limited war. 2 FAA = limited aerobatic category. 3 * glider – secondary or training glider.	
<b>utility finish</b>	Provides fabric with tautness and fill, but lacks gloss.	
<b>utility system</b>	Usually loose term meaning that system serves routine domestic functions not crucial to safety of vehicle; occasionally means special system for specific purpose, and sometimes even a standby emergency system. Never involves flight control, navigation or weapon release, but see <i>utilities control system</i> .	
<b>utilization</b>	1 Proportion of total time an equipment is available for use or is actually used. 2 Number of hours per year something, eg aircraft, is used.	
<b>utilization rate</b>	1 For civil transports, utilization (2). 2 For combat aircraft, flying rate, usually qualified	
	according to conditions, eg normal ** based on (say) 40-h week; emergency ** based on maximum attainable on 6-day week; wartime ** based on 7-day week with wartime crew, maintenance and safety criteria.	
	UTLS Upper troposphere [and] lower stratosphere.	
	UTM Universal transverse Mercator.	
	UTP 1 Unit test pilot. 2 Unshielded twisted pair. 3 Unit training plan (NATS).	
	UTR Universal [or uniform] temperature reference.	
	UTS Ultimate tensile strength.	
	UTS Velocity of tunnel test section (alternative to $V_{TS}$ , sometimes preferred for empty tunnel).	
	UTT Upper-tier technology.	
	UTTAS Utility tactical-transport aircraft system.	
	UTTEM Draft tactical technical economical requirement, start of each new programme (Sweden).	
	UTTR Utah Test and Training Range, south of Salt Lake City (USAF).	
	U/U Unusable [fuel].	
	UUA Urgent upper-air Pirep.	
	UUM 1 Unification of Units of Measurement; P adds Panel (ICAO).	
	2 Former US category, underwater launch, underwater target, attack missile.	
	UUPI Ultrasonic undercarriage position indicator.	
	UUT Unit under test.	
	UV 1 Ultra-violet. 2 Under-voltage. 3 Unmanned vehicle. 4 Upper sideband, voice.	
	UV/V Under-voltage.	
	UVVS Unmanned vehicle for aerial surveillance.	
	UVDF U.h.f./v.h.f. D/F.	
	UVDS UV flame detector system.	
	Uverom Ultra-violet erasable read-only memory.	
	Ueprom UV erasable programmable ROM.	
	UVL UV laser.	
	UVM User view menu.	
	UVR UV-resistant [paint].	
	UVS 1 UV spectrometer, or spectrometry. 2 Unmanned-vehicle system[s].	
	UVSA Unmanned Vehicle Systems Association [West Drayton UB7 8HP] (UK).	
	UVV Ultimate vertical velocity; landing-gear design case.	
	UVVS Administration of the air force (USSR, obs.).	
	UW 1 Unconventional warfare. 2 Unique word.	
	UWAL University of Washington Aeronautical Laboratory [Seattle, WA 98195-2400] (US).	
	UWB 1 Ultra-wideband [R adds radio]. 2 Underwater battlespace.	
	UWNDS Upper-airspace wind[s].	
	UWR Ungrooved wet runway.	
	UWS Urgent weather Sigmet.	
	UWW Underwater weapons.	
	UWY Upper-airspace airway.	
	UXB Unexploded bomb.	
	UXO Unexploded ordnance.	
	UxV Unmanned air/land/sea vehicles.	

# V

- V**
- 1 Volts, potential, e.m.f., also potential energy.
  - 2 Velocity, including TAS, EAS or ASIR.
  - 3 US piston-engine designation prefix, vee-type.
  - 4 US piston-engine designation prefix, vertical orientation, ie crankshaft vertical (currently in use).
  - 5 JETDS code, visible light(s).
  - 6 Volume, or volume-fraction.
  - 7 Total shear stress.
  - 8 Designation prefix: convertiplane (USAF 1954–62), V/STOL (USAF from 1954, USN from 1962).
  - 9 US military-aircraft designation modifying prefix: staff/VIP.
  - 10 Unit designation prefix: airplane (USN 1922–62).
  - 11 Potential energy.
  - 12 Vanadium.
  - 13 Prefix, Victor airway.
  - 14 Varying, variation, or varying between (Metar), or variable, or variable intensity.
  - 15 Ground/air visual code: require assistance.
  - 16 Secondary station (Loran).
  - 17 Visibility, visual or visual descent point.
  - 18 Experimental (G).
  - 19 Veneer.
  - 20 Vertical load.
  - v**
  - 1 Specific volume of gas.
  - 2 Component of RMS velocity; phase velocity of EM wave.
  - 3 Thermionic valve.
  - 4 Linear [called lateral] velocity of point due to rotation of body in pitch.
  - 5 Relative velocity between two moving bodies or points.
  - 6 Propwash velocity relative to undisturbed air, ie ‘true’  $V_p$ .
  - (V) 1 Suffix indicating item of electronic equipment can be configured to suit a number of platforms or system applications. Normally followed by numeral identifying which (JETDS).
  - 2 121.5 kHz available on ATCC request.
  - $\bar{V}_v$  Vertical stabilizer (fin) volume coefficient.
  - $\bar{V}$  Horizontal tail volume coefficient ( $I_1 S_T / \bar{C}_S$ ).
  - $\nabla$  See capital delta [Appendix 1].
  - $V'$  Radial inflow velocity, eg to eye of centrifugal compressor.
  - $\vec{V}$  Velocity vector.
  - $V\alpha$  Free-stream velocity vector.
  - $\dot{V}$  Volume rate of flow.
  - $V_1$  Decision speed; ASIR defining decision point on take-off at which, should critical engine fail, pilot can elect to abandon takeoff or continue. Calculated by WAT and runway friction index for each takeoff, never less than VMCG. Also regarded as engine-failure recognition speed, made up of  $V_{EF}$  plus increment due to pilot thinking time.
  - $V_2$  Two-box VASI, on either side of runway.
  - $V_2$  Takeoff safety speed; lowest ASIR at which aeroplane complies with those handling criteria associated with climb following one engine failure, normally obtained by factoring  $V_{MCA}$ ,  $V_{MSL}$  and pre-stall buffet speed. Aeroplane should reach  $V_2$  at screen after engine

- failure at  $V_1$  and climb out to 120 m height without speed falling below  $V_2$ .
- $V_3$  Normal screen with all engines operating, at which aeroplane is assumed to pass through screen height in normal takeoff; usually about  $V_2 + 10$  kt.
- V4** Four-box VASI.
- V<sub>4</sub>** Steady initial climb speed for first-segment noise-abatement climb with all engines operating.
- V6** Six-box VASI.
- V<sup>8</sup> law** The law governing noise caused by shear at the periphery of a jet [proportional to the eighth power of the shear velocity].
- V12** A V6 on each side of the runway.
- V16** Two V4 VASIs on each side of the runway.
- V90** Category of off-base military airstrips dispersed through countryside and usable by fighters (Sweden).
- $V_{abs}$  Absolute velocity.
- V-aerial** Two rod conductors balance-fed at apex with geometry giving desired directional propagation.
- V-band** Original radar frequency band 46–56 GHz (obs.).
- V-beam radar** Uses an inclined and a vertical beam to determine target bearing, range and altitude.
- V-belt** Drive belt of tapering cross-section, often coming to narrow inner edge like V, mating with pulleys having inclined inner peripheral faces.
- V-block** Hardwood block with large V-notch used in hand sheet-metalwork.
- V-bombers** The UK’s only strategic jet bombers (1951–90), named Valiant, Vulcan, Victor.
- V-diagram** A standard procedure for developing software, in which a V-shape is constructed by listing development activities on the left and verification activities on the right.
- V-engine** See *vee engine*.
- V-force** Squadrons equipped with V-bombers; crews graded as Combat, Select, Select Star [1957–90] (RAF).
- $V_{rel}$  Relative velocity.
- V-speeds** See  $V_1$  et seq.
- V-tail** See *butterfly tail*.
- VA**
- 1 Volts  $\times$  amperes; basic measure of a.c. or reactive electrical power.
  - 2 Visual aids (ICAO panel).
  - 3 Unit prefix: fixed-wing attack squadron (USN).
  - 4 Voice-activated.
  - 5 Air army (USSR).
  - 6 Veterans Administration (US).
  - 7 Visual approach, and VASI.
  - 8 Vortex advisory.
  - 9 Volcanic ash.
  - 10 Virtual airline [simmer].
- V<sub>A</sub>** Design manoeuvring speed; on basic manoeuvring envelope speed at intersection of positive stall curve (assumed in cruise configuration) with  $n_1$  (limiting positive manoeuvring load factor). Highest EAS at which limit load factor can be pulled.
- V<sub>a</sub>** 1 Aquaplaning speed; speed (usually ASIR) at which wheels lose effective contact with runway covered with standing water.

- 2** Axial gas velocity.
- V-A** Volt-amperes, electrical apparent power.
- VAA** *1* Vintage Aircraft Association (US).
- 2* Vertical alert annunciator.
- VAAC** Vectored-thrust aircraft advanced [flight] control.
- VAATE** Versatile affordable advanced turbine engine (USAF programme).
- VAB** *1* Vehicle (originally Vertical) Assembly Building, at KSC.
- 2* Vehicular Assembly Building [Tanegashima] (J).
- 3* Variable-area bypass.
- V<sub>AB</sub>** Resultant velocity of circulation of two particles A and B.
- VABI, Vabi** Variable-area bypass injector.
- V<sub>abs</sub>** Absolute velocity; i.e., not relative.
- VAC** *1* Vintage Aeroplane Club, 1951–55; Vintage Aircraft Group 1964–74; Vintage Aircraft Club 1974–, [OX8 8DW (UK)].
- 2* Valiant Air Command [Florida-based warbird centre].
- 3* Volts a.c.
- 4* Visual-approach chart.
- VACA** The Vintage Aircraft Club of Australia [office, Adelaide, SA].
- vacancy** Unoccupied lattice site in crystal.
- Vaci** Video and computer-based instruction.
- VACIS, Vacis** Vehicle and cargo inspection system.
- VACL** Virtual aircraft component location, 3-D software.
- VACS** *1* Variable-autonomy control system (UAVs).
- 2* Voice-activated control system.
- VACT** Visual air-combat training.
- vacuum casting** See *vacuum melting*.
- vacuum evaporation** Loss of molecules from body's surface in space.
- vacuum gauge** Instrument for measuring low fluid pressure, eg Pirani, Knudsen, ionization, McLeod.
- vacuum melting** Almost self-explanatory, preparation of advanced steels and other alloys in a near-vacuum in order to reduce [almost eliminate] the unwanted formation of oxides, hydrides and other impurities.
- vacuum orbit** Orbit of satellite round incomparably more massive body in complete absence of any atmosphere.
- vacuum pump** Device for establishing unidirectional flow of gas molecules and thus of evacuating fixed enclosure; following gross evacuation by mechanical pump alternatives include vapour/diffusion pump, cryopump etc. Also, in aircraft, simple device for applying depression to air-driven flight instruments, eg venturi.
- vacuum specific impulse** Specific impulse in vacuum operation.
- vacuum system control** Sucks air from aircraft toilet WC.
- vacuum thrust** Thrust of rocket in vacuum, typically about 25% greater than at sea level (actual thrust rises by approx. product of atmospheric pressure and rocket nozzle exit area).
- vacuum tube** Electronic tube whose internal pressure is so low that residual gas or vapour atoms or molecules have no significant effect on operation; also called thermionic valve in most common form.
- vacuum tunnel** Wind tunnel operated at much less than sea-level pressure.
- VAD** *1* Velocity/azimuth display.
- 2* VHPIC applications demonstration (programme).
- 3* Visual approach and departure [usually helicopter] chart.
- VADR** Voice and data recorder.
- VADS** Vulcan air-defense system (USA).
- VAE** Virtual air environment.
- VAES** Voice-activated electronic system.
- VAFA** Vintage Aircraft and Flying Association (UK).
- VAFB** Vandenberg AFB (USAF), see Vandenberg.
- Vaftad** Volcanic-ash forecast transport and distribution.
- VAI** Voice-interactive avionics (not VIA).
- VAL-IPR** Versatile affordable integrated-inlet fan for performance and reliability.
- VAL** *1* Visual approach and landing [chart].
- 2* Variable approach light [3 intensities, 2°–8° azimuth].
- 3* In valleys [mist/fog].
- Valid** Variability and life data.
- validation** Generalized word for activity intended to re-validate licence or authority, esp. training, examinations and emergency-procedure practice of graduate pilot, instructor or ATC (1) officer. ATC \* involves simulated crises worse than any normally encountered.
- validation phase** Period when major-programme characteristics are refined by study and test to validate alternatives and decide whether to proceed to FSD.
- valise** Storage envelope for liferaft.
- V<sub>∞</sub>, V-alpha** Free-stream velocity, or far-field velocity relative to aircraft..
- VALPT** Variable-area LP turbine.
- Valsalva** Called \* manoeuvre, or \* technique, involves pinching nose and blowing/swallowing to relieve dP on eardrums following sudden loss of cabin pressure.
- Value** Validated aircraft logistics utilization evaluation.
- value engineering** Complete engineering discipline devoted to seeking ways to achieve desired hardware performance, quality and reliability at minimal total cost, eg by elimination of unnecessary items, changes in material and manufacturing method, and simplification of design.
- valve** *1* Device for controlling fluid flow, eg into and out of piston-engine cylinder (inlet \*, exhaust \*) or into/out of aerostat, esp. airship.
- 2* Numerous other fluid-flow control devices in hydraulics, oxygen, propellants, hot-gas, bleed air, carburetion [US spelling] and other systems.
- 3* Vacuum tube (UK usage).
- 4* To release air or gas from aerostat into atmosphere.
- valve clearance** Gap between end of stem and rocker arm.
- valve duration** Time or angular crankshaft movement during which a valve remains open.
- valve face** Mating edge of valve (1) bedded by grinding into seat.
- valve gear** Mechanism driving valves of piston engine.
- valve hood** Umbrella-like cowl protecting main airship gas valve against rain or icing.
- valve lag** Angular motion of crankshaft between either maker's specified valve-closing position or TDC and point at which valve actually closes.
- valve lead** 'Leed', not 'led', angular motion of crank-shaft between closure of valve and either maker's specified closing position or TDC.

## valve lift

**valve lift** Total linear motion of poppet valve, ie cam stroke  $\times$  mechanical advantage of valve gear.

**valve line** Cord operating aerostat gas valve.

**valve petticoat** See *petticoat*.

**valve ports** Inlet and exhaust passages forming part of cylinder head.

**valve rigging** Linkage inside aerostat (airship) envelope by means of which automatic valve is opened.

**valve seat** Angled ring, usually made of hard erosion-resistant material, forming poppet-valve mating face in cylinder head.

**valve-seat recession** Accelerating erosion of piston-engine poppet-valve seat caused by fragments of soft seat fusing to valve [avoided by leaded fuel or LRP].

**valve timing** Exact plot of crankshaft angular positions at which piston-engine valves open and close.

**VAM** 1 Variable aerofoil mechanism; usually infinitely reproducible leading edge.

2 Visual anamorphic movie; external-scene (OTW) add-on to simulator.

3 Visual approach monitor (wide-body HUDs).

**Vamom** Visite d'aptitude à la mise en oeuvre et à la maintenance (Armée de l'Air, F).

**Vamp** 1 Variable anamorphic motion picture; see *VAM* (2).

2 VHSIC avionics modular processor.

**VAMS** Vector airspeed measuring system.

**Van, VAN** 1 Value-added, or visual-area, network.

2 Variable-area nozzle.

3 See next (2).

**van** 1 Generalized US term for air-conditioned towed vehicles for major support operations, eg strip, check and reassemble major avionic systems in field. Not called trailer.

2 Common term for [usually checkerboard painted] runway control vehicle, called VAN in code.

**vanadium** Hard silver-white metal, symbol V, density 6.1, MPt 1,887°C, important alloying element, esp. in steels.

**Van Allen belt(s)** Inner and outer zones of high-intensity particulate radiation trapped in Earth's magnetic field around Equator (inner mainly protons, outer mainly electrons) at radii from Earth's centre from 8,700 to 26,000 km.

**V&A** Validation and accreditation.

**Van de Graaff** Registered name of high-voltage generator using rotating belt to convey electrical charges.

**Vandenberg** Originally Camp Cooke, CA, today main West Coast rocket test base, head of Pacific Missile Range, address Lompoc (USAF).

**Van der Waals equation** Best known equation describing behaviour of real (as distinct from perfect) gas:  $(p + a/b^2)(v - b) = RT$ , where p is pressure, v volume, R universal gas constant, T °K and a, b constants.

**Van der Waals forces** Interatomic or intermolecular attractive forces between interacting varying dipole moments; varies as seventh power of radius.

**V&F** Vinyl and fabric.

**V&V** Verification and validation (software).

**Van Dyke** Generalized theory of aerodynamics at Mach 5+ (hypersonics), where air can no longer be assumed perfect gas owing to molecular vibration, dissociation, electronic excitation and ionization.

**vane** 1 Generalized term for thin (flat or, usually, curved

## vapourising combustor

but not necessarily aerofoil section) aerodynamic surface either fixed in order to turn air or gas flow, or freely pivoted and thus aligning itself with fluid direction.

2 Stator blade of compressor or turbine (originally US usage).

3 Gas guide surface at nozzle to turbine (US and UK); abb. IGV.

4 Strips, usually of circular-arc section, in cascade at corners of wind tunnel, or used as valves to control flow.

5 Radial strips around fuel burner of gas turbine imparting rotary vortex motion. Often called swirl \*.

6 Curved surfaces in cascade at angle bends of airflow in many gas turbines; again called swirl \* though rotation is not desired.

7 Curved forward extensions to radial arms of centrifugal compressor or supercharger impeller, called rotating guide \*, RGV.

8 Alternative (unusual) term for fence.

9 Swinging retractable leading-edge flaps normally housed in fixed glove of swing-wing aircraft and extended in high-lift mode, called glove \*.

10 Common term for slat fixed to leading edge of flap and for various other auxiliary aerofoils carried on flaps, ailerons, droops and leading-edge slats.

11 Normal meaning for weathercocking surface, eg to indicate angle of attack, or wind direction or relative wind.

12 Particular application of (1) is sensor in SWIS.

**vane passage** The airflow channel between two vanes.

**vane pump** Large family of fluid pumps in which flat surfaces oscillate and rotate inside chamber eccentrically arranged around drive shaft.

**vane rate** Angular velocity of vane in SWIS indicating rate at which aircraft is approaching stall.

**vane set** Row of vanes (4) across wind tunnel, either fixed and profiled to change flow direction or pivoted and ganged to rotate in unison to control or divert flow.

**vanilla aircraft** Baseline aircraft on which individual customer fits are incorporated.

**vanity unit** Small cabinet housing wash basin, mirror and [probably] storage.

**Vanvis** Visual and near-visual intercept system; visual refers to EM frequency used, not to pilot acquiring target visually.

**Van Zelm** Catcher installation for catapult bridles thrown from aircraft carriers.

**VAO** Vitrified aluminium oxide.

**VAP** 1 Vortex avoidance procedure.

2 Visual-Aids Panel (ICAO).

3 Spray dispensing system for HCN or persistent Toxic-B (USSR).

4 Value-added processor.

**V<sub>AP</sub>** See *V<sub>APP</sub>*.

**VAPI** Visual approach-path indicator; also known as vertical speed and approach-path indicator, suitable for fixed-wing and helicopter operation.

**V<sub>apo</sub>** Velocity at apogee.

**vaporiser** 1 Heat exchanger which converts LOX into breathable gas.

2 Alternative name for vaporising combustor.

**vaporising combustor** Gas-turbine combustion system in which fuel is vaporised prior to passage through burner and ignition (usually in *walking stick*); hence vaporiser, in which fuel is vaporised, and vaporising burner.

## vapour

**vapour** Substance in gaseous state but below critical temperature; thus can be converted by pressure alone to liquid or solid (US = vapor).

**vapour blasting** Surface treatment of [usually metal] part by firing abrasive particles in high-velocity jet.

**vapour cycle** Closed-circuit refrigeration, eg for air-conditioning, in which heat is extracted by refrigerant alternately evaporated and condensed.

**vapour degreasing** Immersion in hot solvent vapour, eg trichlorethylene.

**vapour gutter** Assembly of rings and radial struts, usually of  $>$  section, to retain flame in afterburner; also called flameholder or stabilizer.

**vapour lock** Complete breakdown of supply of liquid, eg fuel from tank, because of blockage by bubble of vapour at high point in pipe.

**vapour-phase inhibitor** Nitrite-based chemical, often locked in paper or other solid, which protects metal parts against corrosion by preventing formation of vapour, esp. of water; usually white powder which volatilises and recrystallises on metal surface.

**vapour pressure** Pressure exerted by molecules of vapour on walls of container; with mixture, sum of partial pressures. Compared with kerosene, wide-cut fuels have high volatility and thus high \*, hastening boiling and vapour lock.

**vapour tension** Maximum attainable vapour pressure exerted by plane liquid surface with vapour above, varies with temperature.

**vapour trail** See *condensation trail*.

**vapour-type thermometer** Needle is driven by Bourdon tube sensing pressure from vapour capsule whose temperature is that indicated.

**V<sub>APP</sub>** Approach speed.

**VAPS, Vaps** 1 Virtual avionics [or applications] prototyping system.

2 Visual approaches.

**Vaptar** Variable-parameter terrain-avoidance radar.

**VAQ** Unit prefix: airborne early-warning squadron (USN).

**VAR** 1 V.h.f. aural range, ie radio range.

2 Visual/aural range; radio range in which two airways are located by A/N signals and two by visual means, eg panel instrument (obs.).

3 Volt/ampere(s) reactive; unit of wattless (reactive) electrical power.

4 Vacuum-arc remelting.

5 Variation.

6 Volcanic-activity reporting.

**var** Variation (magnetic).

**varactor** Device employing p-n junction whose capacitance is varied by reverse voltage; important in parametric amplifiers.

**VARI** Vacuum-assisted resin injection.

**variable** When applied to IGV or stator ring, means variable-incidence; when applied to jet-engine inlet or nozzle, means variable profile and area.

**variable-area nozzle** Propelling nozzle whose cross-section area can be altered (usually, together with profile) to match changed Mach number and afterburner operation (airbreather) or atmospheric pressure from SL to vacuum (rocket).

## variable-geometry engine

**variable-area vane box** Mounted directly under fixed-axis quasi-vertical lift jets [e.g., LiftFan], vectors thrust over large angle about transverse axis.

**variable-area wing** Rare arrangements have included variable span and even retractable lower wing of biplane into upper, but modern flap systems (eg Fowler) give significant change.

**variable camber** 1 Apart from experimental aircraft, most important methods are hinged leading and trailing edges, eg F-16, which can each be pivoted slightly up, centred or pivoted fully down independently to suit desired flight condition. Tail surfaces, eg tailplane, rudder, are today often divided spanwise to change not just surface angle but also camber, for greater power.

2 Camber is varied by elastic deformation of surface, eg 747 Kruegers.

**variable-camber flap** 1 See *anti-balance tab*.

2 Flap, usually Krueger, whose profile changes on extension.

**variable colour stripping** Removal of part[s] of spectrum to indicate presence of organic material or explosive devices.

**variable-cycle engine** Jet engine in which path of working fluid can be altered by shutters/valves/doors, eg to convert from turbojet or turbofan to ramjet, hybrid rocket or other form in cruising flight. Some authorities claim adding an afterburner and variable nozzle results in a \*.

**variable-datum boost control** Auto boost control for supercharged piston engine in which governed boost pressure increases as pilot's throttle lever is opened.

**variable-delivery pump** Fluid pump whose output can be varied independently of drive speed, usually by variable-angle swashplate driving stroked plungers (at 90° stroke is zero).

**variable-density tunnel** Wind tunnel whose pressure can be varied over wide range (usually not below atmospheric) while in operation; normally pressurized to achieve desired Reynolds number.

**variable-diameter tilt-rotor** Full diameter for takeoff, transition to reduced diameter for fast translational flight.

**variable-discharge turbine** Gas turbine, eg driven by piston-engine exhaust, whose throughput (mass flow) can be controlled by valve (often called waste gate) to match turbine power to altitude and other variables.

**variable-displacement pump** Fluid pump whose output (mass flow) can be varied over wide range, often to zero, for any given input drive speed; often synonymous with variable-delivery, but \*\* explicitly implies reciprocating plungers or pistons whose stroke is variable.

**variable-floor-level bridge** Passenger bridge whose airside end can be raised and lowered to match aircraft sill height.

**variable-flow ducted rocket** Propulsion for long-range AAM and ASMs offering sustained supersonic [even hypersonic] speed from combining rocket with ramjet.

**variable-geometry aircraft** Aircraft whose shape can be varied in gross manner, ie more fundamentally than by retractable landing gear or flaps; term has come to mean variable wing sweep, so should not now be used in any other context, unless circumstances change or clear explanation of meaning is furnished.

**variable-geometry engine** Invariably refers to air-breathing engine for supersonic propulsion in which for

reasonable efficiency it is essential to have not only fully variable inlet and nozzle but also variation in flow path in engine itself, eg to divert flow around HP compressor in supersonic mode or to convert engine into ramjet. Needs explanation when used.

**variable-geometry inlet** See *variable inlet*.

**variable-incidence** Pivotally mounted so that angle of incidence can be altered. \* guide vane, stator blade or turbine inlet guide vane whose incidence is altered for best compromise between flow incident on leading edge and flow angle leaving trailing edge, invariably auto scheduled by engine control system. \* tails, tailplane whose incidence is varied either for trimming, with elevators as primary flight control surfaces, or as primary flight control. \* wing: wing pivoted on transverse axis so that over full (large) range of flight AOA fuselage can remain more or less level, eg to improve pilot view on approach or permit short landing gear.

**variable inlet** Variable-geometry airbreathing engine inlet whose area, lip/wedge/centrebody axial position and duct profile can all be adjusted to match required flight shock position and mass flow. Mere downstream auxiliary inlets or spill doors do not qualify.

**variable-inlet guide vane** Gas-turbine IGV whose incidence varies according to engine operating regime; very rare upstream of turbine but common upstream of first and often subsequent stages of axial compressor, to match airflow mass flow and whirl to rotor blade conditions and avoid stall; controlled by auto system always sensitive to rotor speed and inlet air temperature and occasionally to other variables.

**variable load** All variables aboard aircraft other than fuel and payload.

**variable metering orifice** In gas-turbine fuel system, key element in CASC comprising triangular orifice moved axially by stack of aneroid capsules and part-covered by sleeve moved by centrifugal SCG.

**variable overhead** Varies with number of particular item manufactured.

**variable-pitch** Synonymous with variable incidence. Normally confined to propellers, where incidence is called pitch. Usually means pitch can be varied on ground, or by pilot in flight, often only as choice of either coarse or fine pitch, without auto control such as constant-speed. Fine distinction between \* and adjustable-pitch, latter explicitly meaning ground-adjustable only.

**variable-ratio** Two main applications: in shaft-drive gearbox \* drive is usually synonymous with constant-speed drive, ie ratio is varied to hold output speed constant despite varying input; \* bypass engine or turbofan (rare) has bleeds, two-position shutters or doors to change ratio of airflow between bypass duct and core.

**variable-stability aircraft** Aircraft, invariably aeroplane, whose flight-control surfaces, and possibly structure, can be acted upon in flight to effect gross change of stability and control characteristics, either for research or to mimic the behaviour of a totally different type. The inputs should be seamless, not noticed by pilot.

**variable-stator** Usually means gas turbine with not just one but several rows of variable-incidence stator blades (vanes) in axial compressor(s). These are required to avoid surge and/or blade stall.

**variable-stroke** Though many reciprocating engines and machines patented with \*, invariably means axial oscil-

lating plunger liquid pump driven by variable-angle swashplate (see *variable-delivery*).

**variable-sweep** Aerofoil is pivoted so that sweep angle can be varied. Mainly applicable to main wings, where left/right wings are made separate from rest of structure and attached by large diameter fatigue-free pivots so that both surfaces can be scheduled (either auto or by pilot command) by actuator over wide range of sweep angles, symmetrical about axis of symmetry. Does not mean slew-wing. (Helicopter blade rotation about drag hinge is strictly \* but is not called such). Also called variable-geometry (VG) and (colloq.) swing-wing.

**variable-timing** Feature of magneto drives enabling ignition to be advanced or retarded [there are many other aerospace meanings].

**variance** Mathematical average of square of deviations from mean value.

**variance rate** Difference between standard and actual wages (US hourly-paid workers).

**variant** Different version of same basic aircraft type.

**variation** 1 Horizontal angle between local magnetic and geographical meridians, expressed as E or W to indicate direction of magnetic pole from true. Also called declination (see *grid*\*).

2 Detailed schedule of change orders or special furnishings or equipment specific to one customer.

3 Small periodic change in astronomical latitude of Earth locations due to wandering of poles.

**varicam** Pioneer variable-camber aerofoil.

**varicowl** Generalized term for any variable-geometry inlet, esp. for main engine.

**vario** VSI (F, colloq.).

**variocoupler** RF transformer with fixed and moving windings.

**variometer** 1 Aneroid-type VSI (traditional term of gliding fraternity; \* used to seek thermals).

2 Variable inductive coupler with fixed and moving coils or rotors for comparing magnetic fields, esp. Earth's field.

**varistor** Two-electrode semiconductor resistor characterized by resistance varying inversely with applied V, in either direction of current.

**Varite** Resistor characterized by negative temperature coefficient of resistance.

**varnish** 1 Solutions of resins, eg common gum or wood rosin, in drying oil, eg linseed.

2 Thick slimes in overheated lubricant.

**Varsol** Naptha-like petroleum solvent (trade name).

**Vartm**, **VARTM** Vacuum-assisted resin transfer moulding [molding].

**Vartoms** Variable rotor speed and torque-matching system.

**VAS** 1 Visual augmentation system, or sleeve.

2 Voice-activated, or awareness, system.

3 Visible/IR spin-scan radiometer atmosphere sounder.

**VASI**, **Vasi** Visual approach slope indicator.

**Vasis** Vasi system (UK style).

**Vast** 1 Versatile avionics shop test(er); packaged laboratory for installation on Navy airfields or carriers; occasionally 'a' held to mean automatic.

2 Vibration analysis systems technique (GE).

3 Virtual air and space technology (NASA/FAA).

**Vastac** Vector-assisted attack.

**VAT** 1 Value-added tax; applicable to light and sport aircraft (UK).

2 Vernier axial thruster.

3 Visually-augmented target.

4 Vertical-acceleration threshold.

**V<sub>AT</sub>** Target threshold speed; scheduled speed for arrival at threshold at screen height of 10 m after steady stable approach at angle of descent not less than 3°. Usually about 1.3 V<sub>s</sub> (see V<sub>Tmax</sub>, V<sub>Tmin</sub>). Subdivided: V<sub>AT0</sub>, all engines operating; V<sub>AT1</sub>, one engine failed; V<sub>AT2</sub>, two engines failed, etc.

**VATAS** Voice and tone annunciation system, synthesized voice warnings to helicopter pilot in NOE flight.

**Vat-B** Short-form weather report comprising word 'weather' and four numbers (DoD, from vis, amount [cloud], top [cloud] and base [cloud]).

**Vatcas** Very advanced ATC automation system (G).

**VATE** Versatile affordable turbine engine (NASA).

**VATLS** Visual airborne target-locator system; laser ranging device.

**Vatol** Vertical-altitude takeoff and landing, ie 'tail-standing'.

**VATS, Vats** Video-augmented tracking system.

**VATT** Visually augmented tow target.

**VAU** Voltage averaging unit.

**VAVB** Variable-area vane box.

**VAW** Volcanic-ash warning (ICAO study group).

**VAWS** Voice-alarm warning system.

**VAWT** Vertical-axis wind turbine.

**V<sub>axial</sub>** Axial velocity, especially of flow through an axial compressor or turbine.

**VB** 1 Vertical build [of engine]; A adds area.

2 Vacuum-bonded.

**V<sub>B</sub>** Maximum speed at which specified gust (eg ±66 ft/s) can be withstood without airframe damage; hence speed at left lower and upper corners of basic gust envelope. Usually more than half V<sub>c</sub> and less than half V<sub>D</sub>. Plays role in establishing V<sub>RA</sub>.

**V<sub>b</sub>** Fluid velocity relative to propeller-blade at radius r, = TAS + ω r + V<sub>2</sub>.

**VBC** 1 Velocity blast contour.

2 Video bandwidth compression.

**V<sub>BE</sub>** Speed for best flight endurance.

**V<sub>BG</sub>** Airspeed for best glide ratio.

**VBI** Verband Beratender Ingenieure (G).

**V<sub>BL</sub>** MIL/DefStan requirements define balked-landing speed as whichever is greater: maximum speed reached on go-around before high-lift devices can be retracted, or 1.8V<sub>s</sub> with high-lift devices in intermediate [not defined] position.

**VBM** Volatile bulk memory.

**V BMC** Virtual battlefield management center.

**VBO** Velocity at burnout.

**V<sub>BR</sub>** 1 Speed for best range.

2 Limiting IAS for use of airbrake.

**V<sub>BROC</sub>** ASIR for best rate of climb of helicopter, usually at or near SL.

**VBS** Visual bootstrapping subsystem.

**VBV** Variable-bypass valve.

**VBW** 1 Vertikalbordwaffe, dispenser of attack payloads (G).

2 Vertical ballistic weapon.

**VC** 1 US military aircraft prefix, staff/VIP transport.

2 Variable-camber.

3 Vanadium carbide.

4 Or V<sub>c</sub>, velocity command.

5 Variable-cycle; E adds engine.

6 Vicinity (5–10 miles, or n.m., of airport).

7 Voice communication [many suffixes].

8 Vertical-cavity.

9 Vereinigung Cockpit eV [ALPA; office, D-60598 Frankfurt am Main] (G).

10 Virtual circuit.

11 Video cassette.

**V<sub>c</sub>** 1 Design cruising speed, usually one of speeds used in establishing structural strength.

2 Relative closing speed between two aerial targets.

**v<sub>c</sub>** 1 Rate of climb (note: not IAS or other horizontal speed in climb).

2 Circular velocity, satellite speed in linear measure.

**VCAA** Vintage and Classic Aeroplane Association.

**VCAI** Viable combat-avionics initiative, attempt to study system life prior to procurement (USAF).

**VCAS** 1 Vice-Chief of the Air Staff.

2 Visual calibration augmentation system.

**VCASS** Visually coupled airborne systems simulator (a helmet, Armstrong Lab.).

**VCATS** Visually coupled acquisition and targeting system (HMD).

**VCB** Virtual-circuit bridge.

**VCC** 1 Vehicle-control centre.

2 Colour CRT display (F).

3 Voice communication control.

4 Video control centre, in pax cabin.

**VCCO** Voltage-controlled clock oscillator.

**VCCS** Voice communication[s] control system, or switch.

**VCD** 1 Variable-capacitance diode.

2 Voltage-control, or -controlled, device.

**VCDS** Vice-Chief of the Defence Staff (UK).

**VCE** 1 Variable-cycle engine.

2 Virtual collaborative engineering.

**VCFS** Visually coupled flight system.

**VCH** Visual committal height.

**VCID** Voice-controlled, or command, interactive device.

**VCIR** Vistal caesium IR.

**VC/L** Vehicle container/launcher (UAV).

**VCM** Visual countermeasures (OCM more usual).

**VC<sub>max</sub>** Active maximum-control speed.

**VC<sub>min</sub>** Active minimum-control speed.

**VCN** Visual computing network.

**VCNTY** Vicinity.

**VCO** 1 Variable clock, or controlled, oscillator.

2 Voltage-controlled oscillator.

**V<sub>con</sub>** Conventional flying qualities (STOVL aircraft).

**VCOP** Virtual-cockpit optimization program (USA).

**VCOS** 1 Vice-Chief of Staff.

**VCO/S** Voltage controller oscillator/synthesizer.

**VCP** Vehicle check point.

**VCR** 1 Video cassette recorder.

2 Visual control room, in tower.

3 Variable compression ratio.

4 Voice-command recognition.

**VCRG** V.h.f. Channel Requirements Group.

**VCS** 1 Vertical cross-section.

2 Vehicle control station, or system.

3 Voice communication switch, or system.

- 4** Voice-controlled, or voice command, system.  
**5** Visually coupled system.  
**6** Video-camera station, or system.  
**7** Variable colour stripping.
- VCSD** Very-close-in ship defence.
- VCSEL** Vertical-cavity surface-emitting laser.
- VCSELI** VCSEL laser-based interconnect[s].
- VCSS** **1** Vinyl-coated stainless steel.  
**2** Voice-controlled, or communication, switching system.
- VCSU** Video-code suppression unit.
- VCTA** Visual circuit altitude.
- VCTS** Variable-cockpit training system.
- VCU** **1** Video conversion unit.  
**2** VDL(2) control unit.
- VCXI** Visual course cross-pointer indicator.
- VCXO** Voltage-controlled crystal oscillator.
- VCY** Vicinity.
- VD** **1** Video detector, or disk.  
**2** V.h.f. data.  
**3** Visual display.  
**4** Variable displacement.
- V<sub>D</sub>** **1** Design diving speed; highest speed at which aircraft is normally permitted to fly, forming vertical right-hand boundary to both basic manoeuvring envelope and basic gust envelope. One of speeds used in establishing structural strength.  
**2** Heading to a DME distance.
- V<sub>d</sub>** Doppler velocity [range rate].
- v<sub>d</sub>** Rate of descent (note: not airspeed during descent).
- v.d.** Vapour density.
- VDA** **1** Versatile drone autopilot.  
**2** Véhicule de défense anti-aérienne (F).  
**3** Vertical data analysis.
- VDC** **1** Variable-datum control.  
**2** Visual-display controller.
- VDC, Vdc** Volts direct-current.
- VDD** **1** Version description document.  
**2** Variable-drag drogue.
- VDDL** Verband Deutscher Drachenfluglehrer eV (kite-flying instructors, G).
- VDE** Verein Deutscher Elektrotechniker (G, technical society).
- VDF** **1** V.h.f. D/F; most common ground D/F.  
**2** Verein Deutscher Flugzeugführer (G, PIC society).  
**3** Verband Deutscher Flugleiter (G).
- V<sub>DF</sub>** Maximum demonstrated flight diving speed; highest IAS at which aircraft is ever flown (normally only during certification); associated with poor strength margins (inadequate for severe gust) and possibly poor handling, yet attainable at full power even in climb on many transports at low/medium levels.
- VDFT** Verband Deutscher Flugsicherungs-Techniker eV (flight-safety technicians, G).
- VDGS** Visual docking guidance system.
- VDHM** Variable-displacement hydraulic motor.
- VDI** **1** Vertical displacement indicator.  
**2** Variable-depth (sonar) output indicator.  
**3** Verband Deutscher Ingenieure [133,000 members; office, D-40002 Düsseldorf] (G).  
**4** Vertical-deviation indication, or indicator.
- V<sub>DIV</sub>** Divergence speed, IAS at which the wing will fail in torsion.
- VDL** **1** Verband Deutscher Luftfahrt-Techniker (G, aerospace engineers' society).  
**2** V.h.f. data-link (Arinc), or digital link.
- VDLM** V.h.f. data-link Mode, followed by 1, 2, 3 or 4.
- VDLU** Verband Deutscher Luftfahrt-Unternehmen (G).
- VDM** **1** Viscous damped mount.  
**2** Visual display module.  
**3** VSCS display module.
- VDMA** **1** Variable-destination multiple access.  
**2** Verein Deutscher Maschinenbau-Anstalten (G).
- VDMD, Vdmd** Demonstrated maximum diving speed.
- VDNX, VDNKh** Exhibition of national-economy achievement (USSR).
- VDO** Virtual distant object.
- VDP** **1** Validation demonstration phase.  
**2** Visual descent point.  
**3** Variable-displacement pump.
- VDR, v.d.r.1** Voltage-dependent resistor.  
**2** V.h.f. data, or digital, radio.  
**3** Variable-diameter rotor.
- VDRS** Vehicle data recorder system.
- VDRT** Visual display research tool.
- VDS** **1** Variable-depth sonar.  
**2** Video-disc simulation.
- VDSM** Very deep sub-micron.
- VDT** **1** Variable-discharge turbine (driven by piston-engine exhaust).  
**2** Vapour-deposited tungsten.  
**3** Variable-deflection thruster.  
**4** Variable-density [wind] tunnel.
- VDTR** Variable-diameter tilt-rotor.
- VDU** Visual or video display unit.
- VDVP** Variable-displacement vane pump.
- VE** **1** Value engineering.  
**2** Visual exempt[ed].
- V<sub>E</sub>** Generalized symbalent airspeed.  
**2** Effective velocity ratio  $V\alpha/V_j$ .
- Vol** for a limiting speed at which something (eg flap, landing gear) may be selected and extended; suffixes, eg  $V_{EI}$ ,  $V_{EN}$ , used for specific items and additional terms are used (more are needed) for limiting speeds for subsequent retraction. Main gears (usually not nose) are generally cleared to  $V_{MO}$  when locked down, but  $V_E$  always applies for selecting down or up.
- V<sub>e</sub>** **1** EquivEB Vehicle equipment bay.
- Vebal** Vertical ballistic (downward-firing anti-armour).
- VECP** Value-engineering change proposal.
- VECTOR, Vector** Vectoring Estol control tailless operational research (US/Germany).
- vector** **1** Adj, having both magnitude and direction; thus velocity is \* quantity, speed is not. Aerospace is normally based on Euclidean geometry.  
**2** Line representing quantity's magnitude, direction and point of application, eg force on structure, or aircraft heading/vertical velocity [if any] TAS.  
**3** A particular aircraft heading or track, eg that needed to arrive at destination.  
**4** To issue headings to aircraft to provide navigation guidance (DoD definition adds 'by radar').  
**5** On HUD, aircraft direction of travel, usually synonymous with track.  
**6** To control trajectory by altering thrust axis of propulsion.

## vector computer

## velocity of advance

7 In translation from Italian, rocket launch vehicle.

8 Prefix to three-digit heading passed to interceptor engaged in interception (for recovery, corresponding word is steer).

**vector computer** Device for solving vector triangles, eg CSC.

**vectored** Capable of being pointed in chosen directions.

**vectored attack** Surface attack in which weapon carrier is vectored (4) to weapon-delivery point by unit which holds contact on target (DoD, NATO).

**vectored thrust** Propulsive thrust whose axis can be rotated to control vehicle trajectory; term normally applied to swivelling-nozzle jet engine of aeroplane, corresponding term for space and military rockets being usually TVC.

**vector flight control** Control of trajectory by vectored thrust.

**vectoring** *Vectored.*

**vector force** Resultant of wing's lift [or lift coefficient] and pitching moment [or its coefficient], acting through c.p.

**vectoring in forward flight** See *viff*.

**vector quantity** One that has magnitude and direction.

**vector sight** Traditional type of bomb sight incorporating mechanical representation of vectors of relevant vector triangle.

**vector steering** Control of trajectory by vectored thrust.

**vector triangle** Closed figure formed from three vectors, eg (1) heading/TAS, track/GS and W/V, or (2) lift, drag and resultant force on lifting wing.

**vector velocity** See *vorticity*. Tantological on its own, velocity implying direction.

**Vectra** Extremely strong liquid-crystal polymer, injection moulded and often strengthened with chopped graphite or glass (Hoechst Celanese).

**VEDM** Vehicle and engine display management.

**vee-belt** *V-belt.*

**vee depression** Vee-shaped low extending between two highs, usually with squall.

**veeder counter** Stepping digital counter, eg odometer; today often LED or LCD.

**vee engine** Piston engine whose cylinders are arranged in two inclined in-line rows (banks) in V form seen from either end, driving on common crankshaft; hence vee-12 (often called V-12) \*\* with six cylinders in each bank.

**vee formation** Aircraft formation in shape of horizontal V proceeding apex-first, for symmetry with odd number of aircraft.

**Veep** VIP.

**veering** Change of wind direction clockwise seen from above; now applies in either hemisphere.

**vee tab** Elevator spring tab with no-load up-deflection balanced by positive [typically + 10°] trim tab feature of some large aircraft in 1940s.

**vee tail** See *butterfly*.

**V<sub>EF</sub>** Speed at which critical engine failure occurs in accelerate/stop takeoff; defines  $V_1$  as \* plus speed gained with critical engine inoperative during time pilot takes to recognize situation and respond. In US often  $V_{ef}$ .

**vegetable** Mine laid by aircraft at sea (RAF, WW2), hence gardening.

**vegetable oil** Several, esp. castor, used for engine lubrication pre-1935.

**VEGV** Variable exit guide vane.

**VEH** Variable edge enhancement, see *EH*.

**vehicle** Self-propelled, boosted or towed conveyance for transporting a burden on land, sea or through air or space. This is DoD/NATO wording. Only possible word in most generalized contexts, and also only word covering aircraft, spacecraft, missiles, RPVs etc. Air \* identifies flying portion of weapon or reconnaissance system that has extensive non-flying portions.

**vehicle axes** Axes, usually cartesian, related to vehicle rather than to Earth or space.

**vehicle correlator** Radar subsystem intended to eliminate clutter caused by detection of large numbers of road vehicles [e.g., fleeing civilians] whose speeds exceed lower limit for detection in look-down mode.

**vehicle mass ratio** Ratio of final mass of vehicle, usually  $M_f$ , after cutoff or burnout of propulsion to initial mass, usually  $M_0$ . Normally applied to rocket vehicles.

**veil cloud** Loose term meaning either Cs or cloud forming thin veil on mountain.

**VEK** Equivalent airspeed (EDP).

**VEL** 1 True airspeed (EDP).

2 Velocity.

**vela sensor** Usually measures velocity and angle of attack.

**velocimeter** 1 Generalized term for velocity meter.

2 CW-reflection Doppler system for measurement of radial velocity, ie speed of approach or recession relative to observer.

**velocity** 1 Measure of motion; speed (linear or angular) in specified direction.

2 Loosely (though common in fluid flow), speed. SI unit is m/s. For some conversion factors, see *speed*.

**velocity blast contour** Plot of jet wake velocities immediately behind large jet as it proceeds from gate to takeoff point. Usual measure is 6 ft (1.83 m) above ground at distance 50 ft (15.24 m) behind tail.

**velocity budget** Sum of all velocities in planning spaceflight.

**velocity factor** Ratio of speed of RF wave along conductor to its speed in free space, usually 0.6 to almost unity; symbol k. In typical co-axial cable value is about 0.66, often expressed as a percentage.

**velocity gate** Basic ability of CW, Doppler and certain other tracking radars to sense and lock on to particular radial velocity characteristic of target. Hence \*\* pull-off, basic ECM technique to pull radar off target signal and thus give infinite JSRR.

**velocity gradient** Rate of change of fluid speed per unit distance traversed perpendicular to streamlines, eg in boundary layer.

**velocity head** Not accepted term; usually means pitot pressure but has even been used to mean kinetic energy of unit mass of fluid.

**velocity jump** Angle between launch line and line of departure (ASCC).

**velocity microphone** Electrical output = f(V) where V is mean speed of particles on which sound waves impact.

**velocity modulation** Various techniques of modulating electron beams, eg by h.f. transverse field which impresses sinusoidal velocity contour causing corresponding variation in intensity of scanning spot.

**velocity of advance** Airspeed past propeller blades ignoring speed due to rotation of blades; essentially

## velocity of light

synonymous with slipstream speed. Always greater than aircraft airspeed, provided engine is operating.

**velocity of light** In vacuum  $2.9979250 \times 10^8$  m/s, symbol c.

**velocity of propagation** Speed at which EM wave travels along conductor, eg co-axial cable, waveguide; usually = kc, where k is velocity factor.

**velocity of rotation** Rotational speed.

**velocity of sound** See *sound*.

**velocity potential** Integral of flow velocity parallel to surface,  
 $= \phi, = U_x + V_y$  (rectilinear)  $= \frac{\Gamma\theta}{2\pi}$  (vortex)  $= \frac{V}{\nabla}$ .

**velocity profile** Plot of velocity of viscous fluid in traverse (2) perpendicular to flow direction; thus for laminar flow through small tube \*\* = parabolic curve.

**velocity ratio** 1 Common meaning is  $\sqrt{q_j/q_0}$  where  $q_j$  = dynamic pressure of jet.

2 Free-stream relative velocity divided by propulsive jet velocity,  $V_{a0}/(V_j - V_{a0})$ .

3 Generally, velocity of jet or propeller slipstream to free-stream relative velocity.

4 Mechanical advantage.

**velocity shear** The difference in velocity between the periphery of a propulsive jet and the surrounding atmosphere.

**velocity signature** Record of Doppler track of aerial or other moving target.

**velocity transducer** Generates electrical output proportional to imparted V, symbol  $V_e$ .

**velocity vector** 1 Flight path in three dimensions. In most aeroplanes, at high speed, this differs only slightly from the longitudinal axis, whereas in a modern fighter in a minimum-airspeed flypast the difference can be 20° or more.

2 Main reference on primary flight display showing desired flight path on which aircraft is held by FCS.

**VEMID** Vehicle and engine multifunction, or management, display.

**VEN** Variable exhaust nozzle.

**vendor** Supplier to a programme, almost always manufacturer of finished parts, devices and equipment though \* list often includes suppliers of raw material and even services.

**vendor audit** Survey of vendor profiles, eg before entering into discussion or negotiation.

**vendor profile** Detailed standardized description of vendor companies for benefit of large-system prime contractors.

**veneer** Thin sheet wood; when applied to plastics usually means sheet with simulated woodgrain.

**vent** 1 Opening to atmosphere, eg from fuel tank, to equalize internal and external pressures.

2 Opening in centre of parachute for stabilization.

3 Precision aperture in aircraft skin sensing true local static pressure; called static \*.

4 Spanwise aperture on USB flap either to entrain air from below or to reduce Coanda attachment to upper surface.

**vent cap** Vent (2) patch.

**vent hem** Reinforced hem around vent (2).

**ventilated shock** Shockwave at UST point which has been stabilized and weakened by a double slot system.

**ventilated suit** Partial-pressure or pressure suit provided with ventilation system, eg by ventilation garment.

**ventilated tunnel** Wind tunnel whose working section is

perforated by holes or slots to prevent choking at Mach 0.8–1.2.

**ventilated wet suit** Designed to protect downed aircrew against exposure.

**ventilation garment** Light inner suit, forming part of pressure suit, through which dry air is pumped to control body surface temperature and evaporation.

**venting capability** Ability of a closed volume to dissipate sudden increase in pressure.

**venting cycle** Regular or automatic venting of Ni/Cd battery to avoid cell imbalance or thermal runaway.

**vent patch** Piece of fabric covering vent (2) sewn to hem.

**vent plug** Cover over hole in outer skin [e.g., engine-bay ventilation] inserted manually after each flight.

**ventral** 1 On belly side of body; hence with horizontal fuselage, on underside, or, occasionally, firing or directed through underside.

2 Underfin, vertical or inclined, fixed or hinged.

**ventral container/pallet/pod/radar/tank** Criterion for adjective 'ventral', as distinct from fuselage, centreline etc, is that item either forms underside of fuselage or is flush against it, eg Beech 99 baggage container, RF-111 reconnaissance pallet, Harrier gun pod, RA-5C SLAR and Attacker drop tank.

**ventral fin** Fixed or movable fin on underside of body, usually but not necessarily at tail.

**ventral inlet** Inlet on underside of body far enough from nose not to be called chin inlet.

**ventral nozzle** Plain downward facing nozzle in underside of jetpipe from ejector-lift engine, with pilot or auto-controlled valve.

**ventral turret** Defensive gun turret on the underside of the fuselage, usually aft of wing. One species was the ball turret.

**venturi** Duct for fluid flow which contracts to minimum cross-section at throat and then expands (usually to same area as inlet); pressure at throat falls to minimum value which can be used to drive vacuum instruments or as measure of airspeed; flow throughout always subsonic.

**venturi meter** Instrument for measuring fluid mass flow through calibrated horizontal venturi;

$$\text{flow } Q = A_2 \sqrt{\frac{p_1 - p_2}{\rho/2[1 - (A_2/A_1)^2]}} \text{ where } p_1, A_1 \text{ are pressure}$$

and cross-sectional area at start of venturi,  $p_2$ ,  $A_2$  are values at throat and  $\rho$  is density. Assumes flow laminar and compressibility ignored.

**venturi pitot** Combination of pitot tube and venturi, one giving pressure above atmospheric, other below.

**venturi tube** See *venturi*.

**vent valve** Located at a high point in an aircraft fuel system, this provides an escape route for air during refuelling, and can also spill excess fuel overboard.

**Venus** Visual-engine numeric spaces, produces smooth 3-D landscapes.

**VEO-wing** Vectored engine over, used in several RALS studies.

**VER** 1 Vertical ejector, or ejection, rack; VER-2 is twin-store \*.

2 Vertical.

3 Version.

**verb** APPC command.

**Verdan** Versatile digital analyser; pioneer airborne computer used in Reins (Autonetics); colloq. translated as 'Very Effective Replacement for Dumb-Ass Navigators'.

## Verey, verey

**Verey, verey** See Very.

**verge ring** 000°–360° ring rotated to set traditional magnetic compass.

**verification** 1 To ensure meaning and phraseology of transmitted message conveys exact intention of originator.

2 Any action, including surveillance, inspection, identification, detection, to confirm compliance with arms-control agreement.

3 Confirmation of flightplan by inserting waypoints and destination in navigation system and causing system and displays to drive through to destination in accelerated timescale.

4 Re-examination of firing data (DoD).

**vernal equinox** Intersection of ecliptic and celestial equator occupied by Sun about March 21 as it passes through zero declination, changing from S declination to N.

**vernier** Aid to fine adjustment or refined measurement, eg linear scale placed adjacent to main scale, with which, by aligning two corresponding divisions, main scale can be read with enhanced accuracy.

**vernier engine/motor/rocket** Small rocket which remains operating or is started after shut-down of main propulsion to provide accurate final adjustment of vehicle velocity; in most cases has thrust-vector control to refine exact direction of trajectory.

**Veronica manoeuvre** Changing course to avoid known or suddenly encountered defences [RAF nuclear attack plan 1960–90].

**Vert, vert** Vertical.

**vertex** 1 Highest point of trajectory.

2 Point on great circle nearest a pole

3 Node or branch point in network.

**vertical** 1 Vertical or slightly inclined fin on supersonic fighter-type aircraft, either at nose or tail, usually under body at nose but usually above at tail, often pivoted and power-driven to serve as primary flight-control surface. Twin canted \* form U-tail.

2 See *vertical air photograph*.

**vertical air photograph** Taken with optical axis of camera perpendicular to Earth's surface (note: definition, agreed by DoD, NATO, does not say with axis vertical; over mountains, axis could be at 45° which is not intended).

**vertical and/or short take-off and landing, V/STOL** Usually means that aircraft is fixed-wing aerodyne with jet lift giving horizontal attitude VTOL capability at less than maximum weight but that in most missions STO is preferred; landing at light weight may be vertical, thus, STOVL. Some VTOLs do not have STO capability and thus cannot be called V/STOL.

**vertical attitude** Aircraft is rotated approximately 90° nose-up from normal flight attitude; thus a Vtol may have to operate from a special mobile or ship-mounted platform.

**vertical axis** 1 Vehicle-related \*\* is that axis perpendicular to both longitudinal and transverse horizontal axes; in aircraft called OZ, usually lying in plane of symmetry.

2 Local vertical.

**vertical bank** Aircraft is rolled through 90°, so that OZ axis is horizontal and OY axis is coincident with local vertical.

## vertical pressure gradient

**vertical camera** Optical axis is perpendicular to Earth's surface; according to other authorities, axis is aligned with local vertical, no matter what local terrain may be. Need for clarification.

**vertical-cavity SEL(8)** Semiconductor laser whose optical modes are excited perpendicularly to laminate, i.e. vertically.

**vertical circle** Great circle of celestial sphere passing through zenith and nadir.

**vertical clearance** Height above ground.

**vertical data analysis** Identifies and separates out types of data in successive packets to reduce volume of header-style information (satcoms).

**vertical development** Depth of cloud from base to top.

**vertical ejector rack** Carries two superimposed external stores; much lower clean drag than TER.

**vertical engine** 1 Piston engine or gas turbine whose main rotating member rotates about vertical axis, usually for helicopter drive or jet lift.

2 Piston engine whose cylinders are vertical above or below crankshaft.

**vertical envelopment** Tactical manoeuvre in which troops, air-dropped or air-landed, attack flanks and rear of hostile surface force, effectively cutting off latter.

**Vertical Extension** Proposals to reduce FL at which IFR become mandatory, generally = below FL195.

**vertical fin** Fin; traditional fin is fixed, and word 'vertical' alone usually means powered fin serving as flight control.

**vertical force** Vertical component of Earth's magnetic field.

**vertical gust** Gust; but in V-g recorder V signifies vehicle velocity.

**vertical gyro** Two-degrees-of-freedom gyro torqued on gimbal mounts to hold spin axis vertical, thus giving output signals proportional to rotation about two orthogonal axes, usually pitch/roll.

**vertical interval** Difference in height between two locations, eg between two targets or between observer and target.

**vertical launch** Launch of vehicle on initially vertical trajectory where such trajectory is not inevitable; eg non-ballistic vehicle or one launched from launcher of variable elevation.

**vertical layout** Traditional layout of project or design office in which an administrative or seniority hierarchy takes precedence over (1) project or programme, and (2) type of work.

**vertical lift** Lift force along local vertical generated by aerodyne wing, rotor or engine.

**vertical navigation, VNav** Guidance of flight trajectory in vertical plane, eg to minimize pilot workload in letdowns, holding patterns and during climb or descent to ATC cleared FLs along particular routes or on early stages of approach; provided by modern transport navigation systems, esp. those of energy-management type.

**vertical overspill** Vertical beam from weather radar reflected from surface below to give height ring on display; not present in mapping mode.

**vertical pincer** Any DA(3) engagement, one low and one high (relative to target).

**vertical pressure gradient** Change of atmospheric pressure per unit change in height (traditionally per 1,000 ft in UK/US).

**vertical probable error**

**vertical probable error** Product of range probable error and slope of fall.

**vertical reference** Earth-related vertical axis, ie local vertical normally approximated by vertical gyro.

**vertical reference gyro** *Vertical gyro.*

**vertical replenishment** Use of VTOL (helicopter) or V/STOL aircraft for transfer of stores and/or ammunition from ship to ship or to shore (NESN).

**vertical reverse** Aerobatic manoeuvre related to half flick (snap) roll; begun from tight turn by pulling hard back and applying full top rudder to flick inverted, thereafter completing second half of loop to recover level flight; often called vertical reversion (US term).

**vertical riser** Flat-rising VTOL, ie jet-lift aircraft taking off with fuselage horizontal.

**vertical rolling scissors** Defensive descending manoeuvre in vertical plane in attempt to make enemy overshoot and fly into attacker's future flight path.

**vertical separation** Specified difference in FL between air traffic on conflicting courses; normally published for (1) tracks 000–179 and (2) tracks 180–359, and for FLs 0–180, 180–290 and 290 +.

**vertical situation display** Abb. VSD, flight instrument designed to avoid CFIT. It adds a large rectangle in the lower half of the ND showing a side profile of the flight path and the terrain, based on current track. This gives a valuable extra view supplementing TAWS (Boeing).

**vertical situation indicator** See above.

**vertical speed** 1 Helicopter autopilot mode, rate of change of pressure altitude.

2 Loosely, rate of change of height.

**vertical speed indicator** Panel instrument indicating vertical speed, ie rate of climb/descent; invariably one pointer zeroed at 9 o'clock.

**vertical spin tunnel** See *spinning tunnel*.

**vertical stabilizer** Fin (US).

**vertical stiffeners** Angle or other sections riveted or bonded at intervals along spar web or fuselage keel to resist buckling in vertical plane.

**vertical strip** Single flightline of overlapping vertical reconnaissance images, eg of beach or road.

**vertical tail** Traditionally, fin(s) and rudder(s); hence \*\* area, aggregate area in side elevation of fin(s) and rudder(s), together with dorsal fin and any ventral fin(s) but exclusive of fillets, fairings or bullets.

**vertical tail length** Distance from c.g. to aerodynamic centre of vertical tail.

**vertical tailplane** Airbus term for fin.

**vertical take-off and landing** Aerodyne has capability of rising from surface without airspeed, hovering and returning to soft landing again without airspeed, generating lift greater than its weight by rotors, ducted fans, jets, deflected propulsion or other internally energized means.

**vertical tape instrument** Display has roller blind translating vertically, against which are read fixed and/or moving index markers; usually engine instruments are grouped in multi-engine aircraft so that in correct operation all similar readouts are at same levels.

**vertical translation** Motion of aeroplane in vertical plane, esp. under direct lift force, without change of pitch attitude; can be achieved, eg, by Harrier viff or by F-16 symmetric wing-flaperon deflection with scheduled flap-

eron/tailplane interconnect gain and with pitch hold engaged.

**vertical tunnel** See *spinning tunnel*.

**vertical turn** Turn with approx. 90° bank.

**vertical virage** Turn with approx. 90° bank (arch.).

**vertical visibility** Self-explanatory, can be looking down or up.

**vertical wind tunnel** See *spinning tunnel*

**vertigo** Subjective sensations caused by faults in inner ear semicircular canals: subjective \* = external world is moving past sufferer; objective \* = external world is rotating.

**vertiplane** VTOL aircraft having fixed wing with flaps powerful enough to lift aircraft at zero forward speed by deflecting propwash; FAI category E-4 but no records and (it would appear) no current flying examples.

**vertrep** See *vertical replenishment*.

**Vervis** Vertical visibility.

**Very** Patented signal pistol, standard Allied aviation from WW1; hence \* light, \* pistol etc.

**very high** Above FL 500 (DoD).

**very high frequency** 30-300MHz, see Appendix 2.

**very high frequency omni-range** see *VOR*.

**very high speed photography** Image rate 500 to 10<sup>4</sup>/s. Faster = ultra.

**very large aircraft** No definition known to exist.

**very-large-scale integration** Commonly accepted as over 10<sup>5</sup> devices (some authorities, over 16 kbit) per chip.

**very low frequency** 3–30 kHz, see Appendix 2.

**very light aircraft** 1 MTOW ≤750 kg, 1,653lb (FAA). 2 ≤390 kg, 860 lb (BCAR).

**V<sub>esc</sub>** Escape velocity =  $\sqrt{2K/R}$  where K is a constant (universal gravitational constant × primary-body mass) and R is distance from centre of primary body.

**vespel polyimide** Coating for bearing surfaces retaining low-friction qualities to high temperature.

**Vest** Visualization of expeditionary support tools [software integration] (USAf).

**Vesta** Vecteur à statoréacteur [long-burn ramjet] (F).

**vestibule** Region immediately inside main entrance door.

**VEWS** Volcano early-warning system (US Geological Survey).

**VEX** Vertical Extension.

**VF** 1 Voice, or variable, frequency.

2 Unit prefix, fighter squadron (USN).

**V<sub>F</sub>** Design flap limiting speed; replaced by V<sub>FE</sub>.

**V<sub>f</sub>** 1 Surface wind.

2 Volume fraction of fibre or whisker reinforced composites; expressed as % volume occupied by fibre.

3 Fuel flow (CAA).

4 Aircraft forward velocity at moment of touchdown.

**VFB** Video-frame buffer.

**V<sub>FC</sub>** Maximum speed for flight stability (F<sub>C</sub> = full control); usually synonymous with V<sub>MO</sub>, little used outside US and suggest passing from use.

**VFCT** Voice frequency carrier telegraph.

**VFD** Vacuum fluorescent display.

**VFDR** Variable-flow ducted rocket.

**V<sub>FE</sub>** Maximum flaps-extended placard speed; usually an ASIR and in most flight manuals precise meaning is explained, eg whether limit is for landing setting or any lesser setting. Note: this is invariably a limit for an established flap setting; it does not allow for changed settings.

**V<sub>FL</sub>****vibration meter**

**V<sub>FL</sub>** MIL/DefStan defines design speed for landing as whichever is greater:  $1.8V_s$  at MLW with high-lift devices set for landing, or  $1.4V_s$  with such devices retracted.

**VFLB** Variable-floor-level bridge.

**V<sub>FLU</sub>** Critical flutter speed [usually for wing], normally  $\leq 1.2 V_D$ .

**VFMED** Variable-format message entry device.

**VFO** Variable-frequency oscillator.

**VFOP** Visual flight [rules] operations panel.

**VFR** Visual flight rules, G adds Group.

**VfR** Verein für Raumfahrt, society for space travel (G).

**VFR-OT, VFR/OT** VFR on top.

**V<sub>frr</sub>** Becoming used for “take-off failure recognition and reaction”.

**VFSG** Variable-frequency starter/generator.

**VFSS** Variable-frequency selection system.

**VFTO**  $V_1$  for flexible take-off, factored for full power in event of one engine failure at reduced rating.

**VFW** Veterans of Foreign Wars (US).

**V<sub>FXR(R)</sub>** Maximum flap-retraction speed.

**V<sub>FXR(X)</sub>** Maximum flap-extension speed.

**VG** 1 Variable-geometry.

2 Vertical gyro.

3 Vortex generator.

4 See  $V_{GND}$ .

5 Airline pilots' association (G).

**Vg** 1 Geostrophic wind.

2 Gust design speed, usually  $V_B$ .

**V<sub>G</sub>** UK DefStan defines gust speed in two ways: on a V-n plot, intersection of  $C_{L_{max}}$  with  $20 \text{ ms}^{-1}$  gust, or  $V_{s1}(n_G+1)/2$  where  $n_G$  is the load factor resulting from penetrating a  $15.24 \text{ ms}^{-1}$  gust at maximum EAS.

**V<sub>g</sub>** Aircraft speed and normal acceleration; hence \* diagram, graphic plot of these parameters, \* recorder, primitive instrument recording speed and applied loading in vertical (very rarely in other) plane.

**VGA** 1 Variable graphics array.

2 Video graphics array,  $640 \times 480$  pixels.

3 Video graphics adapter.

**VG/DG** Vertical gyro/directional gyro.

**VGG** Visual graphics generator.

**Vgh** Aircraft speed, vertical acceleration and height; hence \* recorder, continuous recording of these parameters on wire or tape.

**VGI** Vertical gyro instrument.

**VGK** 1 Supreme military command (USSR, R)

2 A CFD method (Fortran) for predicting characteristics of a 2-D single-element aerofoil.

**V<sub>GND</sub>** Velocity relative to the ground, suggest usually = G/S.

**VGPO** Velocity-gate pull-off.

**V<sub>grad</sub>** Gradient wind.

**VGS** 1 Velocity-gate steal; usually synonymous with VGPO.

2 Volunteer Gliding School[s] (UK ATC, now Air Cadets).

3 Video guidance sensor.

4 Visual guidance system.

**VGT** Gas-turbine association (Netherlands).

**VGTD** Gas-turbine APU (R).

**VH** 1 Designation, very heavy aircraft or unit (SAC, formerly).

2 Or  $V_H$ , velocity hold.

**V<sub>H</sub>** 1 Maximum speed in level flight with maximum continuous power; little used outside US. Definition should add that H = high altitude; this power at medium/low FLs would usually exceed  $V_{DF}$ .

2 Now also taken to mean maximum speed in horizontal flight.

**V/H** Velocity/height ratio [in compatible units] in taking reconnaissance imagery and in sensor design ( $M0.9/200 \text{ ft}$  gives \* = 5).

**V<sub>h</sub>** 1 Hump speed.

2 Volume ration of horizontal tail.

3 Helicopter hover induced velocity.

**VHDL** VHIC hardware design [or description or descriptive] language.

**v.h.f., VHF** Very high frequency, see Appendix 2; /DF, adds direction finder; /DL, data-link; /PTN = radio link to public-telephone network.

**v.h.f. omni-range** See **VOR**.

**VHFRT** V.h.f. R/T.

**VHL** Very high level (software language).

**VHMS** Vehicle health-management system[s].

**VHPIC** Very-high performance (or power) integrated circuit.

**VHRR** Very-high-resolution radiometer.

**VHS** Very high speed [electronics].

**VHSIC** Very-high-speed integrated circuit; Si or SOS, then GaAs, two to three orders of magnitude faster than MSI/LSI; -2 adds Phase 2.

**V<sub>HW</sub>, V<sub>hw</sub>** Headwind [head-on component].

**VI** 1 Visual identification mode.

2 Viscosity index.

3 Video interface.

4 Variable-intensity (eights).

5 Heading [course] to intercept.

6 Association of Flemish Engineers [B-3500 Hasselt] (Belgium).

**Vi** 1 IAS (not ASIR).

2 EAS.

3 Velocity induced by winglet, normally inwards normal to direction of flight. Note: winglet lift has a useful thrust component.

4 Propeller induced velocity, made up of vector sum of  $V\theta i$  and  $Vxi$ .

5 Mean velocity of air entering jet-engine inlet.

**VIA** Versatile integrated avionics.

**VIAM** All-union (research) institute for aviation materials (USSR).

**Viapure** Optical-grade polyurethane interlayer material.

**VIAS** Indicated airspeed.

**VIB** Vibration.

**vibrating voltage regulator** Controller of d.c. machines which uses vibrating points to sense voltage and adjust resistance controlling field current.

**vibration indicator** Instrument or sensor for either recording or indicating mechanical vibration either remote from crew or of too high a frequency to be obvious, esp. emanating from turbine engines. Modern turbofan engines are fitted with crystal transmitters whose signals are filtered to pinpoint the source.

**vibration isolator** See **isolator**.

**vibration meter** Instrument for recording vibration frequency; very rarely either amplitude or acceleration in addition.

**vibration mode** Most physical objects, from wings to quartz crystals, can vibrate at a fundamental mode having lowest frequency, or (depending on dimensions, mounting, impressed forces, coupling and other factors) at any of numerous modes having different visual pattern and higher frequency. Fundamental mode usually longitudinal over length or thickness, flexural over width or thickness, and shear over thickness or face.

**vibrator** 1 Mechanical source of high-power sinusoidal vibration for test purposes; also called vibration generator.

2 Rapid-action switch for alternately reversing polarity of transformer primary fed from d.c. to give raw a.c. output; also called vibrator converter.

**vibratory torque control** Mechanical coupling for rotary output, eg from piston engine, which at low rpm locks drive into hydraulically stiff configuration but at higher rpm unlocks and allows drive to be taken through slender quill shaft.

**vibrograph** Seismic instrument giving record of vibration displacement/time.

**vibro polishing** Immersion in a vat of small abrasive particles vibrated at a selected frequency.

**Vic, vic** Formation of aircraft all in same horizontal plane having shape of V flying point-first; minimum number of aircraft 3.

**vicious cycling** Standard maintenance procedure for Ni/Cd battery in which charge is violently drained and replaced; also called deep cycling.

**Vickers pyramid** Hardness testing machine in which precise force drives pyramid-point diamond into specimen, hence \* Number = measure of surface hardness.

**Vicon** Visual confirmation (of voice instruction or clearance, especially to take off).

**Victor airway** Airway linking VORs, thus virtually all airways in US and many other countries; identified by prefix V (from 1952).

**victory roll** Flambouyant barrel roll performed at low level over a fighter pilot's home airfield to indicate at least one air-combat victory on that mission.

**VID** 1 Visual identification, or VID required.

2 Virtual (confusingly, also visual) image display.

**Vidap, VIDAP** Voluntary Industry Distributor Accreditation Program [2003–, monitors electronics industry] (US).

**video** Generalized adjective or noun for electronic transmission of visual information.

**video compression** Returning of video from primary radar so that each radial trace is briefly stored and then written more quickly; this allows time for cursive writing of synthetic data.

**video detector** Diode which demodulates video signal.

**video display** Electronic display which, whether or not it presents alphanumerics, symbology and other information, presents pictures.

**video extractor** System for analysing all signals, selecting all that form part of useful image (eg in TV or radar) and excluding all others; in SSR usually synonymous with plot extractor.

**video link** Telecom system conveying pictorial information.

**video map(ping)** Superimposition on radar display of fixed information or picture, usually derived from fine-grain photo plate scanned in synchronization with rotation of radar aerial or from computer memory, eg in

GCA to show exact relationship of aircraft to surface obstructions.

**video signal** Telecom signal conveying video information.

**Videotex** System of computerized self-service information terminals giving complete information (usually without charge) to all users, eg passengers at airports.

**vidicon** Most common form of video (TV) picture (camera) tube, in which light pattern is stored on photoconductive surface; this is then scanned by electron beam, which deposits electrons to neutralize charge and thus generate output signal.

**Vidissector** Modern form of pioneer Farnsworth camera tube; used in space TV surveillance (ITT).

**VIDS** Visual integrated [or information] display set [or system].

**VIE** Video image exploitation.

**Les Vieilles Racines** French association of aerospace pioneers and professionals.

**Les Vieilles Tiges** French association of pioneer pilots.

**Vierendeel** Girder (truss) comprising upper/lower chords and verticals, without diagonals or shear web, designed for flexure.

**view** Opinion; thus 'to take a dim \*' = to oppose or regret a decision or situation (RAF WW2).

**VIEWS, Views** 1 Vibration indicator early-warning system.

2 Virtual integrated EW simulator.

**VIF** Vertical integration facility (space launch vehicle).

**viff, VIFF** Vectoring in forward flight; pilot control of trajectory by direct control of propulsive thrust axis of jet-lift V/STOL aeroplane, selecting downwards for lift (normal acceleration) and forward of vertical for deceleration, thus performing combat manoeuvres unmatchable by any conventional aircraft. Hence verb to viff, viffing etc.

**Vigil** Vinten integrated IR linescan.

**Vigo pad** Small concrete pan preferably surrounded by concealing trees (STOVL).

**VIGV** Variable-incidence (or inlet or integral) guide vane[s].

**VII** Viscosity index improver.

**VIIRS** Visible/IR imaging radiometer suite.

**VIM** 1 Vacuum-induction melting.

2 Vendor information manual.

**VIMD** Speed (IAS) for minimum drag.

**VIMP** Speed (IAS) for minimum power, not necessarily same as above.

**Vi-mp** Speed corresponding with lowest power at which both height and speed can be maintained, ie minimum speed for continuous cruise (not current use).

**Vims** Visible and infra-red mapping spectrometer.

**V $\infty$**  V-infinity, ie free-stream velocity.

**V (Int)<sup>2</sup>** Vehicle integrated intelligence.

**vinyl ester** Low-viscosity solventless liquid resin used as alternative to epoxy in wet lay-up of FRC materials.

**VIO** Violent, meaning heavy static or other radio interference, normal code VLNT for other meanings.

**violet** Route(s) into and out from target area on colour radar.

**VIP** 1 Value improvement programme.

2 Common meaning, very important person.

3 Video integrated processor, or presentation (see next entry).

## VIP levels

- 4 Vehicle improvement programme.
- 5 Variable installation position (engines).
- 6 Voice over Internet protocol.
- 7 Verified identity pass (TSA).

**VIP levels** Those of video processor yielding weather echo intensity for precipitation, from \* 1 (weak) to \* 6 (extreme).

**VIPER, Viper** Vitreous improved-performance extreme removal.

**Viper** Video-input encoder.

**VIPPS** Visual-imaging pass-production system, controlling personnel access.

**virage** Tight turn (pre-WW1).

**virga** Streaks of water or ice particles falling from cloud but evaporating before reaching surface.

**virgin fibre** Continuous tow, long staple.

**VIRSS** Visual and IR sensor systems.

**virtual airline** Air carrier created only as legal entity to facilitate franchising agreement.

**virtual attrition** Reduction in offensive tasking, either by reducing overall numbers or by transfer of attack aircraft to support roles, made necessary by effectiveness of defences.

**virtual cockpit** One offering no natural external view, only displays from sensors.

**virtual collaborative engineering** Links users at remote locations into conference [eg, all can have input to a drawing].

**virtual gravity** Terrestrial acceleration acting on parcel of atmosphere, reduced by centrifugal force due to parcel's relative motion; symbol  $g^*$  = approx. 99.99% g.

**virtual height** Apparent height of ionized atmospheric layer calculated from time for radio pulse to complete vertical round trip.

**virtual image** One visible in mirror but not projectable on surface.

**virtual image display** Small CRT binocular colour high-resolution image of surface target, which appears to be 935 mm (36.9 in) behind face of magnifying lens.

**virtual inertia** That part of inertia forces acting on oscillating body due to surrounding fluid (eg air) and proportional to fluid density.

**virtual level** Energy level of subatomic nuclear system for which excitation energy exceeds lowest nuclear-particle dissociated energy.

**virtual manufacturing** Integration of available technologies to get right information to right people at right time to increase speed and accuracy of decisions.

**virtual mass** Actual mass plus apparent mass.

**virtual piston** Pumping effect caused by collapse of launch tube by explosive lens.

**virtual star** Created by laser illuminating diffuse sodium c100 km above Earth to give continuous readout of atmospheric distortion of telescope optics.

**virtual stress** See *Reynolds stress*.

**virtual temperature** Temperature parcel of air would have had it been entirely free of water vapour, symbol  $T_v = (1 + 0.61 q) T$  where T is measured temperature and q is specific humidity.

**virtual VFR** Combined enhanced and synthetic vision giving pilot apparent VFR view of the external world at all times.

**VIS** Voice-interactive subsystem.

**Vis** Lowest selectable airspeed.

## visibility meter

**vis** Invariably means visibility, but ambiguous.

**Visa** Vertically interconnected sensor array.

**Visac** Variable input speed alternating current.

**viscoelasticity** Behaviour of material which has hereditary or prior stress-history memory and exhibits viscous and delayed elastic response to stress superimposed on normal instantaneous elastic strain.

**viscosimeter** Instrument for measuring viscosity; Saybolt and Engler \* are simple calibrated containers with narrow orifice, result being obtained by timing run-off; accurate (absolute) \* include Stokes (falling speed of small sphere), rotating-cylinder (outer cylinder drives inner via fluid interface whose drive torque is measured), capillary tube (Poiseuille), and oscillating disc (parallel and close to plane surface).

**viscosity** 1 Dynamic \* can be considered internal friction in fluid; property which enables fluid to generate tangential forces and offer dissipative resistance to flow, defined as ratio of shear stress to strain; in air almost unaffected by pressure but increases with temperature. Symbol  $\mu$ ; unit  $\text{Ns/m}^2 = 1,000 \text{ cP}$ ; for air  $1.78593 \times 10^{-5} \text{ Ns/m}^2$  (in traditional units 3.73 slug/ft-s).

2 Kinematic \* is  $\mu/\rho$  where  $\rho$  is density; varies with pressure as well as temperature, units are  $\text{m}^2/\text{s} = 10^6 \text{ cSt}$ ;  $1 \text{ ft}^2 \text{ s}^{-1} = 0.092903 \text{ m}^2 \text{ s}^{-1} = 929.03 \text{ St}$ . Also called dynamic \*. Symbol v.

**viscosity coefficient** Synonymous with viscosity.

**viscosity index** Usually synonymous with viscosity, or its variation with temperature.

**viscosity-index improver** Long-chain waxy polymer[s] which stay thick at elevated temperatures.

**viscosity manometer** Instrument for measuring very low fluid pressure by torque exerted on disc suspended on quartz fibre very close to spinning disc; examples are Dushman and Langmuir gauges.

**viscosity valve** Liquid-system control valve controlled by viscosity of medium, eg in bypassing lube-oil cooler.

**viscous aquaplaning** Occurs when the runway is merely damp, with a water film not penetrated by tyres; important on smooth surfaces, especially coated with deposited tyre rubber; persists to low speeds.

**viscous damping** Energy dissipation in vibrating system in which motion is opposed by force proportional to relative velocity.

**viscous flow** Flow in which viscosity is important; can be laminar or turbulent but criterion is that smallest cross-section of flow must be very large in relation to mean free path. At very low R inertia becomes unimportant and flow is governed by Stokes equations.

**viscous fluid** One in which viscosity is significant.

**viscous force** Force per unit mass or volume due to tangential shear in fluid.

**viscous stress** Fluid shear stress, symbol  $\tau = \mu du/dy$  (Newton's law) where u is velocity distant y from surface or other reference layer.

**Visgard** Polyurethane conductive coating for transparencies, anti-fog, anti-scratch, anti-static.

**visibility** Distance at which large dark object can just be seen against horizon sky in daylight (DoD, NATO, see *RVR, RVV*).

**visibility meter** Instrument for measurement of visibility, visual range, eg telephotometer, transmissometer, nephelometer etc.

**visibility prevailing** Distance at which known fixed objects can be seen round at least half horizon.

**visibility value** Distance (see visibility) along runway, in miles and tenths.

**visible horizon** Circle around observer where Earth and sky appear to meet (USAF). Also called natural horizon.

**visible light** EM radiation to which human eye responds, typically with wavelength from 400 to 700 nm, 0.4 to 0.7  $\mu$ .

**visible line** Full line on drawing representing a line visible in assembled subject item.

**visible radiation** See *visible light*.

**visible spectrum** See *visible light*.

**visionics** Collective term for optical and electronic devices, operating at many EM wavelengths, which enhance human vision, especially at night and in bad weather or smoke or other adverse conditions.

**vision-in-turn window** Eyebrow window in roof of flight deck or cockpit.

**visitor** Person entering a foreign state for period less than three months.

**Vismir** Visible to medium infra-red.

**Visol** Butyl ether + 15% aniline; rocket fuel with Salbei (G).

**visor** 1 Pivoting or translating fairing for forward-facing cockpit windows of supersonic or hypersonic aircraft, in latter case with thermal-protection coating.

2 Hinged screen, transparent clear or tinted, protecting eyes against solar radiation and/or micrometeorites in space exploration.

**Visrep** Visual report by reconnaissance pilot.

**VISSR** Visible IR spin/scan radiometry (or radiometer).

**Vis-STAR** Vision-based software for track, altitude and range [or ranging].

**Vista** 1 Very intelligent surveillance and target acquisition.

2 Variable-stability inflight-simulator test aircraft.

3 Virtual integrated software testbed for avionics.

4 Visual imagery simulation training aid.

**Visual** Visual imaging system for approach and landing, based on a 3.5- $\mu$  Flir.

**visual** See *visual contact*.

**visual acuity** Human ability to see clearly, as tested by letter card.

**visual approach** Landing approach conducted by visual reference to surface, esp. by aircraft on IFR flightplan having received authorization.

**visual approach path indicator** Simple Vasi for private pilots with red/amber/green sectors (Lockheed-Georgia).

**visual approach slope indicator** Systems of visible lights arranged in pattern at landing end of runway providing descent (and limited lateral guidance) information. Basic \* comprises downwind and upwind bars each of three lights on each side of runway (in US, total of 2, 4 or 12), each light projecting red lower segment and white upper. When correctly on glidepath, as close as possible to ILS glidepath, pilot sees pink. For long or LEW aircraft extra light bars are added in 3-bar \*, 3-bar Avasi, T-Vasi and AT-Vasi. FAA-adopted 1970.

**visual arrow** Modern equivalent of finger four (*fingertip*), too tight for tactical use but common on recovery to airfield.

**visual/aural range** See *VAR*.

**visual contact** To catch sight of, or a sudden good view of, target or Earth's surface.

**visual cue** Visual contact of object outside vehicle, esp. Earth, sufficient to give pilot orientation and position information; eg first glimpse of ground through cloud during letdown in remote place far from electronic aids.

**visual descent point** Optional point on final approach course of non-precision landing, identified by a navaid, from which VASI should be visible.

**visual envelope** Plot of flight-deck window areas showing range of P1 vision.

**Visual Flight Operations Panel** Permanently reviews what is permissible in each class of airspace (ICAO).

**visual flight rules** Those rules as prescribed by national authority for visual flight, with corresponding relaxed requirements for flight instruments, radio etc; in US typically demands flight visibility not less than 3 st. miles (1 outside controlled airspace) with specified distances from any clouds; \* *on top* gives a VFR clearance to an IFR flight above the weather or cloud.

**visual head-up image** Imagery created outside simulator, focused at infinity; alternative or addition to terrain model or CGI.

**visual hold[ing]** Over fixed feature easily recognized from altitude.

**visual identification** Control (ATC) mode in which aircraft follows radar target and is automatically positioned to allow visual identification (NESN); ie interceptor pilot looks at other aircraft and, if possible, identifies type and registration or other identity.

**visualization** Making fluid flow visible, eg by injection of carbon tetrachloride or other liquid, smoke, tufting, schlieren, spark photo, hot wire, china clay on surface, liquid films etc.

**visually coupled** Night/all-weather sensor(s) are slaved to pilot's helmet-mounted system, so pilot appears to 'see' normally (field of regard and FOV impose limitations).

**Visually Coupled System** Specific system linked with Tiara, providing monochromatic overlain with aircraft performance data, on pilot's HMD.

**visual meteorological conditions** Generally UK counterpart to VFR, requiring visibility 5+ miles and 1,000 ft vertical and 1 n.m. horizontal from any cloud [variations if a/c below 3,000 ft a.m.s.l.].

**visual/optical countermeasures** Those directed against human eyesight, ranging from reduction of night adaptation to blinding.

**visual photometry** Luminous intensity judged by eye.

**visual range** Distance under day conditions at which apparent contrast between specified target and background becomes equal to contrast threshold of observer (there is also night \*) (see *RVR*, *RVV*).

**visual reference** Earth's surface, esp. that clearly identified and thus giving geographical position as well as attitude and orientation guidance, used as reference in controlling flight trajectory, if necessary down to touchdown.

**visual report** Identical to hot report but based solely on aircrew observations; answers specific questions concerning target for which sortie was flown (ASCC). (ASCC adds 'not to be confused with inflight report', while DoD states 'not to be used; use inflight report').

**visuals** Lifelike scenes viewed through windows of simulator, almost always wholly synthetic and computer-

generated (but in old simulators achieved by optics moved over a large model).

**visual separation** Basic method of avoiding collisions in TMAs or on ground by seeing and avoiding; normally involves conflicts between arrivals and departures and can be accomplished by pilot action or tower instruction.

**VIT** Vision in turn.

**vital actions** Rigorously learned sequences instilled into all pilots, either specific to type or, more often, as general good airmanship; necessary eg before entering aircraft, upon entering cockpit, on starting engine, before taxiing, before takeoff, etc. On simple aircraft generally remembered by mnemonics, eg Bumpf (check brakes, u/c, mixture, pitch, flaps) or HTMPFFG (hood/harness, trim/throttle friction, mixture, pitch, fuel cocks, flaps, gills/gyros).

**vital area** Designated area or installation to be defended by air-defense units (DoD).

**vital items** See *essential items*.

**VITC** Vertical-interval time code.

**Vitreloy** Dense 'metallic glass' (proprietary, Howmet).

**vitrifying** Transformation of ceramic from crystalline phase into amorphous or glassy state.

**Vitro-Lube** Ceramic-bonded dry-film lubricant with wide temperature range.

**VITS** 1 Video-image tracking system.

2 Virtual integrated training system.

**VIU** 1 Video interface unit.

2 Voloclub Italiano Ultraleggeri [ultralight builders; office I-20123 Milan] (Italy).

**Vivid** Video verification and identification.

**V<sub>J</sub>** Velocity of propulsive jet, normally measured relative to vehicle.

**VKIFD** Von Kármán Institute for Fluid Dynamics (Int.).

**VKS** Military space force[s] (R).

**VL** 1 Vertical landing, or lift, or launch.

2 Tunnel velocity  $\times$  characteristic model length.

**V/L** VOR/localizer.

**VL** Relative velocity of flow on underside of aerofoil.

**VLA** 1 Very light aircraft.

2 Very large aircraft.

3 Vertical line array.

4 Variable lever arm (flight-control ratio changer).

**VLAAS** Vertical-launch autonomous attack system.

**VLAC** Vertical-Lift Aircraft Council (US Aerospace Industries Association).

**VLAD** Vertical line-array Difar.

**Vladimir** Very-large-array demonstration imager for IR.

**VLAR** Vertical [altitude] launch and recovery.

**VLBI** Very long baseline interferometry.

**VLBTI** Very-long-burning target indicator.

**VLC** Very low clearance.

**VLCHV** Very low cost harrassment vehicle.

**V<sup>L</sup>/<sub>D</sub>, V<sup>l</sup>/<sub>d</sub>** Best lift/drag speed.

**VLE** Virtual learning environment.

**V<sub>LE</sub>** Maximum speed with landing gear extended and locked; flight manual specifies whether main gear only or all units. Always significantly higher than  $V_E$  values.

**VLEA** Very-long-endurance aircraft, powered by solar cells charging fuel cell(s) for continuous flight of months or years.

**VLED** Visible LED.

**VLES** Very large eddy simulation.

**VLF** Vectored-lift fighter; also see next.

**v.l.f.** Very low frequency. See Appendix 2.

**v.l.f. Omega** Global system of long-range navigation using v.l.f. radio.

**V<sub>LG</sub>** No longer used; was vague maximum landing-gear speed, now replaced by  $V_{EI}$ ,  $V_{LE}$ .

**VLJ** Very light jet [being defined from 2004].

**VLNT** Violent.

**VLO** 1 US term, maximum speed for landing-gear operation; synonymous with UK  $V_E$ .

2 Confusingly, also used to mean lift-off speed, in other words  $V_2$ .

**V<sub>LOF</sub>** Lift-off speed, at which aeroplane becomes airborne; suggest =  $V_T$ .

**VLR** 1 Very long range [1942–45, ranges today considered modest].

2 Telecom code for long-range search/rescue aircraft.

3 Velocity/length Reynolds number.

4 Very light rotorcraft.

**VLS** 1 Visible light sensor.

2 Vertical launch system.

3 Veiculo Lancador de Satelites (Brazil).

**VLSI** Very-large-scale integration.

**VLSIC** Very-large-scale integrated circuit.

**VLSIPA** Very-large-scale integration photonics architecture.

**VLTA** Very-large transport aircraft.

**VLV** Valve.

**VLY** 1 Volley.

2 Valley.

**VM, v.m.** 1 Velocity modulation.

2 Voltmeter (also  $V/M$ ).

3 Voter/monitor (also  $V/M$ ).

4 Visual [target] marker.

5 Heading to a manual termination.

**V<sub>M</sub>** 1 Speed at which precipitation (esp. slush) drag is maximum; always well below aquaplaning speed.

2 Design speed for bird-strike.

**V<sub>m</sub>** 1 Volume fraction of composite material occupied by matrix.

2 Missile velocity.

**V/M** See VM(2), (3).

**VMA** Code, fixed-wing attack squadron (USMC).

**VMAD** 1 Vertically mounted accessory drive.

2 Video-motion anomaly detection.

**V<sub>max</sub>** Maximum CAS for clean aircraft.

**VMC** 1 Visual meteorological conditions.

2 Vehicle management computer.

**V<sub>MC</sub>** Minimum-control speed; more precisely specified as following three entries:

**V<sub>MCA</sub>** Minimum speed at which aeroplane can be controlled in air; defined as limiting speed above which it is possible to climb away with not more than 5° bank and with yaw arrested after suffering failure of critical engine in takeoff configuration, with engine windmilling and c.g. at aft limit. There are usually suggested limits of required rudder-pedal force and on absolute value of \*.

**V<sub>MCG</sub>** Minimum speed at which aeroplane can be controlled on ground; defined as that above which pilot can maintain directional control after failure of critical engine without applying more than 70 kg pedal force,

## **V<sub>MCL</sub>**

without going off runway and if possible while holding centreline, with 7+ kt crosswind and wet surface.

**V<sub>MCL</sub>** Minimum speed at which aeroplane can be controlled in the air in landing configuration, while applying maximum possible variations of power on remaining engine[s] after failure of critical engine.

**VMCL2** As above but with any two engines inoperative.

**V<sub>MC</sub>** Speed, usually EAS, at maximum continuous power in level flight; V<sub>H</sub> is more commonly used.

**V<sub>MD</sub>** Maximum permitted diving speed.

**VMDI** Vector miss-distance indicator.

**VME** 1 Virtual memory environment.

2 V.h.f. management entity [bus].

3 VersaModule Eurocard [bus].

**V<sub>ME</sub>** Airspeed of sailplane for maximum endurance.

**VMECC** Versa module Eurocard card cage.

**VMEP** Vibration management enhancement program[me].

**VMF** 1 Code, fixed-wing fighter squadron (USMC).

2 Navy (USSR, R).

3 Variable message format.

**VMFA** Code, fixed-wing fighter/attack squadron (USMC).

**V<sub>MG</sub>** Vertical main landing gear strut load at MRW and with full aft c.g.

**V<sub>min</sub>** Minimum CAS for basic clean aircraft.

**V<sub>M(LO)</sub>** Minimum maneuver speed (US).

**VMM** 1 Veille Météorologique Mondiale = World Weather Watch.

2 Vehicle management module.

**VM3, VM<sup>3</sup>, VMMM** Versatile mass media memory, 4 RTMMs.

**VMO** Variable metering orifice.

**V<sub>MO</sub>** Maximum permitted operating speed under any condition, higher than V<sub>NE</sub> and less than V<sub>DF</sub> but latter is wholly exceptional limit not intended to be reached except during certification flying.

**VMOS** Virtual machine operating system.

**V<sub>mp</sub>** Helicopter speed for minimum power.

**V<sub>mr</sub>** Helicopter speed for maximum range.

**VMS** 1 Vehicle management system.

2 Vehicle monitoring system (robotics).

3 Vertical motion simulator.

4 Vehicle motion sensor.

5 Variable metering sleeve.

**V<sub>MS</sub>** 1 Minimum EAS observed during normal symmetric stall, usually less than V<sub>s</sub>.

2 Airspeed for minimum sink rate in gliding flight.

**VMTI** Video moving-target indicator.

**VMU** 1 Voice management [or message] unit.

2 Velocity measurement unit.

3 Marine Air Group (USMC).

**V<sub>MU</sub>** Minimum demonstrated unstick speed, at which with all engines operating, and without regard to safety, noise-abatement or any other factor, aeroplane will leave ground and hold positive climb. According to Airbus, "vitesse minimum unstick".

**VN** 1 Speed multiplied by (or plotted against) normal acceleration; more commonly V-n.

2 Vinyl/nitrile (PVC nitrile-based rubber).

**V<sub>n</sub>** Component of wind acting perpendicular to heading; also called normal wind, normal component or (loosely) crosswind component.

**V-n** Flight speed (usually EAS) multiplied by or plotted

## **voice frequency**

against normal acceleration; hence \* diagram, of which two forms; basic manoeuvring envelope and basic gust envelope.

**V<sub>NA</sub>** Noise-abatement climb speed, usually synonymous with V<sub>4</sub> (1st segment) but also commonly used for 4th segment Fuss.

**V-Nav, VNAV, V/NAV** Vertical navigation; generalized topic of control of flight trajectory in vertical plane; now becoming automatic in transport-aircraft energy-managing flight systems. In a specific system, an add-on to LNAV giving glideslope guidance down to 350 ft AGL (WAAS).

**V<sub>NE</sub>** Never-exceed speed; an exceptional permitted maximum beyond V<sub>MO</sub> of which captain may avail himself in unusual circumstances. Implication is that \* must be reported and explained.

**VNII** All-union research institute [EM adds electro-mechanics, RA radio engineering] (R).

**V90** Category of off-base airstrips usable by fighters (Sweden).

**VNIR** Visible to near-IR.

**V<sub>NO</sub>** Maximum permitted normal-operating speed, generally replaced by V<sub>MO</sub>; in smooth air can be exceeded 'with caution'.

**VNR** V.h.f. navigation receiver.

**VNRT** Very near real time.

**VNTSC** Volpe National Transportation Systems Center (US DoT).

**VNV** ALPA (Netherlands).

**VO** 1 Visual optics.

2 US piston engine code, vertical crankshaft, opposed.

**V<sub>o</sub>** Operational speed (airspeed in FCS calculations).

**VOA** 1 Velocity of arrival.

2 Vsesoyuznoe Obshestvo Aviastroitelei (aeronautical society, USSR, R).

3 Volatile organic analyser.

**VOB** Vacuum optical bench.

**VOC** 1 Validation of concept.

2 Visual optical countermeasures.

3 Volatile organic compound[s].

**V<sub>oc</sub>** Obstacle-clearance speed.

**Vocational Tax relief** Granted by Inland Revenue against cost of some commercial-pilot training (UK).

**Vocoder** Voice coder; device responding to spoken input (usually previously stored) to generate synthetic speech output.

**VOCRAD** Voice radio.

**VOCS** Voice-operated carrier suppressor.

**VOD** 1 Vertical-on-board delivery; usually synonymous with vertrep.

2 Vertical obstruction data.

3 Video on demand.

**Voder** Device with keyboard input controlling generation of electronic sounds, esp. synthetic speech output.

**VODR** Has been used to mean VOR.

**VOF** Volume of fluid.

**VÖFVL** Verband Österreichischer Flugverkehrsleiter (Austria).

**Vogad** Voice-operated gain-adjusting device; auto volume compressor or expander.

**Voice** Voice optimal interrogator (USN).

**voice frequency** Normally taken as 25 Hz to 3 kHz for telecommunications, much greater range for hi-fi.

## voice-grade channel

**voice-grade channel** Covers about 300–3,000 Hz, for speech, analog, digital or facsimile.

**voice keying** System enabling telecommunications to use common R/T transmit and receive sites and similar frequencies but with voice-operated carrier suppressor and delay network to switch outgoing signal to transmitter and incoming to receiver. Remote stations normally switch automatically to receive mode except when user is speaking.

**voiceless homing** Any electronic homing system not using speech; traditionally meant radio range (arch.).

**voice message unit** Software-controlled system providing voice or tone warnings of faults, sensor activity and other occurrences.

**voice-operated relay** See *voice keying*.

**voice rotating beacon** Short-range radio navaid transmitting stored-speech headings (usually QDMs) which differ from 000° round to 359°; a form of talking VOR, also called talking beacon, abb. VRB (arch.).

**void** Undesired gap in welded joint.

**void fraction** 1 Percentage of total frontal area of jet engine through which airflow passes.

2 Also several meanings in composite materials and structures.

**Voigt effect** Double refraction (associated with Zeeman) of light passing through vapour perpendicular to strong magnetic field.

**VoIP** Voice over Internet Protocol.

**VOIR** Venus-orbiting imaging radar.

**Voiska-PVO** Troops of air defence of homeland (USSR, R).

**Voispond** Proposed Calsel function that would automatically identify an aircraft by a voice recording.

**VOL** 1 Vertical on-board landing.

2 Volume.

**volatile** 1 EDP (1) memory which dissipates stored information when electrical power is switched off; thus, next morning or after weekend all bits must be restored before computer operation. Also means electrical transients cause corruption (though this may be only temporary). Hence \* data, \* memory, volatility.

2 Having high *vapour pressure*, and thus low boiling or subliming temperature at SL pressure; hence volatility.

**volcano early warning system** This would warn air-traffic control centres within five minutes of the start of an ash-producing eruption (US Geological Survey).

**vol à voile(s)** Gliding, soaring (F).

**vol d'abeille** Beeline, straight-line distance (F).

**Volmet** Routine ground-to-air broadcast of meteorological information (ICAO). Today such broadcasts are Metars and apply to a designated list of airfields.

**Volocan** Radar tracking/computing of flight paths to solve stacking problems (USAF 1953).

**vol piqué** Dive (F).

**vol plané** Planing (inclined) flight, ie glide by powered aeroplane (arch. except in F).

**volt** SI unit of EMF, = W/A.

**voltage amplifier** Delivers small current to high impedance to obtain voltage gain.

**voltage-dependent resistor** Ohms = f(V); resistance varies directly with applied voltage.

**voltage drop** PD across any impedance carrying current.

**voltage-fed aerial (antenna)** Fed from one end, where signal potential is maximum.

## Vorloc, VOR/Loc

**voltage gain** Ratio of output/input voltages.

**voltage standing-wave ratio** Ratio maximum/minimum V along waveguide or coaxial.

**volt-ampere** SI unit of alternating-current power, symbol S, made up of power component P watts and reactive component Q;  $S = \sqrt{P^2 + Q^2}$ ; see *power factor*.

**voltmeter** Instrument for measuring potential difference, ie V.

**volume** SI unit is  $m^3$  (conversion factors for non-SI measures, from  $ft^3 \times 0.02831684$ , UK gal  $\times 0.004546087$  and US gal  $\times 0.003895411$ ); litre ( $dm^3$ ) =  $0.035287 ft^3 = 60.9756 in^3$ ;  $cm^3$  (cc) =  $0.06102 in^3$ ; UK gal [Imp. gal] =  $1.20095$  US gal; US gal =  $0.83267$  UK gal.

**volume fraction** 1 Proportion, usually %, of reinforced composite (FRP) occupied by reinforcing fibres.

2 Generally, proportion of whole volume occupied by particular substance.

3 For aerostats see *air* \*, *gas* \*.

**volumetric efficiency** Volume of combustible mixture (in diesel, air) actually drawn into cylinder of piston engine on each operating cycle divided by capacity (swept volume) of cylinder, usually expressed as %. Symbol  $\eta_v$  or  $e_v$ .

**volumetric loading** Also called \* density, total volume of solid rocket motor propellant divided by total volume of unloaded case, usually expressed as %. Symbol  $\lambda$ .

**volume unit** Measure of audio volume to be outputted by electrical current, expressed in dB equal to ratio of magnitude of electrical waves to magnitude of reference volume, usually 1 mW; abb. VU.

**volute** Spiral or planar helix; thus, spiral casing of centrifugal compressor or supercharger impeller.

**Vom** Volts/ohms/milliamps tester.

**Vomit Comet** Aircraft, e.g. KC-135, used for zero-gravity tests.

**Von Brand** Standard method of measuring jet smoke by passing measured gas volume through filter and then recording intensity of calibrated light reflected by filter pad. Gives quantified measure of particulate matter trapped by chosen filter. Hence \* scale for visible smoke.

**von Kármán street** See *street* (also called Kármán street).

**VOP** Variation of price.

**VOR** V.h.f. omnidirectional radio range, announced by RCA in 1941 and forced through by US in 1959 to become universal global [except USSR] radio navaid. Comprises fixed beacon emitting fixed circular horizontal radiation pattern at 108–118MHz on which is superimposed rotating directional pattern at 30 Hz giving output whose phase modulation is unique for each bearing from beacon. Thus airborne station can read from panel instrument bearing of aircraft from station, called inbound or outbound radial. Each fixed station identified by three-letter keyed intermittent transmission (sometimes voice). See Doppler \*.

**VOR/DME** VOR steering guidance with DME distance information.

**Vorgen** Voltage generator.

**VOR/ILS** Linkage of VOR signals to aircraft ILS so that left/right steering guidance is given by ILS panel instrument. Latter often called \* deviation indicator, or Vorloc.

**Vorloc, VOR/Loc** Panel instrument giving steering guidance from received VOR signals; can be complete ILS

indicator or (esp. in light aircraft) simple VOR receiver with localizer needle only.

**VORMB, VOR/MB** VOR marker beacon.

**Vormet** Sends scripted pilot's weather reports to overflying aircraft.

**Vorpostenboot** Flakship (G).

**Vortac** Combination of VOR and Tacan (occasionally written VOR/TAC) offering from one fixed station VOR az, Tacan az and Tacan (DME) distance information; ident codes prove VOR and Tacan signals are both from same fixed station. Normally \* is end-product of trying to integrate civil (VOR/DME) with military (Tacan) nav aids, latter being u.h.f. and therefore inherently incompatible.

**vortex** Fluid in rotational motion (possessing vorticity), eg streamed behind wingtip or across leading edge of slender delta. See line \*, point \*, trailing \*.

**vortex breakdown** Sudden separation of large vortex from leading edge of slender delta (naturally followed by its decay) at particular AOA (higher than stalling AOA for most wings); essentially represents stall of slender-delta wing.

**vortex burst** See *vortex breakdown*.

**vortex dissipator** Bleed-air jet(s) blown down below and ahead of jet-engine inlet to prevent ingestion of material from unpaved airfields or contaminated runways.

**vortex drag** Drag caused by vortex formation; not normally a recognized part of aircraft drag.

**vortex filament** Line along which intense (theoretically infinite, at  $R = 0$ ) vorticity is concentrated; either closed loop or extending to infinity.

**vortex flap** Hinged along its leading edge just behind leading edge of wing on upper surface. Opened to 45° traps vortex to increase lift.

**vortex flow** Fluid flow combining rotation with translational motion.

**vortex generator** Small flat blade perpendicular to skin of aircraft or other body set at angle to airflow to cause vortex which stirs boundary layer, usually to increase relative speed of boundary layer and keep it attached to surface; also called turbulator.

**vortex hazard** Danger to aircraft, esp. light aircraft, from powerful vortices trailed behind wingtips of large aircraft; also called wake hazard, wake turbulence.

**vortex lift** Lift generated by slender delta or similar wing having sharp, acutely swept leading edge (subsonic relative velocity normal to leading edge): large and powerful vortex is shed evenly on left/right wings, adding major non-linear increment to lift; also postpones stall to lower speed and extreme AOA, but with high drag.

**vortex line** Line whose direction at every point coincides with rotation vector, all of whose tangents are parallel with local direction of vorticity. Must be closed curve or extend to infinity, or to edge of fluid or to a point on an infinitely intense vortex sheet.

**vortex panel** A hypothetical treatment of aerofoil circulation by dividing the flow into a series of nodes on the surface.

**vortex ring** Vortex forming closed ring (eg smoke ring); collar vortex, and formed by helicopter as it slows to the hover.

**vortex-ring state** Operating state of rotorcraft (esp. helicopter) main rotor in which direction of flow through rotor is in opposite sense to relative vertical flow outside

rotor disc and opposite to rotor thrust. Occurs in autorotative landing, and can occur with rotor under power if rate of descent equals rotor downwash velocity.

**vortex separation** Filtration of different types of particle from fluid by different centrifugal forces in vortex motion.

**vortex sheet** Theoretical infinitely thin layer of fluid characterized by infinite vorticity; in practice layer of finite thickness formed by large number of small vortices, eg as trailed behind lifting wing (where much of vorticity is quickly rolled up into two large tip vortices).

**vortex street** See *street*.

**vortex strength** Circulation round any body or other closed system, symbol  $\Gamma$ , constant at all points on a vortex filament.

**vortex trail** Visible (white) trail from wingtip, propeller tip etc, caused by intense vortex.

**vortex tube** Device devoid of moving parts in which pressure difference induces fluid flow through tangential slots into tube; violent vortex divides flow into surrounding warm flow and cold (about 40°C cooler) core.

**vortex turbine** Mounted in optimum location at wingtip to extract power from tip vortex.

**vorticity** Vector measure of local rotation in fluid; in uniformly rotating fluid proportional to angular velocity (in UK, exactly defined as twice angular velocity). Symbol  $q$  [some authorities use  $\Omega$ ] =  $\nabla \times V$  where  $\nabla$  is del (mathematical operator) and  $V$  is vector velocity ( $\circ$  curl  $V$  in US; often called rot.  $V$ , from rotation, in Europe).

**vorticity component** Circulation around elementary surface normal to direction of vorticity divided by area of surface; more strictly, limit of circulation as area of element approaches zero.

**vortillon** Name coined by McDonnell Douglas to describe fence around underside of DC-9 wing leading edge controlling boundary-layer direction.

**VORW** VOR without voice.

**VOS** 1 Velocity of sound.

2 Voice-operated switch.

**VOT, Vot** VOR test signal; ground facility for testing accuracy of VOR receivers.

**voter** Binary logic element or device which compares signal condition in two or more channels and changes state whenever a predetermined signal mismatch occurs, usually to exclude a minority 'outvoted' signal. Also called a \* monitor.

**voter threshold** Difference between signals at which voter is switched or triggered; normally difference between one selected signal and mid-value signal from all others in parallel system.

**voting system** System in which outputs of several parallel channels are sensed and compared by voter so that any single malfunctioning channel may be excluded.

**Votol, VOTOL** Vertical-only take-off and landing.

**VOWS, Vows** Valuation of weight saved; measure of financial reward (usually in increased annual earning power) from cutting each unit of mass (kg or lb) from empty weight; eg VOWS for Concorde in 1974 currency was £50/lb.

**VOX** Vanadium oxide.

**VOX** See *Vox*.

**Vox** Voice (communication, keying or activation).

**VP** 1 Variable-pitch.

2 Code: fixed-wing patrol squadron (USN); suffix B adds bomber.

3 Vector processor.  
 4 Video processor.  
 5 Combat helicopter regiment (R).  
 6 Validation parameter.

**V/P** Vehicle or personnel deviation, any action that violates FARs.

**V<sub>p</sub>** 1 Propellant volume; that volume occupied by solid propellant in a rocket motor.  
 2 Propwash velocity, V + v.

**v.p.** Vapour pressure.

**VPAC** Vapour-phase aluminide coating.

**V<sub>path</sub>** Vertical path.

**VPC** Vertical-path computer.

**VPD** Virtual product design.

**VPDS** Variable public display system.

**V%** Best angle-of-climb speed (UK usage, US = Vx).

**V%SE** Best angle-of-climb speed, single-engine (UK).

**V<sub>peri</sub>** Perigee velocity, maximum speed of satellite  
 $= \sqrt{K \frac{2}{r_o} - \frac{1}{a}}$  where K is constant, r<sub>o</sub> is distance to centre of primary and a is semi-axis of elliptical orbit.

**VPI** 1 Vapour-phase inhibitor.  
 2 Vertical-position indicator.

**VPM** Virtual product management, or model.

**vpm, v.p.m.** Vibrations per minute.

**VPN** 1 Vickers pyramid number.  
 2 Variable primary nozzle.  
 3 Virtual private network.  
 4 Vendor part number.

**VPP** Voluntary Protection Program (OSHA).

**VPR** Voice position report.

**VPS** Vacuum plasma spray.

**VPTAR** See *Vaptar*.

**VPTS** Voice-processing training system.

**VPU** 1 Video, or voice, processing unit.  
 2 Vortac position unit.

**VPU(D)** Voice processor unit with data mode.

**VPVO** Air-defence troops (R).

**VR** 1 Resultant velocity.  
 2 Vernier radial (thruster).  
 3 Visual reconnaissance.  
 4 Volunteer Reserve.  
 5 Veer[ring].  
 6 Visual route, rules or range.  
 7 Vortex ring.  
 8 Virtual reality.  
 9 Voice recognition.  
 10 Variable reluctance [much less common, variable resistance].

**VR** 1 Rotation speed, at which PIC starts to pull back on yoke to rotate aeroplane in pitch; normally determined by one of following: not less than 1.05 V<sub>MCA</sub>; not less than 1.1 V<sub>MS</sub>; not less than 1.05 or 1.1 V<sub>MU</sub>; and it must allow 1.1 V<sub>MCA</sub> or 1.2 V<sub>MS</sub> to be achieved at screen after one engine failure.  
 2 Radar velocity, i.e., of aircraft in which it is mounted.  
 3 Heading to a radial (US wording).

**V<sub>r</sub>** Radial velocity, eg component of velocity along sightline to target (rate of change of range) or fluid speed along radial direction in centrifugal compressor measured relative to compressor (ie eliminating tangential component).

**VRA** Variable-response [research] aircraft.

**V<sub>RA</sub>** Rough-air speed; maximum recommended EAS for flight in turbulence.

**VRAM** Video random-access memory.

**VRB** 1 Voice rotating beacon.  
 2 Variable.

**VRBL, Vrbl** Variable.

**VRC** 1 Vendor reject crib.  
 2 Value relay centre (EC).

**VRD** Virtual retinal display.

**V<sub>REF</sub>** 1 Loosely, any reference, or 'bug', speed.  
 2 In jet transports, a typical approach speed at about 1.35 V<sub>S0</sub> (chiefly US).

**V<sub>rel</sub>** Relative velocity.

**VRF** Code: ferry squadron (USN).

**VRG** 1 Vertical reference gyro, = vertical gyro.  
 2 VDL(2) reference guide.

**vrille** Spin (arch.).

**VRK** Very Restricted Knowledge, classification refined by suffix number, thus \*-7 (NSA 1974-).

**VRMT** Virtual-reality maintenance trainer.

**VROC** 1 Vertical rate of climb (helicopter).  
 2 Validated rate of climb.

**VRP** 1 Visual reporting post or point.  
 2 Visual refrence point, giving a fix.

**VRPS** Voice recording and playback system.

**VRS** 1 Video recording system.  
 2 Voice response system.  
 3 VTOL recovery and surveillance [aircraft] (USCG).  
 4 Vortex-ring state.

**VRT** Virtual-reality toolkit [& S adds and simulator].

**VR(T)** Volunteer Reserve (Training) (UK).

**VRU** Vertical reference unit.

**VS** 1 USN squadron code: fixed-wing ASW.  
 2 Vestigial sideband.  
 3 Velocity search (radar).  
 4 Vane set.  
 5 Vertical speed (also V/S, VSP).  
 6 Versus.

**V<sub>s</sub>** 1 Stalling speed; IAS at which aeroplane exhibits characteristics or behaviour accepted as defining stall (in US, FAA adds 'or minimum steady flight speed at which airplane is controllable', which is not same thing and is separately defined in UK as V<sub>MCA</sub>). V<sub>s0</sub>, V<sub>s1</sub> see entries.  
 2 Velocity of slip (propeller).  
 3 Slipstream velocity, relative to aircraft.  
 4 Sink rate.

**V/S** Vertical speed.

**VSA** 1 By visual reference to ground (ICAO code).  
 2 Value-stream analysis.

**VSAM** Vestigial-sideband amplitude modulation.

**VSAT, V-Sat** Very small aperture terminal.

**VSB** 1 Vendor service bulletin.  
 2 Visible.

**vsby** Visibility.

**VSC** 1 Video scan converter.  
 2 Vacuum system control.

**VSCAS** Variable-stability control-augmentation system.

**VSCF** Variable-speed constant-frequency.

**VSCS** 1 Voice switching and communications, or control, system (FAA).  
 2 Vertical-stabilizer control system (Notar).

**VSD** 1 Vertical situation display.  
 2 Video symbology display.

<b>3</b>	VDL(2) specific DTE address.	
<b>VSDR</b>	Variable-speed digital recorder.	
<b>VSER</b>	Vertical-speed and energy rate.	
<b>VSF</b>	Void-sensing fuze.	
<b>VSKI</b>	Vertical-scale flight instrument.	
<b>V<sub>SFL</sub></b>	Level-flight stalling speed with flaps set for landing.	
<b>VSG</b>	Vibrating-structure gyro.	
<b>VShorad</b>	Very short-range air defense (USA).	
<b>VSI</b>	1 Vertical-speed indicator, output is rate of climb or descent.	
2	Vertical soft-iron; component of Earth's field.	
3	Vapour space inhibitor = VPI.	
4	Vacuum superinsulation.	
5	Velocity and steering indicator.	
6	Variable-swath imagery.	
7	Vertical situation indicator.	
<b>V<sub>SI</sub></b>	Indicated stalling speed [avoid confusion with V <sub>s1</sub> ].	
<b>V<sub>s(in)</sub></b>	Stalling speed, clean, in inverted flight.	
<b>VSIP</b>	Virtual-system implementation.	
<b>V6, V16</b>	Vasi with 6 or 16 boxes, the 16-box being on both sides of the runway.	
<b>VSJ</b>	Vazduhoplovni Savez Jugoslavije, aeronautical sport union of former Yugoslavia.	
<b>VSL</b>	Vertical-speed limit [A adds advisory, which may be preventative or corrective].	
<b>VSLD</b>	Velocity-, or vertical-, search lookdown.	
<b>V-sled, VSLED</b>	Vibration, structural life and engine diagnostic system.	
<b>VSM</b>	1 Vertical-separation minimum, or minima.	
2	Very small munition.	
<b>VSMI</b>	Verein Schweizerischer Maschinen-Industrieller [office, CH-8032 Zürich] (Switzerland).	
<b>V<sub>s0</sub></b>	Stalling speed at MTWA with flaps at landing setting, engine[s] idling.	
<b>V<sub>s1</sub></b>	Stalling speed at MTWA in a specified configuration other than clean.	
<b>V<sub>s1g</sub></b>	Stalling speed at MTWA under 1 g vertical (normal) acceleration; obtained from V <sub>s</sub> by correcting for any imposed normal acceleration that may have been present during an actual measured stall; a 'pure' V <sub>s</sub> not normally entering into performance calculations.	
<b>VSP</b>	Vertical speed; VS more common.	
<b>VR</b>	1 Very short range.	
2	Volume search radar.	
3	Valve-seat recession.	
<b>VSRA</b>	V/STOL research aircraft (NASA).	
<b>VSRAD</b>	Very short range air defence.	
<b>VSRS</b>	Variable-speed rotor system.	
<b>VSS</b>	1 Video signal simulator.	
2	Variable-stability system.	
3	Vehicle systems simulator.	
<b>VSSA</b>	Variable-stability simulator aircraft.	
<b>VSSC</b>	Vikram Sarabhai Space Centre (India).	
<b>V<sub>SSE</sub></b>	Minimum 'safe single-engine' speed, selected by manufacturer, for intentionally shutting down one engine in flight for pilot training; in UK and some other countries this is prohibited below 3,000 ft (907 m) AGL.	
<b>VSSG</b>	Vertical Separation Study Group (Navsep).	
<b>VST</b>	Variable-stability trainer; aeroplane with avionics and flight-control surfaces added to enable it precisely to duplicate flight characteristics of other types.	
<b>V<sub>st</sub></b>	One reference states 'stall or minimum flight speed, flaps up, no power'; not a normally recognised abbreviation.	
	V-Star Variable search and track air-defence radar.	
	V/STOL Vertical or short takeoff and landing.	
	VSTT Variable-speed training target.	
	VSU Voltage-sense unit.	
	VSV Variable-stator vane, or valve [A adds actuator, AS adds actuating system].	
	VSVT CAA of lithuania (1992), in 1994 became DCA(2).	
	<b>VSW</b> 1 Vertical speed and windshear; hence VSWI = * indicator.	
2	Variable-sweep wing.	
3	Verification software.	
<b>VSWE</b>	Virtual strike warfare environment.	
<b>VSWR</b>	Voltage standing-wave ratio.	
<b>VT</b>	1 Vernier thruster.	
2	Voltage transient.	
3	Vectorized thrust.	
4	Internal prison, eg for design teams (USSR, 1929–42).	
5	Target speed.	
6	Video tracker [SC adds system controller].	
7	Variable time, or timing.	
8	Validity time[s].	
9	Vertical tail.	
<b>VT</b>	1 Takeoff speed.	
2	Confusingly, threshold speed, see V <sub>TDM</sub> , V <sub>Tmax</sub> , V <sub>Tmin</sub> .	
3	Velocity of target.	
4	Threshold voltage, especially that established for automatic target detection.	
5	Alternative to V <sub>t</sub> .	
<b>Vt</b>	True airspeed, in aerodynamics.	
<b>VTA</b>	1 Military transport aviation (USSR, R).	
2	Vibration tuning amplifier.	
3	Vertex time of arrival.	
4	Voice terrain advisory.	
<b>VTAS</b>	1 Visual target acquisition system.	
2	True airspeed.	
3	Voice, throttle and stick.	
<b>VTC</b>	1 Vectorized (or vectoring) thrust control.	
2	Vernier thruster control.	
3	Variable time-constant.	
4	Vibratory torque control (Teledyne Continental).	
5	Vertical turning center [machine tool].	
<b>V<sub>TD</sub></b>	Touchdown [= landing] speed.	
<b>VTDF</b>	1 Vectored-thrust ducted fan.	
2	Vortex-tube dust filter.	
<b>V<sub>TDM</sub></b>	Minimum threshold speed demonstrated.	
<b>VTDP</b>	Vectored-thrust ducted propeller.	
<b>V<sub>θi</sub></b>	Circumferential component of propeller induced velocity.	
<b>VTK, V<sub>TK</sub></b>	Vertical track distance.	
<b>VTL</b>	Prefix to aviation de-icing fluid specification(G).	
<b>VTM</b>	Voltage-tunable magnetron.	
<b>V<sub>Tmax</sub></b>	Maximum threshold speed, above which risk of overrunning is judged unacceptable; usually V <sub>AT</sub> + 15 kt.	
<b>V<sub>Tmin</sub></b>	Minimum threshold speed, below which risk of stall (esp. in windshear) is judged unacceptable; usually V <sub>AT</sub> - 5 kt.	
<b>VTO</b>	1 Vertical takeoff.	
2	Varactor-tuned oscillator.	
3	Volumetric top-off.	

<b>4</b> Visiting technical officer (UK).	V/V Vertical velocity.
<b>V<sub>TO</sub></b> MIL/DefStan requirements define T-O speed as whichever is lower: highest speed reached before high-lift devices can be retracted, or 1.6V <sub>s</sub> in T-O configuration.	<b>V<sub>v</sub></b> 1 Volume ratio for the vertical tail.
<b>VTOCL</b> Vertical takeoff, conventional landing.	2 Vertical velocity on landing.
<b>VTO grid</b> Vertical takeoff grid designed to reduce erosion and reingestion problems in operating jet-lift aircraft from unprepared surfaces.	<b>VVA</b> 1 Zhukovskiy air force academy (USSR, R).
<b>VTOGW</b> Vertical takeoff gross weight.	2 Vietnam Veterans of America; F adds Foundation.
<b>VTOVL</b> Vertical takeoff and landing; VTOVL adds redundant second 'vertical'.	3 Voltage variable attenuator.
<b>VTP</b> Vertical tailplane.	<b>V&amp;V&amp;A</b> Verification, validation and accreditation.
<b>VTOSS</b> Takeoff safety speed (rotorcraft) (FAA).	<b>VVI</b> Vertical velocity indicator, suggest = VSI.
<b>VTPR</b> Vertical temperature-profile radiometer.	<b>VVIA</b> VVA engineering academy (USSR, R).
<b>VTR</b> 1 Video tape recorder.	<b>VVLR</b> Group of Flemish aerospace companies [100 members, office B-2000 Antwerp].
2 Vocational training, or tax, relief.	<b>VVR</b> Voice and video recorder.
3 Variable takeoff rating.	<b>VVS, V-VS</b> Air forces (USSR, R).
<b>VTRAT</b> Visual threat recognition and avoidance trainer.	<b>VVT</b> Variable valve timing.
<b>VTRK, V/TRK</b> Vertical track.	<b>VW</b> Vortex wake; S adds spacing.
<b>VTRM</b> Variable-thrust rocket motor.	<b>V<sub>w</sub></b> 1 Tailwind, or tailwind component.
<b>VTS</b> 1 Video target simulator.	2 Becoming common as alternative to W <sub>v</sub> for wind velocity.
2 Voice telecom system.	<b>VWA</b> Virtual worktop architecture.
3 Voice, throttle and stick.	<b>VWF</b> Verband der Wissenschaftler an Forschungsinstituten (G).
<b>V<sub>θi</sub></b> Circumferential component of propeller induced velocity.	<b>V<sub>whirl</sub></b> Whirl velocity.
<b>V<sub>TS</sub></b> Velocity of tunnel test section.	<b>VWL</b> Video wireless link.
<b>vTSPi</b> Video time/space position information.	<b>VWP</b> Visa-waiver program (Dept. of State).
<b>VU</b> Volume unit.	<b>VWRS</b> Vibrating-wire rate sensor.
<b>VTUAV</b> 1 VTOL UAV. 2 VTOL tactical UAV.	<b>VWS</b> 1 Vertical windshear.
<b>VTVL</b> Vertical takeoff, vertical landing [suggest = VTOL].	2 Ventilated wet suit.
<b>V<sub>U</sub></b> 1 Relative airspeed across upper (positively cambered or lifting) surface of aerofoil.	<b>VX</b> 1 General code for nerve gases.
2 Tangential velocity, eg of flow leaving centrifugal compressor.	2 Test and Evaluation Squadron (USN).
3 Utility speed (US usage).	<b>V<sub>x</sub></b> 1 Airspeed for best angle of climb, segment not specified (US usage).
<b>VUAV</b> Vertical UAV.	2 Vertical shear on beam at station x.
<b>V/u.h.f.</b> Very and ultra-high frequency; Appendix 2.	<b>VXE</b> Antarctic Development (ie, exploration) Squadron (USN).
<b>Vulcanoids</b> Hypothetical asteroids within the orbit of Mercury.	<b>V<sub>xi</sub></b> Axial component of propeller induced velocity.
<b>Vulkollan</b> Hard erosion-resistant thermosetting plastics material (trade name, F).	<b>VXO</b> Variable crystal oscillator.
<b>V<sub>us</sub></b> Unstick speed of marine aircraft.	<b>V<sub>xse</sub></b> Airspeed for best angle of climb, single-engine (US usage).
<b>VV</b> 1 Vertical visibility, measured (most countries) in hundreds of feet, or runway visibility value.	<b>V<sub>y</sub></b> Airspeed for best rate of climb (US usage).
2 Valve voltmeter.	<b>V<sub>y</sub></b> Downwash velocity behind wing.
3 Validation and verification (sometimes V&V).	<b>VYRO, Vyro</b> Vertical yaw and roll.
4 Velocity vector.	<b>V<sub>yse</sub></b> Airspeed for best rate of climb, single-engine (US usage, also called blueline speed).
	<b>VZ</b> Aircraft designator, vertical-lift research (USA 1957–62).
	<b>VZLU</b> Aeronautical Research and Test Institute, Prague (Czech Rep.).
	<b>V<sub>ZRC</sub></b> Airspeed for zero rate of climb, at which with one engine inoperative drag reduces gradient to zero.

# W

**W** 1 Watt[s], and general symbol for power in SI countries.

2 Weight, including total W on a structural member; loosely synonymous with mass mg, and mass flow, esp. through jet engine.

3 Force of applied load.

4 Energy [work]; E is preferred.

5 Tungsten [from wolfram].

6 Aircraft mission, prefix, electronic search or AEW (USN 1952–62).

7 Modified mission, suffix, AEW (USN 1944–62); prefix, weather reconnaissance (USAF from 1958, USN from 1962).

8 JETDS code: armament, automatic flight or remotely piloted.

9 Weather, and airport with NWS office (US).

10 West, western longitude.

11 Weapon.

12 Wave[s] or Mach-wave angle.

13 IFR flightplan; approved R-nav but no xpdr.

14 Wing [military unit].

15 Prefix, NW warhead.

16 White light.

17 Width, wheel track, maximum tyre [tire] cross-section.

18 Warning, warning area.

19 Indefinite ceiling, sky obscured.

20 Secondary station (Loran).

21 See W-engine.

22 Without voice (radio).

23 Suffix, quenched in cold water.

**w** 1 Generalized symbol for special fluid velocities, eg vertical gust [or any velocity along the Z-axis], wing downwash, propeller slipstream etc.

2 Warm (air mass).

3 Load per unit distance, or per unit area, or per unit width of a panel.

4 Specific loading.

5 Linear velocity due to yaw, velocity normal to chord.

6 Suffix, wing; thus Ww = wing weight.

7 Rate term for weight or mass, eg per unit time.

8 Generalized symbol for work.

9 Range, of values.

**W<sub>1</sub>** Structural mass of wing.

**W<sub>2</sub>** Non-structural mass of wing.

**W-code** W (13): approved R-Nav but no transponder.

**W-engine** Piston engine with three linear banks of cylinders about 50°–60° apart; also called broad-arrow.

**W-wing** Shaped like W in planform with sweepback inboard and forward sweep outboard.

**WA** 1 Work authorization.

2 Prefix: word after . . .

3 Airmet weather advisory.

4 Wing anti-ice.

**WIA** Weight per cross-section area (warhead).

**W<sub>A</sub>** Equipped airframe weight.

**W<sub>a</sub>** Air mass flow, eg passing through engine per second.

**WAA** War Assets Administration (US, 1946 –).

**WAAF** Women's Auxiliary Air Force (UK, 1939–49).

**WAAM** Wide-area anti-armour munition.

**WAAS** 1 Wide-area active surveillance (radar).

2 World airline accident summary (UK CAA).

3 Wide-area augmentation system (GPS, US counterpart to Egnos).

**WAASA** Women's Aviation Association of South Africa.

**WAC** 1 World Aerobatic Championships.

2 Weapon-aiming computer.

3 Wide-angle collimated; S adds system.

4 World Aeronautical Chart (1,000,000 scale).

5 Women's Army Corps (US, 1943 –).

**WACA** World Airlines Clubs Association [office, Montreal] (Int.).

**WACCS** Warning and caution computer system.

**WACD** Wide-area change detection (DDB).

**Waco** World Air Cargo Organisation [office, Zurich] (Int.).

**WACRA, Wacra** World Airline Customer Relations Association (Int.).

**WAD** 1 Workload assessment device.

2 Wide-angle differential (see \*GNSS, \*GPS).

**WADC** Wright Air Development Center (USAF).

**WADD** Wright Air Development Division.

**WADDS** Wind and altimeter [setting] digital-display system.

**WADGNSS** Wide-area differential global navsat system.

**WADGPS** Wide-area differential GPS.

**WAEA** 1 World Airline Entertainment Association [office, Los Angeles, CA] (Int.).

2 World Aerospace Educational Association [office, Washington DC] (Int.).

**WAOE** World Aerospace Education Organization [office, Leicester, UK] (Int.).

**WAF** Women in the (US) Air Force (1948 –).

**WAFC** World area forecast centre.

**wafer** Complete (near-circular) slice of single crystal (usually epitaxial) semiconductor material on which numerous electronic devices are constructed, subsequently separated by scribing and cleavage to make chips.

**waffle plate** Thin metal sheet stabilized by impressed dimples, often parallel rectangles. Same name for more complex sandwich structures.

**WAFS** 1 Women's Auxiliary Ferrying Squadron (US, 1942).

2 World area forecast system.

**WAG** 1 World average growth.

2 World Air Games, held annually.

**WAGE** Wide-area GPS enhancement.

**waggle** Rapidly repeated bank to left and right [say, ±20°].

**Wagner bar** Pioneer spoiler-type flight control with bang/bang solenoid operation for radio command guidance of missiles (from 1937).

**Wagner beam** Idealized pure tension-field beam assumed to have zero compressive strength and thus to

react loads as diagonal tensions; generally, a beam designed to buckle in operation.

**Wagner function** A correcting factor due to the fact that, even when penetrating a “vertical” sharp-edged gust,  $\alpha$  [wing AOA] does not reach its maximum value instantaneously.

**wagon wheel** See *wheel* (6).

**wagonwheel propellant** Solid rocket motor propellant grain with cross-section having form [positive or negative] of wagon wheel.

**WAGS** Windshear alert and guidance system.

**WAHC** World Airline Hobby Club [office, Erlanger, KY] (Int.).

**WAHS** World Airline Historical Society [office, Jacksonville, FL32225] (US, Int.).

**WAI** 1 Wing anti-ice, anti-icing.

2 Women in Aviation, International [1994 –, office, West Alexandria, Ohio] (Int.).

**wailer** Unmistakeable warning triggered by autopilot disconnect without human response.

**WAIN** Wide-area integrated network.

**waist** 1 Amidships portion of fuselage or hull; thus \* gunner, firing laterally (often from rear midships area).

2 Middle portion of gas-turbine engine, esp. where diameter here is less than elsewhere; thus \* gearbox for accessories.

**waisting** 1 Local reduction in diameter caused by plastic flow under tension, esp. at point of failure.

2 Local reduction of cross-sectional area of body, eg to conform to Area Rule.

**waiting beacon** “A low-power omni-directional beacon used by aircraft waiting their turn to follow the radio track” (B.S., 1940).

**waiver** Whereas usual meaning is permanent relinquishment, in air law or certification it is a postponement.

**WAK** Wing adapter kit.

**wake** 1 Fluid downstream of body where total head has been changed by body's presence; usually to some degree turbulent.

2 Wingtip vortices left in atmosphere behind aircraft whose wing is generating lift, in case of large/heavy aircraft very powerful and persistent, capable of destroying light aircraft.

**wake constraint** Rules defining time or distance in n.m. which must elapse between arrival or departure of a Heavy or Super Heavy and the following aircraft.

**wake contraction ratio** In a helicopter, the ratio of the radius of the wake to that of the rotor.

**wake-interaction noise** Generated by impingement of wake from moving blade on object downstream, eg stator; in gas turbine hundreds of such interactions can generate noises at blade-passing frequency of each stage of blading, plus harmonics.

**wake separation** Divergence of wakes (2) behind large aircraft.

**wake turbulence** Turbulence due to wakes (2), behind large aircraft with powerful downward motion.

**wake turbulence classification** Applies to conventional aeroplanes: light aircraft  $\leq 7$  t (15,432 lb); medium = 7–136 t (c 300,000 lb); heavy = 136+ t (ICAO). The UK has a definition ‘small aircraft’ = 17–40 t.

**wake vortex** Wake (2).

**walkaround oxygen** Bottle carried by aircrew when disconnected from system.

**walkback** Return of deck arrester wire (pendant) to ‘cocked’ or ready position.

**walking** 1 To advance engine throttles (power levers) in asymmetric steps, left/right/left etc.

2 To keep straight on takeoff with violent left/right rudder.

**walking beam** Pivoted beam transmitting force or power, eg to retract landing gear; secondary meaning arising by chance from repeated usage is landing-gear retraction and bracing beam whose upper end is not pivoted direct to airframe but to a sliding or translating member, eg long jackscrew.

**walking in/out** Movement of aerostat, esp. airship, in or out of hangar by large ground crew walking while holding tethering lines.

**walking-stick** 1 Laser used to indicate ground clearance in descent through cloud with ceiling close to terrain (not colloq.; name derives from stick of blind person).

2 Gas-turbine vaporizing burner in which fuel is heated in tube with 180° bend looking like top of \*.

**walk-on service** Airline service in which anyone could walk directly on board, buying ticket from cabin crew [not after 9-11, but gradually restored in 2004].

**walk-up service** See preceding.

**walkway** Catwalk or other narrow structure provided in airship (rarely, large aircraft of other type) to provide human access to other part; hence \* girder.

**wall** 1 Sides of tyre, between wheel and tread.

2 Internal boundaries of wind tunnel; not only vertical sides.

**wall constraint** Distortion of flow round model in tunnel with closed working section arising from fact that walls are seldom aligned with streamlines.

**wall energy** Energy per unit area of boundary between oppositely oriented magnetic domains.

**Wallops Flight Facility** NASA island complex on US east coast [Hampton, VA] used for nearly all small rocket launches.

**wallowing** Uncommanded motions about all three axes.

**Walter** Emergency locator beacon emitting battery-powered pulses.

**WAM** Window addressable memory.

**WAMRS** Water-activated mask-release system.

**Wams, WAMS** 1 Weapon-aiming mode selector.

2 Women Aircraft Mechanics Service (1942 –) (US).

3 Wide-area master station.

**WAN** Wide-area network (distributed systems).

**wander** See *apparent precession*.

**wandering** Slow and apparently steady uncommanded change in heading; may from time to time reverse itself.

**Wanganui** Blind skymarking of target obscured by cloud: Main Force set zero wind and on a given heading bombed on parachute flare (RAF WW2).

**WAP** Wireless application, or access, protocol [mobile telephones].

**WAPS, Waps** 1 Weighted airman promotion system (US).

2 Wide-area precision surveillance.

3 Whole-airframe parachute system.

**WAR** Warning.

**War Air Service Program** American (DoD) plan for civil airline routes, equipment and services following withdrawal of CRAF aircraft.

**warbird** Historic military aircraft, real or replica.

**WARC** World Administrative Radio Conference [suffix MOB added mobile service, ST space telecommunications, and two numbers indicated last two digits of year, eg 1992] (ITU).

**war consumables** All essential expendables directly related to hardware of a weapon/support system or combat/support activity (USAF).

**War Executive** Officer in squadron responsible for detailed planning of all combat missions (RAF).

**war game** Simulation, by whatever means, of warfare using rules intended to depict real life.

**war gas** Chemical agent designed for use against human body directly; eg not used to contaminate water supply. Liquid, solid or vapour.

**warhead** Portion of munition containing HE, nuclear, thermonuclear, CBR (2) or inert materials intended to inflict damage. DoD recognizes additional term, \* section, as assembled \* including appropriate skin sections and related components; thus \* alone need not include fuizing, arming, safety and other subsystems.

**Warhorse, War Horse** Wide-angle reconnaissance hyperspectral overhead real-time surveillance experiment.

**warhud** Wide-angle raster HUD.

**warload** Generally taken to include expendable weapons, external fuel and external EW.

**Warloc** W-band advanced radar for low-observables control.

**Warlord** War Executive (colloq.).

**Warmaps** Wartime Manpower Planning System (US).

**war materiel** All purchasable items required to support US and Allied forces after M-day (US).

**warm front** Locus of points along Earth's surface at which advancing warm air leaves surface and rises over cold air.

**warm gas thruster** Propulsive jet composed of HP stored gas heated (eg by main rocket combustion) before expulsion through separate nozzle; various configurations but common for vehicle roll control.

**warm sector** Portion of depression, esp. recently formed, occupied by warm air.

**warm-up** Generalized term for process, or necessary elapsed time, in which device is operated solely for purpose of bringing it to steady-state operating condition, with steady running speed, temperature, pressure or other variables. Examples: piston engine, gyro.

**warm-up time** Published time for device, eg gyro, to reach specified performance from moment of energization.

**Warn** Weather-analysis radar network.

**warned exposed** Friendly forces are lying prone with all skin covered and wearing at least two-layer summer uniform.

**warned protected** Friendly forces are in armoured vehicles or crouched in holes with improvised overhead shielding.

**warning area** Airspace over international waters in which, because of military exercise, non-participating aircraft may be at risk.

**warning indicator** Device intended to give visual or aural warning of hazard, eg fault condition or hostile attack.

**warning in/out** Two books in which members record details of temporary duty elsewhere, leave and other absence (RAF Officers' Mess).

**warning net** Designated telecom system for dis-

seminating information on enemy activity to all commands.

**warning order** Preliminary notice of friendly action to follow.

**warning panel** Area of display, eg on aircraft flight deck, containing numerous designated warning indicators or captions, with or without attention-getting master \*.

**warning receiver** Passive EM receiver with primary function of warning user his unit/vehicle/location is being illuminated by an EM signal of interest.

**warning red** Attack by hostile aircraft/missiles imminent or in progress.

**warning streamer** Brightly coloured fabric strip, flexible in light breeze, drawing attention to protective cover or other item which must be removed from vehicle before flight or launch.

**WARP** Wing aerial [or air-] refuelling pod.

**Warp** Weather and radar processor, a 1990s development (FAA).

**warp** Threads in fabric parallel to selvage, continuous full length of material.

**warping** Twisting wings asymmetrically to obtain lateral stability and control; usually imposed by diagonal downward pull on rear of wing near tip to twist (wash-in) and increase camber.

**Warps** Wing air-refuelling pod system.

**warp-sheet** Standard raw-material form of reinforcing fibre, esp. carbon/graphite, in which broad sheet is made up entirely of parallel fibres; usually used cut to shape in multiple laminate structure.

**warpwheel** Pre-1914 lateral control wheel.

**WARR** Wissenschaftliche Arbeitsgemeinschaft für Raketechnik und Raumfahrt (G).

**war-readiness spares kit** Prepared kit of spares and repair parts to sustain planned wartime or contingency operations of weapon system for specified period (USAF).

**Warren** Structure in form of frame truss comprising upper/lower chords joined by symmetric diagonal members only; hence \* bracing, \* girder, \* struts, \* truss. \* biplane in front view has only diagonal interplane struts, forming continuous zig-zag along wing.

**Warren-Young** Wing of rhomboid form with sweptback front wing joined at tips to swept-forward rear wing.

**war reserve** Inactive stocks, subdivided into nuclear and other, of all forms of supplies (US = materiel) drawn upon in event of war.

**Warrior** Conceptual American all-arms fighting man able to project force anywhere on the globe.

**WARS** 1 West Atlantic route structure.

2 Whole-aircraft recovery system.

3 Wide-area reference station.

**Warsaw Convention** Principal international agreement on carriage by air, signed 12 October 1929 and subsequently amended, notably at The Hague in 1955.

**wartime rate** Maximum attainable flying rate based on seven-day week and with wartime maintenance/safety criteria.

**warting** Pitting of metal surface, esp. in gas turbine, caused by combined actions of carbon and atmospheric salts plus thermal cycling.

**WAS** 1 Weapon-aiming system.

2 Wide-area search, or surveillance.

3 Weapons avionics simulator.

**WASAA** Wide-area search [and] autonomous-attack: M adds munition, MM miniature munition.

**WASD** Wide-area surveillance and detection.

**WASG** 1 Warranty and service guarantee.

2 World Airline Suppliers' Guide.

**wash** 1 Wake (colloq.).

2 To play upon or around, as 'the hot jet can \* tyres of aircraft astern'.

**washed** Subjected to impingeing flow of fluid, especially of hot gas.

**washed out** Failed course of instruction, esp. as pilot.

**wash-in, washin** Inbuilt wing twist resulting in angle of incidence increasing towards tip.

**washing fluid** For cleaning aircraft exterior, typically mains water, possibly with a little detergent; for engine compressors, distilled water plus 1–11 per cent solvent, plus [option] inhibiting oil.

**washing machine** Trainer used by commanding officer or CFI and thus that in which failed pupil makes last flight (US colloq., probably arch.).

**wash-out, washout** 1 Inbuilt wing twist resulting in angle of incidence reducing towards tips.

2 To fail course of flight (pilot) instruction.

3 Failed pupil pilot.

4 Removal of particulate matter from atmosphere by rain.

5 See next.

**washout phase** Point at which flight simulator can no longer sustain sensation of acceleration.

**wash primer** Self-etching primer to prepare surface of Al or Mg for subsequent priming or painting.

**WASP, Wasp** 1 War Air Service Program (DoD).

2 Wide-area special [or surveillance] projectile (USAF).

3 Women Air Service Pilots (US, replaced WAFS 1942–44).

4 Weasel attack signal processor.

5 White alternate sector propeller [black/white to prevent deaths on the ground].

6 Windshear airborne sensors program (NASA/FAA).

**Waspaloy** Registered (Pratt & Whitney) nickel alloys for gas-turbine rotor blading and similar purposes, typically with about 19% Cr, 14% Co and also Mo, Ti, Al etc.

**WASR** Wideband antennas and sources research (AFRL).

**Wassar** Wide-angle search synthetic-aperture radar.

**wastage** Those pupils who fail a course of instruction, esp. aircrew; hence \* rate, % failing.

**waste energy** Energy not put to use, that in propulsive jet being  $W(v_j-V)/2g$ , where  $(v_j-V)$  is waste velocity.

**waste gate** Controllable nozzle box for exhaust gas turbine of turbocharged piston engine; hence \*\* valve, which when open allows gas to bypass turbine but which gradually closes with height until at rated full-throttle or other selected height valve is closed completely.

**wastes** 1 Human body wastes, esp. fecal.

2 Surplus radioactive equipment and materials.

**waste velocity** In the propulsion of any aircraft, the difference between the speed of the propulsive jet (behind anything giving propulsion, e.g. a propeller or helicopter rotor) and the TAS, i.e.  $(v_j-V)$ . At the start of conventional takeoff \* is 100%; it would be zero were it possible for a high-speed aircraft to leave its jet at rest with respect to surrounding air.

**WAT** 1 Weight/altitude [density altitude of airfield]

/temperature; factors independent of runway which govern each takeoff and determine whether aeroplane can meet specified positive climb criteria after engine failure at  $V_1$ ; pronounced 'watt', but invariably written all in capitals.

2 Western Atlantic (ICAO, RVSM).

**WATA** World Association of Travel Agents (Int.).

**watch office** Aerodrome air traffic control centre (UK 1918). Progressively replaced after c 1933 by control tower, but term still common in 1939–45.

**WAT curve** Graphical plot of WAT limitation for particular aircraft type; hence WAT limit, limiting value(s) of WAT at which performance is minimum for compliance with requirements.

**water** Modern gas-turbine fuels typically contain 0.028 per cent by volume, still enough to cause freezing problems.

**water bag** Polythene bag carrying water ballast.

**water ballast** Standard ballast carried by competitive sailplane.

**water barrier** 1 Runway overrun barrier using water as retarding material.

2 Notional barrier to prolonged spaceflight caused by fact that plants used for fresh food/oxygen continuously convert more material to water than they return in consumable form.

**water bias** See sea bias.

**water bomber** Aircraft designed for surface (eg forest) firefighting by dropping large masses of water; can be marine aircraft with means for quick on-water replenishment using ram inlet on planing bottom.

**water cart** Dispenser of water to aircraft on apron, with supplies of either or both demineralized water for engines or potable water for passengers.

**water-collecting sump** Low point in any system where water could collect, esp. fuel tank and tray under vapour-cycle air-conditioning coils, from which water can be extracted.

**water-displacing fluid** Commercial liquids (eg LPS-3) which preferentially attach themselves to metal surface in place of local droplets of moisture, thus arresting corrosion.

**water doors** Watertight doors in the planing bottom of a seaplane or amphibian used as a fire bomber.

**water equivalent depth** Measure of depth of precipitation contamination on runway; WED = actual depth × density, thus 20 mm slush with SG 0.5 gives WED 10 mm. For water, \*\*\* = actual depth.

**waterfall** Basic model of software life cycle.

**water flaps** Surfaces hinged about near-vertical axis near afterbody keel of marine aircraft (esp. jet) which when under water are used differentially for steering and together for braking (usually also used as airbrakes).

**water gauge** Pressure expressed as height of column of water; 1 in  $H_2O = 249.089 \text{ Nm}^{-2}$ ; 100 mm =  $980.66 \text{ Nm}^{-2}$ .

**water injection** Injection of demineralized water, either pure or with 30–67% alcohol or (more commonly) 44–60% methanol, into cylinders of piston engine to cool charge and eliminate detonation at maximum BMEP, or into compressor inlet or combustor of gas turbine to cool air and thereby increase density and thus mass flow and power.

**water jacket** Container for cooling water around cylinder.

**water level** Generalized term in lofting and aerospace construction generally (except vehicles whose major axis is vertical, eg most space launchers) to denote measures in the vertical plane; thus  $** 193 = 193$  mm above aircraft reference datum for measures in vertical plane, which may be longitudinal axis OX or some other essentially horizontal reference; abb. WL. Note: in US unit is often still inches.

**waterline** 1 Intersection of body exterior profile and a horizontal plane; often used as synonymous with water level, thus WL 0 is lowest point of body and all subsequent slicing planes are parallel to prime longitudinal axis or other horizontal reference. Thus \* view, \* plot (all water-lines drawn on common axis of symmetry).

2 Any horizontal reference other than local Earth surface used in aircraft attitude instrument or HUD.

**waterloop** Inadvertent turn by marine aircraft on water, eg after dipping wingtip float at high speed (full  $**$  rare because usually aircraft rolls in opposite direction through centripetal force).

**watermarking** Sending spread-spectrum digital signal during first 900 ms of transmission to provide secure identification of sender.

**water/methanol** See *water injection*.

**water recovery** Recovery of usable water from propulsion exhaust, esp. aboard airship for use as ballast.

**water resistance** Drag caused by water to aircraft moving through it, made up of skin friction and wavemaking.

**water rudder** Small surface usually hinged on centreline of marine aircraft to sternpost or rearstep heel; used for directional control on water.

**waterspout** Visible water-filled tornado over sea.

**water suit** Anti-g suit in which interlining is filled with water which automatically provides approx. required hydrostatic pressures under large normal accelerations.

**water tunnel** Similar to wind tunnel but using water as working fluid for large R at low V.

**water twister** Rotary liquid-turbine device which absorbs energy in MAG arrested landings.

**WATOG, Watog** World Airlines Technical Operations Glossary.

**WATRS** West Atlantic route system.

**WATS** Wide-area tracking system.

**watt** SI unit of power (not only electrical power), W = J/s. Conversion factors: hp 745.7 exactly, CV 735.499, Btu/min 17.5725, in each case to convert to \* from unit stated.

**watt-hour** SI unit of energy = 3,600 J.

**wattless power** Reactive power VAR; also called wattless component.

**Wave, WAVE** 1 Warfighter alliance in a virtual environment (NATO0).

2 Wide-area voice environment.

**wattmeter** Instrument for measuring electrical power.

**wave** 1 Disturbance propagated in medium such that at any point displacement = f (time) and at any time displacement of point = f(position); any time-varying quantity that is also an f(position). This definition falls down for light and other EM radiation, which appears not to need a 'medium' for propagation (f = function of).

2 Formation of assault vehicles (land, sea or air) timed to hit hostile territory at about same time.

**wave angle** Angle between upstream free-stream direc-

tion and an oblique shock created by a real [large source] supersonic body, symbol  $\alpha$ .

**waveband** Particular portion of EM spectrum in telecommunications frequency region assigned by national authority for specific purpose.

**wave cloud** Formed at crest of a lee wave.

**wave crest** Peak of waveform.

**wave disturbance** Discontinuity or distortion along a met. front.

**wave drag** Additional increment of aerodynamic drag caused by shockwave formation, made up of distribution of volume along length (longitudinal axis) and drag due to lift; symbol for coefficient of  $** C_{Dw}$ .

**waveform** Shape of a repetitive (eg sinusoidal) wave when plotted as amplitude against time-base or when displayed on CRT.

**waveform generator** Converts d.c. or raw a.c. into any desired waveform output, with any frequency, amplitude (both time-varying if required) or other characteristic, eg for testing airborne electronic systems.

**wave front** 1 Leading edge of shockwave group, or of blast wave from explosion.

2 In a repetitive wave, a surface formed by points which all have the same phase at a given time.

**waveguide** Conductor for EM radiation in reverse sense to normal conductor in that radiation travels through insulator (usually atmosphere) surrounded by metal walls, usually rectangular cross-section, along which waves propagate by multiple internal reflection. Rarer form is dielectric cylinder along whose outer surface EM radiation propagates.

**waveguide modes** See *propagation modes*.

**waveguide mode suppressor** Filter matching particular waveguide cross-section designed to suppress undesirable propagation modes.

**wavelength** Distance between successive wave crests; symbol  $\lambda = v/f$  where  $v$  is velocity of EM radiation (usually close to speed of light) and  $f$  is frequency.

**wavelet** Small shockwave, usually present in large numbers in boundary layers and around surface of supersonic body. Sometimes called Mach wave or Mach \*.

**wave lift** Lift on lee side of ridge or mountains.

**wavemaking resistance** Drag of taxiing marine aircraft caused by gross displacement of water in waves; reaches maximum at about 20–30% of unstuck speed.

**wave motion** Oscillatory motion of particle(s) caused by passage of wave(s), usually involving little or no net translation, ie particle resumes near-original position after wave has passed. Direction of  $**$  varies with transverse waves (eg EM radiation), longitudinal waves (sound) or other forms, eg surface (water/air interface) waves.

**wave number** Reciprocal of wavelength  $1/\lambda$  or (alternatively)  $2\pi/\lambda$ .

**waveoff, wave-off** Any landing prevented, for whatever reason, by a command from the ground terminal or carrier DLCO.

**wave period** Elapsed time between successive crests,  $1/f$ , where  $f$  = frequency.

**waverider** Hypersonic aircraft designed to use shockwaves to increase L/D ratio.

**Waves** Women Accepted for Voluntary Emergency Service (USN, from 1942).

**wave soaring** Using wave lift.

## wave trough

## weakest maintained

**wave trough** Point of minimum, or maximum-negative, amplitude, usually half-way between crests.

**waviness** Surface irregularities with spacing greater than for roughness; height is mean difference between peaks and valleys and spacing is distance between peaks.

**way** Speed of marine aircraft relative to water surface, also called way on.

**waybill** Document listing description of each item of cargo, consignor, consignee, route, destination, flight number, date and other information.

**Waymouth unit** Capacitance-type fuel contents gauge (tradename).

**waypoint** 1 Predetermined and accurately known geographical position forming start or end of route segment.

2 In US, as (1) but with addition 'whose position is defined relative to a Vortac station' (FAA).

3 In military operations, a point or series of points in space to which an aircraft may be vectored.

**WB** 1 Weather Bureau (US, NOAA).

2 Prefix: word before ...

3 See W-BAR.

**W/B** Weight and balance.

**Wb** Weber.

**W-BAR** Wing bar [runway lights at threshold, normally green].

**WBC** 1 Weight and balance computer.

2 Wideband convertor.

**WBD** Wideband data, or detector.

**WBDDS** Weapons-bay door drive system.

**WBF** Wing-borne flight (jet V/STOL).

**WBG** Wideband gapfiller.

**WBGS** Wideband gap semiconductor.

**WBL** Wing buttock [or base] line.

**WBM** Weight and balance manual.

**WBO** Wien-bridge oscillator.

**WBPT** Wet-bulb potential temperature.

**WBR** Wideband receiver.

**WBS** 1 Work breakdown structure.

2 Weight and balance system.

**WBSA** Wideband synthetic array.

**WBSS** Wideband switching system.

**WBSV** Wideband secure voice.

**WBT** 1 Web-based training.

2 Wideband transmitter.

**WBTM** Weather Bureau technical memoranda.

**WBVTR** Wideband video-tape recorder.

**WC** 1 Weather centre.

2 Wire-combed (runway surface).

3 Warnings and cautions (ECAM).

4 Wide-cut.

**W/C** Wavechange.

**WCA** 1 Wind correction angle.

2 Warning caution advisory.

**WCAN** Wideband communications airborne network.

**WCCS** Wireless control and communication system.

**WCE** Workflow construction environment.

**WCFB** Wide-chord fan blade.

**WCG** Water-cooled garment.

**WCGA** World Computer Graphics Association [office, Washington DC] (Int.).

**WCM** Weapon control module.

**WCMD** Wind-corrected munitions dispenser.

**WCMS** 1 Wing-contamination [especially ice] monitoring system.

2 Weapon[s] control and management system.

**WCNS** Weapon control and navigation system.

**WCO** World Customs Organization (Brussels).

**W/comp** Wind component.

**WCP** 1 Working capital productivity.

2 Weapon[s] control panel.

3 WXR [weather radar] control panel[s].

**WCQL** Worst-cycle quality level.

**WCR** Weight/capacity ratio.

**WCS** 1 Weapon control system.

2 Waveguide communications system.

3 Writable control store (EDP).

4 Wing centre section.

**WCSL** West Coast Spacelift Range (USAF).

**WCSPL** Waist-catapult safe parking line, aligned across deck midway between Cats 2 and 3 (USN).

**WCTB** Wing carry-through box, joining pivots of variable-sweep aircraft.

**WCTG** Wide-cut turbine gasoline.

**WCTL** Worst-condition time-lag.

**WD** 1 Wind direction.

2 Warning display.

3 Word or word group.

4 War Department (US, replaced 1947 by DoD).

**WDA** Weather display adapter.

**WDAU** Weapon-dispenser arming unit.

**WDC** Weapon[s]-delivery computer.

**WDD** Western Development Division (USAF 1954-62, later Samso).

**WDDS** Weather-data display system.

**WDEL** Weapons Development and Engineering Laboratories (US).

**WDF** Water-displacing fluid.

**WDI** Wind-direction indicator.

**WDIP** Weapon-data input panel.

**WDL** Weapon, or weapons, datalink; A adds archive, or architecture.

**WDLY** Widely.

**WDM** Wave - [or wavelength-] division multiplexing; AOR adds area of responsibility.

**WDNS** Weapon-delivery and navigation system.

**WDS** Wavelength dispersive spectrometer.

**WDSPRD** Widespread.

**WDU** Wireless Development Unit (UK, WW2).

**WDX** Weather-data extractor, or extraction.

**WE** Weekend.

**WE** Mass of propulsion system (from weight of engine[s]).

**We** Zero-fuel weight.

**WEA** Weather.

**WEAA** Western European Airports Association [office, Amsterdam, Schiphol] (Int.).

**WEAAC** West European Airport Authorities Conference (Int.).

**WEAAP** West European Association for Aviation Psychology (Int.).

**WEAF** West of England Aerospace Forum [office, Clevedon BS21 6UP] (UK).

**WEAG** Western European Armaments Group.

**weakest maintained** Weakest fuel mixture at which under specified conditions maximum power can be maintained; also called WMMP.

**weak extinction** Cessation of combustion [the flame goes out] because of inadequate supply of fuel in a gas-turbine combustor.

**weak link** Point at which structure, esp. hold-back tie (eg on aircraft about to be catapult-launched), is designed to break when normal operating load is applied. Catapult launch \*\* resists full thrust of aircraft engines but breaks when catapult thrust is added. Occasionally a safety feature fracturing only on overload.

**weak mixture** Fuel/air ratio for piston engine below stoichiometric; economical for cruising but engine runs hot. Hence \*\* rating, maximum power permitted for specified conditions cruising with \*\*, \*\* knock rating, fuel performance-number grade under economical-cruise conditions.

**weak tie** Structural weak link designed to fail in normal operation (eg holdback on catapult takeoff).

**weapon-aiming system** That governing launch trajectory of unguided weapon.

**weapon bay** Internal compartment for carriage of weapons, esp. of varied types, eg AAMs, ASMs, NWs, free-fall bombs, guns, sensors, cruise missiles etc. If for one type of weapon preferable to be more explicit. Derived terms include \*\* door, \*\* fuel tank, \*\* hose reel pack.

**weapon control system** Avionics and possibly other subsystems (eg optics) built into launching aircraft to manage weapons before release and release them at correct points along desired trajectories. Should not be used to mean radio command or other form of guidance system of missile.

**weapon debris** Residue of NW after explosion; not usually well defined but generally means all solids (assumed recondensed from vapour) originally forming casing, fusing and other parts, plus unexpended Pu, U-235 or other fissile material.

**weapon delivery** Total action required to locate target, establish release conditions and maintain guidance to target if required (ASCC).

**weaponeering** Process of determining quantity of specific weapon necessary for required degree of damage to particular (surface) target. Takes into account defences, errors, reliabilities etc.

**weaponized** Modified to carry weapons (USAF UAVs).

**weapon line** See **bomb line**.

**weapon-replaceable assembly** Any item, not necessarily related to weapons, that can be quickly removed and replaced, such as a PCB.

**weapons assignment** Process by which weapons are assigned to individual air weapons controllers for an assigned mission (DoD).

**weapons of mass destruction** For arms-control purposes, strategic NW, C, B, R devices with potential of killing large numbers of people, but exclusive of delivery systems.

**weapons recommendation sheet** Defines intention of attack and recommends nature of weapons, tonnage, fusing, spacing, desired mean points of impact, intervals of reattack and expected damage.

**weapons state of readiness** In DoD usage, lists of numbers of air-defence weapons and reaction times: 2 min, 5 min, 15 min, 30 min, 1 h, 3-h, and released from readiness.

**weapon system** 1 A weapon and those components required for its operation (DoD, NATO). This could

simply be a part of a manned aircraft, eg radar, HUD, WCS.

2 Composite of equipment, skills and techniques that form instrument of combat which usually, but not necessarily, has aerospace vehicle as its major operational element (USAF). As originally conceived in 1951, includes all type-specific GSE, training aids, publications and every other item necessary for sustained deployment.

**weapon-systems physical security** Concerned to protect aerospace operational resources against physical damage.

**weapon/target line** Sightline (straight line) from weapon to target.

**Weasel** See *Wild*\*.

**weather** Short-term variations in atmosphere, esp. lower atmosphere.

**weather advisory** Expression of hazardous weather likely to affect air traffic, not predicted when area forecast was made.

**weather beam** Emitted by radar operating in weather mode, conical pencil of approx 5° total angle projecting horizontally ahead (thus filling whole troposphere about 100 km ahead).

**weather categories** 1 Traditional \*\*, eg US cat C (contact), N (instrument) and X (closed), common today in many countries.

2 Precise measures of DH/RVR as they affect arrivals; Cat 1, DH 60 m/200 ft or better, RVR 800 m/2,600 ft or more; Cat 2, 60–30 m/200–100 ft, 800–400 m/2,600–1,300 ft; Cat 3a, 0 along runway, 200 m/700 ft in final descent phase; Cat 3b, 0, 50 m/150 ft; Cat 3c, 0, 0, (visual taxiing impossible).

**weather central** Organization collecting, processing and outputting all local weather information.

**weathercocking** Tendency of aerodynamic vehicle to align longitudinal axis with relative wind; note that this affects pitch as well as yaw. Effect is felt in flight and when taxiing.

**weathercock stability** Basic directional stability of air vehicle or re-entering spacecraft; in CCV (eg modern fighter) this is degraded to ultimate degree and replaced by synthetic \* applied by avionics linking sensors to flight controls.

**weather forecast** Prediction of weather within area, at point or along route for specified period.

**weather map** Shows weather prevailing, or predicted to prevail.

**weather minima** Worst weather under which flight operations may be conducted, subdivided into VFR and IFR; usually defined in terms of ceiling, visibility and specific hazards to flight.

**weather radar** Airborne radar (less often, surface radar) whose purpose is indication of weather along planned track; traditional output is picture of heavy precipitation, but modern \* can indicate severe turbulence (in meaningful colours) even if precipitation absent.

**weather reconnaissance** Flight undertaken to take measurements (traditionally = thum = temp + humidity) at specified flight levels up to near aircraft ceiling; today rare but also includes all forms of weather research.

**weather report** 1 Broadcast \* by national weather service, eg each hour.

2 An actual, transmitted by airborne flight crew.

**weather satellite** See *met. satellite*.

**weathervane** US term for weathercock (eg on building),

## weathervane stability

and for weathercocking tendency of aircraft on ground to face into wind. Hence \* effect of vertical tail, which progressively gives directional stability to VTOL aircraft as forward speed increases.

**weathervane stability** That provided in flight by fixed tail surfaces.

**weave** 1 To make continuous and smooth changes of direction and height while over a period following a desired track; weaving assigned to proportion of fighters escorting slower aircraft so that continuous watch could be kept astern and in other difficult areas. Hence, weaver.

2 Angular wander of spin axis, esp. of gyro, radar scanner, rotary mirror etc.

**WEB** Web effective burn (time).

**web** 1 Principal vertical member of a beam, spar or other primary structure running length of wing or fuselage, providing strength necessary to resist shear and keep upper and lower booms (chords) correct distance apart. Occasionally expanded to \* member, \* plate.

2 In solid-propellant rocket, distance through which propellant burning surface will advance from initial surface until \* burnout as defined by two-tangent method; usually measured as linear distance perpendicular to initial surface, symbol  $\tau_w$ .

3 Any material form resembling sheet, either as discrete pieces or continuous \* unrolled from drum or coil; esp. sheet form of prepreg, supplied in standard widths.

**web average burning-surface area** Total volume of solid rocket propellant, excluding slivers, divided by web; thus has dimensions of an area, symbol  $A_s$ .

**webbing** Strong close-woven fabric strip produced to specified UTS, used eg for securing loose (bulk) cargo.

**weber, Wb** SI unit of magnetic flux; that flux which, linking circuit of one turn, produces EMF of 1 V as it is reduced to zero uniformly in 1 s. Symbol  $\Phi$ . To convert from maxwell, multiply by  $10^{-8}$ .

**web fraction** Web (2) divided by internal radius of motor case or chamber; symbol  $f$ , expressed as %.

**web rib** Rib fabricated from sheet or plate.

**WEC** World Energy Conference.

**WECMC** Wing electronic-combat management, or managers', course.

**WECPNL** Weighted equivalent continuous perceived noise level (see *noise*).

**WED** Water equivalent depth.

**wedge** 1 Air mass having wedge shape in plan, esp. such a mass of high pressure extending between two lows.

2 Sharp-edged essentially 2-D \* forming one wall of 2-D inlet of supersonic airbreathing engine, extending ahead of inlet so that its shock may be focused on inlet lip and normally extending rearwards as a variable ramp. Hence \* inlet.

3 Small \* added above trailing edge of aileron [rarely, other control surface] giving blunt trailing edge; supersonic equivalent of aileron cord.

**wedge aerofoil** Sharp LE and blunt TE, useless except at supersonic speed where efficiency is high, so confined to use on missiles. See *parallel double-\**.

**WEDS** Weapons effects display system.

**weeds, in the** 1 At lowest possible level, on TFR or manually (colloq.).

2 Location of [usually inadvertent] landing outside airfield boundary.

## weight

**wee-heat** A simple form of on/off turbojet afterburning.  
**weeping wing** Fitted with liquid-injection leading-edge de-icing.

**wef, WEF** With effect from.

**Wefax** Weather facsimile format; one selectable mode of data transmission between weather satellite and ground printout.

**Weft** Wings/engine(s)/fuselage/tail; most basic of mnemonics used in early aircraft-recognition instruction.

**WEG** Weapons Evaluation Group (USAF).

**Wehnelt** Type of cathode whose emissivity is enhanced by coating of radioactive-metal oxides.

**Weibull analysis** Standardised form of plotting component failure against age, categorised as infantile, wear-out and random.

**Weick** Coefficient for calculating propeller characteristic, also called speed/power coefficient,

$C_s = V^5 \sqrt{\rho/PN^2}$ , where  $V$  is velocity of advance,  $\rho$  is density,  $P$  is power and  $N$  is rpm See *power/speed coefficient*.

**weighing** Today almost all determination of aircraft weight is done by moving landing gears over platforms supported on load cells which measure forces by strain-gauges, whose output may be summed and displayed automatically. A few aircraft have landing-gear hydraulics giving a cockpit readout of weight and c.g. position.

**weighing points** Locations, published in engineering documents and stencilled on aircraft, where jacks may be applied in weighing process.

**weighing record** Hard copy updated each time aircraft is weighed; includes c.g. position.

**weigh-off** Free ballooning of airship before casting off to refine trim.

**weight** Force exerted on a mass by Earth's gravity; thus a figure unique to a particular location which by international agreement is any at which  $g$  (free-fall acceleration) is 9.80665 m/s. For modern aeroplane some measures include: empty, complete aircraft plus systems measured in accord with specification (eg in US military usage, MIL-STD-3374); CCDR, empty minus items listed in STD-25140A such as engine(s), starter(s), electrics and avionics where removable direct from racking, wheels/brakes/tyres/tubes; standard empty, bare aircraft plus unusable fuel, full oil and full operating fluids (thus excluding potable water); basic empty, standard empty plus optional equipment; structure, bare airframe without systems and equipment other than wing/tail movables and flight-control power units, flap actuation, landing gear and actuation, and equipped engine installation(s) minus engines; useful load, those items that when added to \* empty (for transport, OEW) will add up to gross weight for design mission (transport, MTOW); operating weight (military), empty plus useful load minus expendable fuel (internal/external), ammunition and stores; operating empty (OEW), equipped empty + all consumables (fuel, lube, filled galleys and bonded stocks, toiletries etc) + removable furnishings, reading and entertainment materials, cutlery, flight and cabin crews and their baggage, ship's papers; zero-fuel (ZFW), (military) operating plus ammunition/missiles/stores, (transport) MTOW minus usable fuel; gross (military), MTOW (civil), allowable at moment of takeoff; ramp (MRW), (civil) allowable at moment of starting engines; basic

flight design (military), takeoff with full internal fuel and useful load for primary mission; minimum flying gross (military), empty + minimum crew, 5% usable/unusable fuel (zero for flutter) and lube consistent with fuel; maximum design, military equivalent of MRW allowing for full internal/external fuel (in some cases extended to higher figure still after air refuelling); maximum landing (MLW, civil), figure specified for each type between ZFW and MTOW; landplane landing design gross, basic flight design gross plus empty external tanks and pylons minus 60% internal fuel; maximum landing design gross, maximum design minus dropped tanks, fuel expended in one go-around (overshoot) or 3 minutes (whichever is less) and any items routinely dropped immediately after takeoff; bogey, also called target bogey, established 4% below specification \* (in practice \* tends to rise, and bogey is usually a pious hope); specification (military), that number written into original agreed specification; job-package target/bogey, series of targets for each \* group parts-breakdown; current, also called current status, that representing best available information, obtained by adding to previously reported status all subsequent revisions.

**weight and balance sheet** Document carried with transport (military/civil) recording distribution of weight and c.g. at takeoff and (military) landing.

**weight breakdown** Subdivision of aircraft weight (usually a design gross) into broad headings: structure (itself divided into wing group, tail group, fuselage and landing gear), power-plant, equipment services, and disposable load (latter divided into fuel/consumable items and payload).

**weight coefficients** Dimensionless ratios BF/TOW, BF/ZFW, RSV/LW, RSV/ZFW, TOW/LW and TOW/ZFW.

**weight distributors** In a large gas-turbine engine the fuel pressure is equalised all round the combustor by a system of masses and springs, the latter being in unison at '6 o'clock' and in opposition at the top.

**weight flow** See *mass flow*.

**weight gradient** Required change in weight, eg MTOW, for unit change in temperature, usually expressed in kg/ $^{\circ}\text{C}$ , in such corrections as QNH variation, air-conditioning and anti-icing.

**weight in running order** Traditional measure of piston-engine weight in which radiator/coolant/pipes/controls were added, plus oil within engine, but excluding tanks/fuel/oil/reserve coolant/exhaust tailpipes/instruments.

**weightless** Condition in which no observer within system can detect any gravitational acceleration; can be produced either in free fall near a massive attracting body, eg Earth satellite, or remote from any attractive body.

**weight-limited** Payload that can be carried is limited by restriction on aircraft MTOW or ZFW and not by available space.

**weight-on-wheels** Signal sent to landing-wheel brake system confirming oleo struts are compressed, enabling brake [and, if fitted, lift dump] system to function.

**weight per horsepower** Usually incorrectly called power/weight ratio, basic measure of piston or other shaft-output engine; dry weight divided by maximum power (latter can be 2½-minute contingency).

**weight per unit thrust** Dry weight (mass) of jet engine divided by a specified measure of thrust (for

turbojets/turbofans usually SLS/takeoff); in SI it is not possible to divide a mass by a force, but a meaningful ratio is still obtainable provided units of both are compatible and specified.

**weightshift control** Controlling aircraft [micro, hang glider, or similar] by pilot moving his/her c.g. laterally or longitudinally.

**Weir tables** Azimuth diagram and tables for interpreting radio direction finding (obs.).

**weld bead** Metal deposited along welded joint.

**weld bonding** Combination of resistance spot-welding and adhesive bonding with properties superior to either alone.

**weld continuity** Specified as tack, intermittent, continuous.

**welded patch** Thin sheet-steel patch welded over local damage in steel tubular airframe.

**welded wing** Pair of aircraft in unvarying side-by-side formation about 500 ft apart.

**welded steel blade** Propeller blade assembled by edge-welding two shaped sheets of steel to form aerofoil, also called hollow-steel.

**weld fusion zone** Width of bead.

**welding** Joining metal parts by local melting, with or without addition of filler metal to increase strength of joint, using gas torch, electric arc, electrical resistance, friction, explosive, ultrasonic vibration and other methods, often with local atmosphere of inert gas. Techniques generally called diffusion bonding are closely allied but often require no heat or added metal and rely upon natural bonding of two clean surfaces in intimate contact.

**welding flux** Material, eg provided as coating on welding rod, which melts and flows over joint, excluding oxygen.

**welding jig** Fixture for holding parts to be welded in exact relative positions while joints are made.

**welding machine** Invariably an electric machine welding workpieces by spot, roll or seam methods.

**welding rod** Consumable rod of correct metal to act as joint filler which also conveys current to form arc struck against workpiece; diameter selected according to current and usually with flux coating.

**well** 1 Generalized code word (including air intercept) = serviceable.

2 Internal space or compartment for retractable item such as landing gear, FLIR or radar.

**Wellington boot** Radar viewing vizor.

**WEM** Warning electronic module.

**WEMA** Western Electronic Manufacturers Association (US).

**WEP** 1 Weapon effect planning.

2 War emergency power.

**WEPSS** Wideband enhanced passive surveillance system (USAF).

**WES** 1 Warning electronic system.

2 Weapons effects simulation, or system.

**Westland-Irving** British name for an internally balanced flight-control surface, esp. aileron.

**wet** 1 To come in contact with surface of body; hence wetted area.

2 With water injection [see *wet thrust*].

3 Of station or pylon, plumbed for fuel, or carrying a tank.

4 Fuel included [hire cost per hour].

**wet adiabatic**

5 Structure is sealed to house fuel [see \* *wing*, but adjective also applicable to fuselage, fin or horizontal tail, eg Airbuses].

**wet adiabatic** See *saturated adiabatic*, SALR.

**wet and dry bulb** See *pyrometer*.

**wet assembly** Important technique for modern aerospace structures in which all primary components are not only given successive surface treatments but are put together and joined while their surfaces are still wet; eg each component would be anodised, then coated with primer and finally with Thiokol sealer, rivets or bolts also being coated with Thiokol except in case of interference-fit bolts (Taper-loks or radius-nose Hi-loks) which fill holes completely.

**wet boost** Boost pressure permissible for piston engine with water injection in operation.

**wet builder** Manufacturer employing wet-assembly techniques.

**wet-bulb potential** Temperature air parcel would have if adiabatically cooled to 100% RH and then adiabatically brought to 1,000 mb level.

**wet-bulb thermometer** Has sensitive element surrounded by muslin kept moist by supply of water, hence reading gives indirect measure of relative humidity.

**wet emplacement** Rocket test emplacement or vehicle launch pad whose flame deflector and nearby parts are cooled by deluge of water.

**wet film** Film, usually large-format, used in traditional optical camera.

**wet filter** Particles are retained by a liquid film on element surface.

**WET FUR** Mnemonic for remembering aircraft components for recognition purposes: wings, engines, tail, fuselage, undercarriage, radiators (or radomes) (UK, WW2).

**wet H-bomb** Thermonuclear device whose fusion material is liquid, cryogenic or otherwise not a dry solid.

**wet layup** Fabrication of composite structure using reinforcements saturated with liquid resin.

**wet lease** Hire of commercial transport from another carrier complete with crew (at least flight crew, but often not cabin crew) and in effect forming continuation of previous operation, with major servicing performed by owner, but with hirer's logo and insignia temporarily applied.

**wet pad** Wet emplacement for launches.

**wet point, wet pylon** Wet station.

**wet rating** Power or thrust with water or water/methanol (rarely, water/alcohol) injection.

**wet-run anti-icing** Surface kept continuously above temperature at which droplets freeze.

**wet sensor** ASW sensor dropped or dunked into ocean, eg sonobuoy.

**wet side** Especially in a long banana-shaped accessory gearbox, the portion on which are mounted the fuel, oil and hydraulic pumps, and other items involving fluids.

**wet start** Faulty start of gas turbine in which unburned or burning fuel is ejected from tailpipe.

**wet station** Plumbed for fuel [or other liquid] carried in external tank.

**wet suit** Standard anti-exposure suit for working in sea; eg in winch rescue.

**wet sump** Piston-engine sump which serves as container for entire supply of lube oil.

**wet takeoff** Takeoff with water injection.

**wetted area** Total area of surface of body over which fluid flow passes and on which boundary layer forms. In case of aircraft usually simplified to visible external skin, ignoring inner surfaces or air inlets, ducts, jetpipes and air-conditioning system.

**wetted fibre** Fibre, eg carbon/graphite/boron/glass, coated with same resin as will be used to form matrix of finished part.

**wetted surface** See *wetted area*.

**wet thrust** 1 Thrust of jet engine with water injection.

2 Confusingly, thrust with afterburner.

**wetting agent** Surface-active agent which, usually by destroying surface tension, causes liquid to spread quickly over entire surface of solid or be absorbed thereby.

**wet weight** Weight of devices plus liquids normally present when operating.

**wet wing** Wing whose structure forms integral fuel tank. Note: not merely a wing in which fuel tanks are housed.

**wet workshop** Space workshop launched as operative rocket stage whose propellants must be consumed or removed prior to equipping as workshop in space.

**WEU** 1 Assembly of Western European Union [defence organization of 10 original countries, created 1954 by Modified Brussels Treaty, office B-1000 Brussels] (Int.).

2 Warning electronic unit.

**WEWO, Wewo** Wing Electronic Warfare Officer (RAF).

**WF** US mission prefix, weather-reconnaissance fighter.

**W<sub>f</sub>** Total weight of fuel.

**W<sub>f</sub>** 1 Mass flow rate of fuel, various further suffixes.

2 Gross weight with full tanks.

**WFA** WXR [weather radar] flat-plate antenna.

**WFC** 1 Wallops Flight Center (NASA).

2 Wet-film camera.

3 War Finance Corporation (US, WW1).

**WFD** Widespread fatigue damage.

**WFG** Waveform generator.

**WFNT** Warm front.

**WFO** Weather forecast office.

**WFOV** Wide field of view.

**WFP** Warm front passage.

**WFR** Water/fuel ratio.

**WFSC** Wavefront sensing and control.

**WFS** Wide-field sensor.

**WFU** Withdrawn from use.

**WFZ** Weapons-free zone.

**WG** 1 Working group.

2 Water gauge.

3 Weapons-grade Pu.

**Wg** Maximum growth, section width of tyre [tire].

**w<sub>g</sub>** Helicopter rotor upwash velocity normal to chord.

**W/G** Water/glycol.

**WGD** Windshield (windscreens) guidance display, transport-aircraft HUD for Cat IIIB operations.

**WGF** Wideband gap-filler.

**WGMD** Wire-grid micrometeoroid detector.

**WGN** White gaussian noise.

**WGS** 1 Weapon guidance system (GPS).

2 Followed by 72 or 84, World Geodetic Survey [1972] or System [1984].

3 Wideband gapfiller satellite, or system.

**WGT** Weight.

**WGU** Waveguide unit.

**WH** Hurricane advisory.

**Wh** 1 Watt-hour.

2 White.

**WHCA** White House Communications Agency.

**Wheatstone bridge** Circuit with known and variable resistances with which unknown resistance can be accurately measured.

**wheel** 1 Early aircraft commonly had such an input to lateral control system (cf ships, road vehicles); terminology is needed for all forms of stick/control column/handwheel/yoke/spectacles. No modern captain would say “take the \*”.

2 Complete turbine rotor, esp. single-stage or small size.

3 High-speed gyrostabilizing device (see *reaction* \*, *internal* \*, *gyro* \*).

4 Verb, change of heading by formation of aircraft.

5 Verb, to introduce 3-D curvature to sheet (see *wheeling*).

6 Noun, a defensive formation of several aircraft circling in horizontal plane.

7 Of column of marching men, to change direction whilst remaining in column of route.

**wheelbarrow** 1 Manoeuvre for airshows in which aircraft proceeds with nosewheel[s] in contact with runway and tail high in air (only possible with certain types of aircraft).

2 To reposition tailwheel-type light aeroplane by lifting tail and walking.

**wheelbarrowing** Violent oscillation in pitch on ground, either because of undulating surface or harsh brake application and rebounds from nose gear (not applicable to tailwheel aircraft).

**wheelbase** Distance in side elevation between wheel centres of nose and main landing gears; where there are two sets of MLGs (eg 747, C-5A) measure is to point midway between mean points of contact of front and rear MLGs.

**wheelbrakes** Brakes acting on landing-gear wheels.

**wheelcase** Compartment containing train of drive gears to accessories which are usually mounted thereon, the whole tailored to fit against or around prime mover, eg turbofan. There is only a shade of difference between this and accessory gearbox.

**wheel door(s)** Covers landing wheels when retracted.

**wheeler** Tail-high landing by tailwheel aeroplane, subsequently sinking into three-point position, also called wheely or wheelie.

**wheeling** Sheet-metal forming (on \* machine) by locally squeezing it between upper and lower rollers; workpiece hand-positioned to achieve desired 3-D curvatures.

**wheel landing** See *wheeler*.

**wheel load** Vertical force exerted by each landing wheel on ground; hence \*\* capacity, but this is imprecise in comparison with various soil-mechanics and civil-engineering measures, eg CBR.

**wheel mode** Satellite or position thereof rotates, often fairly slowly (5–30 rpm), for attitude stabilization.

**wheel satellite** Made in shape of wheel, normally rotating either for attitude stabilization or to impart artificial gravity to occupants.

**wheel track** See *track* (8).

**wheel trimming** By separate [usually small] wheel inceptor[s], requiring pilot to remove hand from flight control.

**wheel well** Compartment in which one unit of landing gear is housed when retracted.

**which transponder** R/T code: please state type of transponder fitted, IFF, SSR or ATCRBS (DoD).

**Whidds** War HQ information display and dissemination system (USA).

**whifferdil** Nose up 30°–60°, bank 90°, change heading 180° ending in dive.

**whiffletree** 1 Also rendered whippletree, originally horse-traction linkage, which equalized and distributed pull of many horses at one point; now used to distribute pull of one large hydraulic jack or other load applicator over an area of airframe via array of beams pulled at intermediate point (usually mid-point) and transmitting pull from both ends to other such beams.

2 Also used loosely for any pivoted beam or bellcrank (US).

**whip** One meaning is upward jump of carrier pendant or runway arrester wire after being depressed by passage across it of landing wheel.

**whip aerial** Flexible aerial (antenna), either quarter-wave or of arbitrary length and usually vertically polarized, projecting at about 90° from skin.

**whip stall** US term which appears ill-defined; existing definitions agree only on fact that \* is complete, violent and involves large positive change in pitch attitude; some suggest it is entered with flick manoeuvre, others make this impossible by suggesting possible tail-slide at outset. One authority gives tail-slide as alternative meaning. Recent authorities equate \* with stall turn.

**whirl** 1 Rotational flow of fluid, esp. when in translational motion in duct, in which case streamlines follow spiral paths.

2 Distortion of a shaft from straight to curved caused by centrifugal force, tending to be rapidly catastrophic. See *whirling mode*.

**whirling arm** Large family of instruments or installations in which object (usually under test) is whirled on end of balanced beam rotated about vertical axis; originally used for aerodynamic tests, eg of aerofoils, but now more often used to apply sustained high-g acceleration to human beings and devices, sometimes in evacuated chamber.

**whirling mode** Vibratory mode of shaft in which elastic bending is suffered, giving severe out-of-straightness either at end or along length, pronounced only at certain critical rpm (critical whirling speeds).

**whirl-mode flutter** Aeroelastic flutter, esp. of wing, in which input energy is derived, at least initially, from whirling of engine or propeller shaft (catastrophic on one type of turboprop transport).

**whirltower** Installation for static testing of helicopter main rotor, including overspeed conditions. Peripheral net retains separated blades.

**whirl velocity** Peripheral or tangential velocity, eg of flow in axial or centrifugal compressor.

**whirlwind** Small local tornado in dry air, without cloud or rain.

**whirlybird** Helicopter (rarely, other rotorcraft) (colloq.).

**whisker** 1 Small single crystal, usually lenticular, whose

## whiskers

strength is very close to maximum theoretically attainable.

**2** Sharpened contact pressed against semiconductor in point-contact transistor or solid-state diode; hence \* resistance.

**3** See next.

**whiskers** Multiple weak shocks on surface of real body, through each of which flow is retarded slightly. Hence whiskering effect.

**whisper-shout** A sequence of ATCRBS interrogations and suppressions of varying power levels transmitted by TCAS equipment to reduce severity of synchronous interference and multipath problems.

**whistle** Annoying high-pitched note, usually slightly varying in pitch, caused by interference carrier in superhet reception.

**whistler** RF signal, usually in form of falling note, generated by lightning; heard on Earth and Jupiter and in former case bounces to and fro along magnetic-field lines between N/S hemispheres.

**Whitcomb body** Streamlined body added to aircraft (eg wing trailing edge) to improve Area Rule volume distribution; many other names, eg speed bump, Küchemann carrot.

**White** **1** Not black, hence can be disclosed to public.

**2** Friendly, as alternative to Blue.

**3** Overseeing authority in war game.

**white, white hot** TV/video mode giving positive (normal) picture, which in IR display renders hot as white and cold as dark.

**white body** Hypothetical surface which does not absorb EM radiation at any wavelength, ie absorptivity always zero.

**white level** Maximum permissible video signal, 100% + modulation or 0% -.

**white noise** **1** Strictly, noise having constant energy per unit bandwidth (Hz).

**2** Commonly used to mean spectrum of generally uniform level on constant-% bandwidth basis (so-called broadband noise) without discrete-frequency components.

**whiteout** **1** Loss of orientation with respect to horizon caused by overcast sky and sunlight reflecting off snow.

**2** Zero visibility caused by what one authority calls ping-pong-ball snow.

**White Rating** Holder of licence is authorized to land in cloud base  $\geq 400$  ft, 122 m.

**white room** **1** Super-clean room in which air is continuously filtered to eliminate micron-size and larger particles and special rules almost eliminate introduction of contaminants by human beings or objects (eg india-rubber, pencils, handkerchiefs, etc, prohibited).

**2** Anechoic chamber.

**3** Overseeing authority in war game, esp. in netcentric warfare.

**White Sands** Chief USA missile range, large area of New Mexico; abb. WSMR.

**white-scarf syndrome** Alleged antipathy towards UAVs by human pilots (US, esp. USAF).

**white smoke** Unburned fuel vapour in engine efflux.

**white-tailed** **1** Not bearing markings of a commercial air carrier.

**2** Available for wet or dry lease with peelable logo and name.

## wide-cut

**3** Completed but unsold.

**4** Company demonstrator (recently including UAV).

**White World** Ordinary [not black], especially in manufacturing industry.

**Whitney punch** Hand-operated tool for punching holes of selected sizes in metal sheet.

**Whitworth** Traditional UK screwthread with radiused crest and root and 55° angle.

**whizzer** TV zoom lens.

**whizzkid** Civilian analyst or adviser in DoD.

**whizzo** WSO (colloq.).

**WHO** World Health Organization (UN agency, HQ Switzerland).

**whole-aircraft charter** Operator charters complete aircraft for one flight or for a period, in contrast to split charter.

**whole-body counter** Nucleonic instrument for identifying and measuring body burden (whole-body received radiation) of human beings and other living organisms.

**whole-range distance** Horizontal distance between point vertically below release point and whole-range point.

**whole-range point** Point on surface vertically below aircraft at moment of impact of bomb released by it, assuming constant aircraft velocity (ASCC).

**WI** **1** Welding Institute (BWRA).

**2** Within.

**3** Wallops Island, Virginia.

**WIA** **1** Wounded in action.

**2** Women in Aviation (US).

**WIAS** Weather information and display system.

**WIC** **1** Warning information correlation.

**2** Women, infants and children.

**3** Weapons instructor course.

**wick** **1** See *static wick*.

**2** Throttle(s); eg to turn up \* = increase propulsion power (colloq.). Invariably used for turbine engine(s), esp. jet(s).

**WID** Width.

**WIDE** Projection equipment used in simulator to generate FOV of  $150^\circ \times 40^\circ$  (Redifon); WIDE II, five projectors for  $200^\circ$ .

**Wide** Wide-angle infinity display equipment.

**wide-area augmentation system** Under development from 1995 to improve GPS accuracy (FAA).

**wideband amplifier** One offering uniform response over many decades of frequency.

**wideband dipole** Large ratio diameter/length.

**wideband ratio** Ratio of occupied frequency bandwidth to intelligence bandwidth.

**wide body** See *wide-body aircraft*.

**wide-body aircraft** Commercial transport with internal cabin width sufficient for normal passenger seating to be divided into three axial groups by two aisles; in practice this means not less than 4.72 m (15 ft 6 in) (B.767, narrowest \*\*).

**wide-cut** Generalized term for aviation turbine fuels assembled from wider range of hydrocarbon fractions than kerosene-type fuels; more accurate term is wide boiling-point range, for whereas little or no kerosene-type boils below  $174^\circ\text{C}$ , \* begins to boil at  $52\text{--}53^\circ$  and fractions continue to boil off at up to about  $220^\circ$ . SG well below 0.76, compared with 0.79–0.8 for kerosene-type fuels. Widely held to be dangerous because of high volatility

## wide-deck

(arguable) but operational fuel of nearly all air forces and several airlines.

**wide-deck** Lycoming term for piston-engine cylinder having wide base held by hexagonal nuts on large-radius circle; no separate hold-down rings or plates.

**widespread fatigue damage** Potentially catastrophic reduction in strength of structure cause by networks of small [e.g., microscopic] cracks.

**widget** Any small cunning, fascinating device.

**Widia** German range of sintered tungsten carbides with 3–13% Co.

**WIDS** Weather information display system.

**width** Maximum lateral dimension of lifting-body aircraft, equivalent to span.

**width of sheaf** Lateral interval between centres of flak bursts or bomb impacts (DoD).

**WIDU** Wireless Intelligence and Development Unit (RAF, from October 1940).

**WIE** With immediate effect.

**Wiedemann-Franz law** States ratio of electrical to thermal conductivity for all metals is proportional to °K (for most metals observed value is slightly higher than \*\* figure).

**Wien bridge** Stabilized oscillator whose frequency is determined by circuits incorporating resistances, capacitances and two triodes.

**Wien law** States wavelength of peak radiation from hot-body source is inversely proportional to °K; =  $\frac{2,900\mu}{T}$ .

**WIFU** Weapons interface unit.

**WIG, WIGE** Wing in ground effect.

**wigglystrip** Rolled [occasionally machined] refractory strip with endless square-corner up/down form [combustors and afterburners].

**WII light** Wing ice inspection light.

**Wilco** R/T code: "I will comply with your instruction".

**wildfire** Forest fire out of control.

**Wildhaber-Novikov** Best known form of conformal gears with mating profiles formed by convex/concave circular arcs whose centres of curvature are on or near pitch circles.

**Wild Weasel** Though originally name of specific programme, now generalized term for dedicated EW platform based on airframe of combat (eg attack or fighter) aircraft.

**Williot** Diagram which graphically portrays deflections of all joints (panel points) of loaded planar truss; result contains small inaccuracies which are removed by Mohr correction diagram, result being called Williot-Mohr.

**will not fire** Code sent to spotter or other requesting agency affirming that target will not be engaged by surface fire.

**willy-willy** Tropical cyclone (Australia).

**Wimet** British range of tungsten carbides.

**WIMS, Wims** Worldwide intratheatre mobility study.

**WIN** 1 WWMCCS intercomputer network.

2 Web industrial network.

**winch launch** Launch of glider by winch, usually locally built on road vehicle and driven by latter's engine.

**winchman** Member of aircrew of rescue helicopter in charge of winching payloads, eg rescues, and who may hand winch to colleague and descend to organize pick-up of incapacitated rescuer from below.

## window

**winch suspension** Rigging joining kite balloon and flying cable.

**wind across** Horizontal component of wind at 90° to catapult or centreline of (axial or angled) deck.

**windage** Loss of rpm of rotating device caused by air drag.

**windage jump** Vertical jump (up or down) of bullet trajectory caused by crosswind, eg firing laterally from bomber or gunship.

**wind angle** Angle between wind direction and true course (heading), measured 000–180° L or R of course.

**wind axes** 1 In UK usage, three rectilinear axes (u, v, w) with origin within aircraft, usually at c.g., and directions each representing component of relative wind in longitudinal, lateral and vertical planes. Traditional names: lift axis, + upward; drag axis, + to rear; crosswind axis, + to left.

2 In US usage, X, Y, Z, each the exact opposite of drag, sideforce and lift and acting through c.g. to eliminate rotary and translational motions.

**wind cone** See *windsock*.

**wind correction angle** Difference between course and track.

**wind diagram** US for triangle of velocities.

**wind direction** That from which wind is coming, expressed as number from 000° to 359°.

**wind down** Horizontal component of wind along axis of catapult or centreline of (axial or angled) deck.

**Windee** Wind-tunnel data encoding and evaluation (EDP [1]).

**wind factor** Net effect of wind on aircraft progress, expressed as ± knots (USAF).

**wind-gauge sight** Drift meter; instrument which (BSI definition), by determining track on two or more courses, enables air, wind and ground speeds to be represented by vectors (arch.).

**wind gradient** Rate of change of wind with unit increase in height AGL; usually factor of interest is component of wind along runway, thus direct headwind at 150 m/500 ft veering to crosswind at threshold is regarded as change equal to full wind speed even though actual wind speed does not alter. See *windshear*.

**winding** See *filament* \*.

**WINDMG** Wind magnitude.

**Windmill** An aerobatic manoeuvre comprising an upward Immelmann followed by a flat spin with AOA of c90°.

**windmill** 1 Of inoperative engine, to be driven by propeller (piston or turboprop) or by ram airflow through it (turbojet or turbofan); hence windmilling, windmilling drag etc.

2 Small propeller-like \* used on older aircraft to drive electrical generator and occasionally other machines; in principle like modern RAT but permanently operating.

3 Of free-turbine propeller, to spin idly in wind when aircraft parked (normally prevented by brake).

4 Propeller (colloq.).

**windmill-brake state** Operating condition of helicopter rotor in which thrust, flow through disc and flow outside disc are all in same direction, the rotor extracting power from the slipstream.

**wind over deck** Vector sum of wind plus speed of carrier.

**window** 1 Transparent area in skin for aircraft optics or IR (in latter case not apparently 'transparent').

## Windpads

## wing area

2 WW2 code for frequency-cut metal reflective slivers, wire, foil etc that later became better known by US name chaff (ECM).

3 Launch opportunity, defined as unique and possibly brief time period in which spacecraft can be launched from its particular site and accomplish its mission; usually recurring after a matter of days to months.

4 Small band of wavelengths in EM spectrum to which Earth atmosphere is transparent; there are many such, though together they account for only small part of total spectrum, rest being blocked. Like (3) this meaning rests on \* being a small transparent gap in a dark continuum.

5 Verb, to enlarge local part of drawing or graphic display, usually to show greater detail.

**Windpads** Wind-profile precision air-delivery system (para-drop accuracy, USAF).

**WINDR** Wind direction.

**wind rose** Polar plot for fixed station showing frequency of winds and strengths over given (long) period from 000°–359°.

**wind rotor** Multi-blade rotor for forced aircooling of landing-wheel brake, of which it forms part.

**Winds** Wideband internetworking engineering, test and demonstration satellite (J).

**winds aloft** US term for upper winds.

**windscreen** Windows through which pilot(s) look ahead, called windshield in US. Originally on open-cockpit aeroplanes complete assembly of frame and windows ahead of pilot's head. On modern flight deck less obvious and generally replaced by such term as flight deck windows/transparencies/fenestration, which includes side and roof (eyebrow) windows.

**windscreen wiper** Term confined to mechanical devices with oscillating blades; rotary-disc and air-blast (eg for rain-shedding) excluded.

**windshear** Exceptionally large local wind gradient. Originally defined as 'change of wind velocity with distance along an axis at right angles to wind direction, specified vertical or horizontal' (BSI), which is same as wind gradient. Today recognized as extremely dangerous phenomenon because encountered chiefly at low altitude (in squall or local frontal systems) in approach configuration at speed where \* makes sudden and potentially disastrous difference to airspeed and thus lift. In practice pilot must take into account air movement in vertical plane (see *downburst*) because sudden encounter with downward gust is more serious than mere fall-off in headwind. Often accompanied by severe turbulence and precipitation which can make traditional ASI under-read.

**windshear indicator** Modern electronic displays will show \* situation well, but with traditional instruments an extra dial is avoided by adding an energy-rate pointer to VSI; this striped needle is driven by combined vertical-speed rate and rate of change of airspeed to show rate of change of aircraft energy. Pilot can readily work throttles to keep this needle coincident with VSI needle.

**windshield** See *windscreen*.

**windshield guidance display** Optical projector in glareshield giving HUD-type ground-roll guidance after blind (Cat IIIB) touchdown.

**wind shift** Sudden change in wind direction.

**wind sleeve** See next.

**windsock** Traditional fabric sleeve hung from mast to give rough indication of local wind strength/direction;

also called wind sleeve, wind cone. Inlet called throat or mouth.

**wind star** Plot for determining wind by drawing drifts measured on two headings (US, arch.).

**wind tee** White T-shaped indicator displayed in signals area to show pilots wind direction; also called wind T. See *tee*.

**wind tetrahedron** US counterpart of wind T (which is also used in US): large pyramid shape indicating wind direction, rotated on pedestal.

**wind tunnel** Any of family of devices in which fluid is pumped though duct to flow past object under test. Duct can be closed circuit or open at both ends. Working section, containing body under test, can be closed or open (called open jet). Fluid can be air at any temperature/pressure or various other gases or vapours. Operation can be continuous, intermittent or as brief as a millisecond. Particular species is spinning tunnel.

**wind-tunnel balance** Apparatus for measuring forces and moments on object tested in tunnel; originally included actual mounting for object but today usually electrical force-transducers built into sting.

**wind-tunnel stability axes** Considered more helpful term than mere 'stability axes' for data from tunnels.

**windup** Integrator saturation in a digital flight-control system.

**wind-up turn** Turn by winged aerodyne that becomes ever-tighter [rhymes with mind].

**wind vane** Small pivoted blade which aligns itself with local airflow; usually drives via rotary viscous damper to one or more precision potentiometers to form a flow-angle transmitter for AOA (pivoting on horizontal axis) or yaw.

**windy drill** Workshop tool driven by high-pressure air (colloquial).

**wing** 1 Main supporting surface of fixed-\* aerodyne; despite term 'rotating-\* aircraft' not used in that context, usual word for rotating supporting aerofoils being blade. Normally taken to cover all parts within main aerofoil envelope, including all movable surfaces. Many terms, eg \* jig, \* structure, are judged self-explanatory.

2 Numerous types of military unit, eg in RAF basic combat administration organization comprising perhaps three squadrons, often all sharing same base, but in US usually a larger unit comprising one or more groups with support organizations, in Navy a self-contained unit for deployment of organic air power at sea (one \* per carrier) or land, and in Marines those aviation elements for support of one division.

3 Extreme left or right of battlefield or aerial formation.

4 To be positioned on \*, to be alongside in formation (see *wingman*).

5 To fly (colloq.).

**wing area** 1 Area of surface encompassed by planview outline drawn along leading and trailing edges, including all movable surfaces in cruise configuration, and including areas of fuselage, nacelles or other bodies enclosed by lines joining intersections of leading or trailing edges with such bodies. One expression is

$$S = \int_{-b/2}^{b/2} c dy \text{ where } b \text{ is span, } c \text{ chord at distance } y \text{ across}$$

lateral axis. Thus, pods hung below wing are excluded;

## wing arrangement

## wing skid

wingtip tanks are normally excluded; winglets are included as they appear in plan view; in case where root meets fuselage or nacelle at sweep approaching 90° (eg with forebody strakes) most authorities include these portions and fuselage up to intersection of leading edge with fuselage. VG 'swing wing' is measured at minimum sweep. Foreplane for lifting canard is counted separately.

2 Net \*\* excludes projected areas of fuselage, nacelles etc. Note: US measures of gross \* often omit all areas outside basic wing trapezum, such as exist if taper is greater at root.

**wing arrangement** 1 Basic configuration of aeroplane.

2 Height at which monoplane wing is mounted, eg low, mid etc; see *wing position*.

**wing axis** Locus of all aerodynamic centres.

**wing bar** Row of approach lights perpendicular to runway and starting beyond runway edge (Vasi).

**wing bending moment** Bending moment. Hence \*\*\* relief, reduction afforded by masses (fuel, engine pods) distributed across span instead of being located in or on fuselage.

**wing bending torsion mode** Aeroelastic deflection, sustained or flutter, of swept wing in which bending introduces twist.

**wing/body fillet** Fillet, possibly very large, filling in rear part of wing/body junction to prevent separation of flow and possibly reduce peak velocities and suctions.

**wing box** Primary structure of modern stressed-skin in which all loads are taken by cantilever beams comprising upper and lower (usually machined) skins joined to front and rear spars, plus small number of ribs (occasionally additional spar[s] within \*). This strong structure, usually by far heaviest single piece of airframe, is usually sealed to form integral tank.

**wing car** Airship car suspended to L or R of centreline.

**wing cell** See *cell*, *cellule*.

**wing centre section** See *centre section*.

**wing chord** See *chord*.

**wing drag** When lifting, induced plus profile drags.

**wing drop** Sudden loss of lift on one wing, eg near stalling AOA, causing rapid roll not recoverable by aileron.

**wing fence** See *fence*.

**wing fillet** See *fillet*; avoided if possible, but often introduced because of need to accommodate main landing gears and in some cases combined with air-conditioning ducts on underside.

**wing flaps** See *flap*.

**wing flutter** See *flutter*.

**wing guns** Guns mounted within or attached to wing.

**wing heavy** Tending to roll in one direction.

**wing in ground effect** Class of vehicles, arguably aircraft, supported by a wing riding close above Earth surface. Unlike ACV (hovercraft) they rely for lift on forward speed.

**wingless wonder** 1 Officer without brevet (RAF colloq., derogatory).

2 Aircraft whose wings have been permanently removed, to end its days in ground test programmes [eg, catapult/arrest].

**winglet** 1 Upturned wingtip or added auxiliary aerofoil(s) above and/or below tip to increase efficiency of wing in cruise, usually by reducing tip vortex and thus

recovering energy lost therein and improving circulation and lift of outer portion of wing.

2 Miniature wing mounted horizontally on fuselage (not at nose or tail), on interplane struts or elsewhere (eg nacelles), often not so much for lift as to carry external load or connect bracing struts or main gears to fuselage.

**winglet lift** This invariably means the resultant force on the winglet, which is usually perpendicular to the surface in the vertical plane and inclined forwards [giving a positive thrust component] in the horizontal plane.

**wing leveller** Simple single-axis autopilot with authority only in roll; often with heading lock and VOR/ADF coupler. Generally synonymous with aileron-centring device.

**wing loading** Gross weight or MTOW divided by wing area (1); 1 lb/sq ft = 4.88243 kg m<sup>-2</sup>; reciprocal 0.204816.

**wingman** Second in element of two combat aircraft, esp. interceptors; term loosely applied to pilot or aircraft. Flies off wingtip of element leader except when required to perform manoeuvres, eg day/visual intercept of unidentified aircraft.

**wingover** US flight manoeuvre most briefly defined as climbing turn followed by diving turn; at apogee aircraft (usually trainer) is almost stalled, and rotation continues in pitch and roll so that recovery takes place at lower level by diving out on reciprocal. Almost = stall turn.

**wing overhang** See *overhang*.

**wing panel** See *panel*.

**wing pivot** That on which VG wing ('swing wing') is attached.

**wing plan** Shape of wing outline seen from above (see *plan*).

**wing position** Height at which wing (1) is mounted relative to fuselage, esp. as seen from front, eg low, shoulder, parasol etc.

**wing profile** See *profile*.

**wing radiator** Cooling radiator mounted on wing, esp. inside wing, fed by leading-edge inlet.

**wing reactions** Those forces applied to fuselage by wing.

**wing rib** See *rib*.

**wing rider** A wing walker [and more accurate term].

**wing rock** Oscillatory roll/yaw motion of [usually swept-wing] aircraft at high AOA; similar to inertia coupling, but for different reasons.

**wing root** Junction of wing with fuselage (not with nacelle or any other body). Some authorities include junction of wing with opposite wing, eg on centreline (upper wing of biplane). Hence \*\* chord, \*\* fillet, \*\* thickness.

**Wings** 1 Weather information and navigational graphics system (PC-based, overlays latest Wx on planned route by GA pilot).

2 Commander (Flying) on RN carrier.

**wing section** Appears to be synonymous with aerofoil section, wing profile; only ambiguity caused by erroneously using term to mean portion of wing, eg centre section, outer panel.

**wingset** Left and right (port + starboard) wings for same aircraft.

**wing setting** See *angle of incidence*.

**wingside** More specific than airside: in immediate proximity of parked aircraft.

**wing skid** Protective skid on underside near tip (rare since 1916).

**wing skin** Usually refers to large stressed skin forming upper or lower surface of wing box; largest single piece of material in aircraft.

**wing slot** Slot built into wing; extends through outer wing from lower to upper surface with profile generally similar to that left by open slat.

**wing spar** Principal spanwise member of wing, in traditional or light aircraft usually isolated but in modern stressed-skin wing forming one face of wing box which itself behaves as a spar. Always extends full available depth, unlike stringers. In slender delta built perpendicular to longitudinal axis, thus in such wings there are many spars which terminate not at tip but at points along leading edge.

**wing spread** See *span*.

**wing strut** Primary structural links joining wings of biplane (interplane struts) or bracing high-wing monoplane diagonally to fuselage (such are actually ties in flight but struts on ground).

**wing sweep** See *sweep*.

**wing tanks** 1 Tanks, normally for fuel, either accommodated in wing or (integral) formed by sealing wing box.

2 Wing-mounted drop tanks where aircraft also has drop tanks elsewhere; thus \*\* may be dropped first to permit sweep to be increased.

**wingtip** Outer extremity of wing; either extreme tip or general area.

**wingtip aileron** Aileron forming entire tip of wing, either with chordwise inner end or extending inboard along trailing edge.

**wingtip extension** Increase of span by adding at tip at same dihedral angle as wing.

**wingtip fence** Winglet of very low aspect ratio.

**wingtip flare** Pyrotechnic attached to wingtip and ignited by pilot to assist night landing (obs. technique).

**wingtip float** Stabilizing float of flying boat, usually inboard from wingtip.

**wingtip handler** Person walking beside sailplane being towed across airfield holding one tip so that wings are level.

**wingtip rake** See *rake*.

**wingtip sail** Winglet, especially prominent.

**wingtip tank** External fuel tank, jettisonable or not, carried on wingtip.

**wingtip vortex generator** Ducted windmill at wingtip providing shaft power. Does the opposite of generating vortex.

**wingtip vortices** See *vortex*; always present off tips of conventional wings at lifting AOA, and when intense (eg tight turn) pressure at centre falls so low that moisture condenses to leave white visible trail.

**wing truss** Wing plus all bracing struts and wires transmitting loads to or from fuselage.

**wingunder** Bunt [suggest unpremeditated].

**wing waggle** Waggle.

**wing walk** Area marked in upper surface where maintenance engineers may walk in soft shoes.

**Wing Walk** Patented brushed-on paint for walkways offering high coefficient of friction.

**wing walker** 1 Passenger, invariably attractive girl, who seldom walks but rides standing securely attached to upper centre section of biplane at airshow.

2 Person[s] required to hold a wingtip of taxiing aircraft to prevent unwamted weathercocking.

**wing warping** Lateral control by warping; called primary on lower wing of biplane, secondary on upper. Relies on wing torsional flexure (see also *warping*).

**wing yawmeter** Yawmeter in form of miniature wing, aligned vertically or (for AOA) horizontally, with sensing holes at 0.15 or less chord.

**WINN, Winn** Weather information network (NASA, Honeywell and others).

**WINS, Wins** 1 Workshop in negotiating skills.

2 Wireless instrumentation station [sometimes WIS].

3 Wireless integrated network sensor.

**WINTEM** Upper wind[s] and temperature[s].

**winterization** Process of equipping aircraft for flight in Arctic-type environment; obviously includes full anti-icing and de-icing of airframe, engines, propellers and flight-deck windows and extends to landing gears, systems, fluid specifications and many items of GSE.

**winter solstice** Point on ecliptic occupied by Sun at maximum southerly declination, around 22 December.

**WIP** Work in progress [i.e., check if field is open].

**wipe-off switch** Attached externally under belly or engine pod in most vulnerable place in belly landing; triggers safety system, eg tank inerting or fire extinguishers.

**WIPO** World Intellectual Property Organization; handles copyright (eg EDP data); Berne Convention.

**Wipps, WIPPS** Wideband integrated platform protection system.

**Wire** Wide-field IR explorer.

**wire** 1 See fly by \*.

2 Misleadingly in common use for the multi-wire cables used to arrest aircraft on carriers.

**wire braid** Woven covering over ignition cables to prevent escape of emissions causing radio interference.

**wire bundle** Large group of electrical wires individually tagged, clipped together and then attached as a unit to structure, usually in wireway.

**wired** 1 Fitted with locking wire.

2 Acronym, wind-tunnel integrated RTIC/RTOC experiments and demonstrations.

**wired program** One employing wired storage; also called fixed program.

**wire-drawing** 1 Manufacture of wire of required diameter by drawing through circular die.

2 Part-throttling fluid flow by passage through constriction (colloq.).

**wired storage** EDP(1) storage which was originally literally wired in and could be erased only by physically removing it; today any indestructable storage (usually for ROM).

**wire edge** Sharp burr along edge of sheet freshly cut by shear.

**wire gauge** 1 Measure of diameter of wire or thickness of sheet; in UK by SWG measure based on Imperial (0.001–0.5 in).

2 Hand gauge for measurement of sheet thickness or wire diameter.

**wire group** Several wires routed to common destination and tied by clips.

**wire guidance** Command guidance of missile or other vehicle by electrical signals (bang/bang or analog) conveyed along fine wires unrolled behind vehicle and used to position surfaces governing trajectory.

**wireless telegraphy** Transmission of Morse by radio.

## wire link

**wire link** Telemetry in which signals are conveyed by wire instead of by radio; also called hard-wire telemetry.

**wire locking** Tying a group of nuts with safety wire to prevent rotation.

**wiresonde** Meteorological balloon at low altitude transmitting data over fine wire(s).

**wire-strike kit** Measures taken to reduce lethality of impact between low-flying aircraft, usually small helicopter, and electric (eg national grid supply) cable. Simplest form is forward-sloping sharp-edged deflector. Guillotines [as in WW2] appear to be extinct.

**wireway** Large conduit forming secondary structure along which numerous electrical circuits (occasionally also fluid lines) are routed; in civil aircraft under floor or behind trim.

**wire-wound** Constructed by wrapping ultra-high-strength (eg tungsten) wire on mandrel and bonding by plasma spray or other method. Usually final part, eg rocket case or nozzle, has several layers aligned in different directions; also called wire-wrapped.

**wire-wrapped connection** Connection between single electrical signal wire and terminal made not with solder but by crimp wrapping by machine designed for purpose.

**wiring** All internal wires in airship, divided into structural \*, preserving cross-section and other dimensions, and gasbag \*, distributing lift and preventing chafing.

**WIS** WWMCCS information system.

**Wisp** Waves in space plasma.

**WIST** Windshear and turbulence (ICAO study group).

**WIT** Warfighter interface technology.

**witness** 1 Hole, groove, recess or slot cut in reference plate by each tool used in complete NC program for producing a large machined workpiece; if each \* is dimensionally correct this proves software and cutters and reference plate is stored as master for that program.

2 Marks on surface of structure or component showing where two surfaces rubbed, scored, impacted, jammed or became deformed prior to crash of aircraft.

**WIU** Weapon[s] interface unit.

**Wizard!** Expression of approval (RAF WW2).

**Wizzo** WSO (colloq. uial).

**WJAC** Women's Junior Air Corps (1939–, UK, became GVC [AC]).

**WJIS** Wall-jet induced suckdown.

**WK, Wk** Week.

**WK, WKN** Weaken, weakening.

**WKC** Watch Keeping Certificate (RN navigators).

**Wkdy** Weekday.

**Wkly** Weekly.

**wksp** Workshop.

**WL** 1 Water level, eg WL 365.8.

2 Weight-limited.

3 Will.

**WL** Actual aircraft landing weight.

**WL reference** Horizontal axis used to define water levels, usually synonymous with static ground line (usually not synonymous with longitudinal axis).

**WLC** Whole-life cost[s].

**WLD** Welded [pipe or tube].

**WLDP** Warning-light display panel.

**WLFL** Wet landing field length.

**WLG** Wing-mounted landing gear.

**WLOP** Air-defence and aviation force (Poland).

## wooden bomb

**WLR** Weapon-locating radar.

**WLR-Arbeitskreis** Defence and aerospace trade union (G).

**WLU** Wireless LAN unit.

**W/M, WM** 1 Water/methanol.

2 Weak mixture.

3 WXR [weather radar] mount [also WM].

4 Warm.

**WMA** Weather-radar waveguide adapter and antenna pedestal.

**WMAP** Wilkinson microwave anisotropy probe.

**WMC** 1 Warfare management computer.

2 War Manpower Commission (US, WW2).

3 Wrist-mounted control.

**WMD** 1 Weapons of mass destruction [-CST adds US National Guard civil support teams].

2 Walkthrough metal detector.

3 Wireless medical device.

**WM50** 50/50 mix of water and methanol.

**WMFNT** Warm front.

**WMI** Weather-radar indicator mount.

**WMMP** Weak-mixture for maximum power.

**WMO** World Meteorological Organization (UN agency, 1947–, HQ Switzerland).

**W/MOD** With modification of vertical profile.

**WMS** 1 World Magnetic Survey (ICSU).

2 Water mist system [fire protection].

3 Wide-area master station (WAAS3).

**WMSC** Weather-message switching centre; R adds replacement.

**WMT** Weather-radar mount.

**WN** Week number.

**WN** The Nth root of unity used in expressing coefficients of Fourier transform in complex notation =  $e^{-j2\pi/N}$ .

**W-N** Wildhaber-Novikov.

**WNA** Wrought nickel alloy.

**WNC** Weapon[s] and navigation computer.

**WND** Wind.

**WNS** Wideband netted sensors.

**WNW** Wideband network[ing] waveform[s].

**WO** 1 Work order.

2 Winch operator.

**W/O** Written off.

**W<sub>o</sub>** Gross weight.

**W/o** Without.

**WOA** Warbirds of America.

**wobble plate** See *swash plate*.

**wobble pump** Cockpit hand pump, eg for building up fuel pressure before starting piston engine.

**wobbulator** FM signal generator, varied at constant amplitude above/below central frequency.

**WOC** Wing Operations Center (US).

**WOD** Wind over deck (carrier).

**WOFF** Weight of fuel flow; usually means per unit time.

**wolfram** Tungsten.

**Wolf trap** Instrument with sample collector and numerous culture chambers for detecting life in interplanetary space.

**Womble** Wire-operated mobile bomb-lifting equipment.

**Wong** Weight on nose gear.

**wooden bomb** Hypothetical concept of weapon or device which has 100% reliability, infinite shelf life and requires no special storage, surveillance or handling (DoD).

**wooden round**

**wooden round** Missile that fails to work when needed (colloq.).

**Wood's metal** Low-melting alloy (70°C), typically 50% Bi, 25% Pb, 12.5% Sn, 12.5% Cd.

**woolmeter** Yawstring.

**woolpack** Cumulus.

**Woolworth carrier** CVE, escort carrier (WW2 colloq.).

**Woomera** Location in South Australia of Weapons Research Establishment, head of missile range extending northwest to Indian Ocean.

**WOP** Wet (integral-tank) outer panel.

**Wop** Radio ('wireless') operator (colloq., arch.); hence \* AG adds air gunner.

**Word** Wind-oriented rocket deployment (Stencil seat).

**word** Basic group of ordered characters, bits or digits handled in EDP (1) as one unit. In the latest standard buses [1553B and A629] bits 1/2/3 provide locked synchronization, bits 4 to a maximum of 19 send the word and 20 provides parity. In this protocol singnal change negative to positive sends 0 and positive to negative sends 1.

**word rate** Frequency derived from elapsed time between end of one word and start of next.

**words twice** Please repeat each phrase or sentence.

**Worf** Window Observational Research Facility.

**work** 1 Transfer of energy, defined as force multiplied by distance through which output moves.

2 Transitive verb, to use a particular ground station by airborne radio officer, hence working that station.

**work function** 1 Thermodynamic: Helmholtz free energy  $A = U - TS$  where  $U$  is internal energy,  $T^{\circ}\text{K}$  and  $S$  entropy.

2 Electronic: energy (usually measured in eV) supplied to electron at Fermi level in metal to remove it to infinite distance; governs thermionic emission.

**work hardening** See *strain hardening*.

**working** Productive flight by Ag-aircraft or RPH, hence \* height, \* speed, \* endurance; last measure excludes time between base and \* site.

**working fluid** Fluid used as medium for transfer of energy within system or (in wind tunnel) for study of flow around body. Can be gas, vapour or liquid.

**working line** On any graphical plot describing performance of a device [usually on 90° orthogonal axes], the line to which device is intended to perform. Prime example is gas-turbine compressor pressure ratio plotted against airflow, always a safe distance below surge line.

**working load** That borne by structure or member in normal operation; in aircraft varies greatly with turbulence, manoeuvres and with aeroelastic forces, and maximum is usually taken. Hence working stress experienced.

**working pressure/temperature** Value typical in normal operation.

**working section** Where model or other body is placed in wind tunnel; may be of open-jet form, without bounding walls, in traditional low-speed tunnel.

**working up** Process of turning newly formed squadron [or other unit] into state of complete combat-readiness.

**work lights** Powerful airborne floodlights, directed forward or laterally, to enable agricultural aircraft to work in the dark.

**work package** 1 Quantified series of operations required to make one part of airframe; eg one wing panel may be

divided into 15 \*\*, each of short time period and exactly costable.

2 Basic unit of manufacturing effort into which entire product (eg aeroplane) is divided for allocation of effort in agreed manner between programme partners.

**work parameter**  $dH/T$ , change of enthalpy over total temperature, or  $CP^{\text{dT}}/T$ , change in specific heat.

**works** 1 A factory (UK, suggest colloq.).

2 A functioning mechanism (UK, colloq.).

**workscope** A definition and schedule of work required for a particular item [especially an engine] on a shop visit, based on its condition and working environment.

**Works finish** Unpainted except for a coat of primer [probably an archaic usage] (UK).

**workstation** Local interface to any major CAE system or computer network.

**world fare** Averaged value(s) of IATA tariffs.

**World Geographic Reference System** Better known as Georef, uniform position-fixing and designation system for control of aircraft, targeting of ICBMs and many other functions (USAF).

**World Weather Watch** Scheme to share and disseminate weather-satellite information internationally; also called VMM (WMO).

**Worm** Write once, read many, or multiple.

**wormhole** Theoretically achievable short cut between two points [lightyears apart] by warping spacetime.

**Wortmann** Family of wing profiles designed by Prof F.X. Wortmann of Stuttgart; tailored to R appropriate to sailplanes (ie small chord), with outstandingly low drag which, esp. for flapped sections, extends over wide range of  $C_L$ .

**WOS** Weather observing station.

**WOT** Wide-open throttle.

**Wow, WOW** 1 Weight on [rarely, off] wheels, hence Wow switch.

2 Women ordnance workers (US, WW2).

**WP** 1 Warsaw Pact (now defunct).

2 Working paper.

3 White phosphorus; -T adds tracer.

**Wp** Payload.

**W/P** 1 Waypoint; also WP or WPT.

2 Work in progress.

**WPA** 1 Wheelchair Pilots Association (US).

2 Works Progress Administration (US 1935, for Federal relief).

3 Works Projects Administration (followed \* 2 to develop US civil airfields for defense purposes, 1939–43).

4 Weapon personality adapter.

**wPa** Warm polar Atlantic.

**WPAFB** Wright-Patterson AFB, Dayton, OH.

**WPB** War Production Board (US 1942 –).

**WPC** World plotting chart.

**wPc** Warm polar continental.

**WPFC** World Precision-Flying Championships.

**WPM, wpm** Words per minute.

**Wpn, wpn** Weapon.

**wPp** Warm polar Pacific.

**WPR** 1 Wideband programmable receiver.

2 Waypoint position report[s].

**WPT** Waypoint.

**WPU** Weapon programming, or processing, unit.

**WR** 1 Work request.

2 Wave rider, waferider.

## WRA

**WRA** 1 Weapon replaceable assembly.

2 War Resources Administration (US, WW2).

**WRAC** Women's Royal Army Corps (UK 1946–93).

**WRAF** Women's Royal Air Force (UK, 1949–94).

**WRALC** Warner-Robins Air Logistics Center (USAF).

**wrap-around** Wrap-round.

**wrapped connection** Not soldered but made by wire wrapping.

**wrapping cord** See *serving cord*.

**wrap-round boosts** Boost motors, usually four spaced at 90°, arranged around sides of body of missile or test vehicle and at burnout separated laterally.

**wrap-round engine** Turboramjet comprising turbojet core surrounded by separate ramjet duct; differs from afterburning turbofan in that there is no fan, all burners are in roughly same axial plane, and in RJ mode core is shut off.

**wrap-round fins** Rocket or missile fins which, before launch, are recessed around the curved body; they open after launch on hinges parallel to the longitudinal axis.

**wrap-round windscreen** Manufactured as single blown or vacuum-formed moulding forming entire front of cabinm, or cockpit, extending from nose or engine cowl to behind front seat[s].

**wrap-round wing skin** Single sheet wrapped around leading edge and forming upper/lower wing surfaces back to rear spar.

**WRB** War Resources Board (US, WW2).

**WRCP** Weather-radar control panel.

**WRCS** Weapon-release computer set (USAF).

**WRD** War-reserve drop-tank (large quantities in store).

**WRDA** Weapons range danger area.

**WRE** Weapons Research Establishment [Woomera, office at Salisbury, South Australia].

**Wrebus** WRE break-up system; radio-commanded method of explosively disintegrating errant vehicle.

**wreckage field** Total area of land or seabed considered to contain every part of crashed aircraft, especially one that broke up in flight.

**wreckage trail** Wreckage field from aircraft which broke up at high altitude.

**Wren[s]** See *WRNS*.

**Wright-Patterson AFB** Vast complex outside Dayton, OH, formed by 1948 merger of Wright Field [1917] and Patterson Field [1931] (USAF).

**wring (wringing it) out** To demonstrate one's piloting skill by flamboyant demonstration intended to push aircraft (usually training aeroplane) to limits; has overtones of poor airmanship.

**wrinkle** Visible buckle in skin.

**wrist actimeter** Gives alarm if pitch attitude changes, even slightly, with pilot dozing [interpreted as no wrist movement in 4 min]; can be set to alarm even with no aircraft rotation.

**wrist pin** 1 In UK: attaches radial-engine con-rod (articulated rod) to master rod; also called knuckle pin. Hence \*\* end of articulated rod.

2 US: attaches piston to con-rod [in UK called gudgeon pin].

**write** In EDP (1), to enter in memory, to record input information.

## WSK

**write off** To damage an aircraft so severely it is not judged worth repairing.

**write-off** 1 An aircraft so severely damaged that repair is uneconomic.

2 Unobligated balance of funds removed from account involved.

**written off** Struck off charge, for reasons of obsolescence, unrepairable damage, total cannibalization or destruction in crash; does not include sale or MIA.

**WRM** 1 War-readiness (or reserve) materiel (USAF).

2 Warm.

**WRMFNT** Warm front.

**WRNG** Warning.

**WRNS** Women's Royal Naval Service.

**WRO** Western Range Operations; CI adds communications and information (VAFB).

**wrought** Generally, shaped by plastic deformation, eg by forging or other hot or cold working as distinct from casting, sintering or machining.

**WRP** Wing reference plane.

**WRR** Wide-range ramjet (from 1995, France-Russia).

**WRS** 1 Word-recognition system.

2 Wide-area reference station (WAAS3).

3 Weather Reconnaissance Squadron.

**WRSK** War-readiness spares (or supply) kit (USAF).

**WRT** Weather-radar receiver/transmitter.

**WS** 1 Weapon system.

2 Weather service (FAA).

3 Water service (cart).

4 Windshear (Sigmet warning).

5 Weather-advisory Sigmet.

6 Wireless School (RFC, RAF).

**W/S** 1 Warning/status (display).

2 Windscreen.

**Ws** 1 Structure weight.

2 Maximum shoulder width of tyre [tire].

**WS<sup>3</sup>** See *WSSS*.

**WSADS** Wind-supported air, or aerial, delivery system [for leaflets and similar items] (USA).

**WSC** 1 Weapon-system controller.

2 World Space Congress (2002).

**WSCP** Warning-system control panel.

**WSCS** Weapon-system computational subsystem.

**WSD** Wind speed and direction (W/V is preferred).

**WSDDM** Weather support for deicing decision-making.

**WSDL** Weapon-system data-link.

**WSDPS** Weapon-system design and performance specification.

**WSEG** Weapon-systems evaluation group (DoD).

**WSEP** Weapon-system evaluation program (USAF).

**WSF** Weapon storage flight (RAF).

**WSFO** Weather Service Forecast Office (US NWS).

**Wsg** Maximum growth shoulder width of tyre.

**WSHFT** Windshift.

**WSI** 1 Windshear indicator.

2 Water-separometer index (fuel).

**WSIM** Water-separometer (or separation) index, modified.

**WSOA** Wide-swath ocean altimeter.

**WSOp** WSO(1) in RAF style.

**WSIP** Weapon[s] system improvement programme.

**WSK** Wire-strike kit.

**WSL** 1 Weapon-system level (programme lead responsibility).

- 2 Wide-spectrum language.
- 3 Workstation lift [cargo handling].

**WSMC** Western Space & Missile Center (Vandenberg, USAF).

**WSMIS** Weapon-system management information system.

**WSMO** Weather Service Meteorological Observatory.

**WSMR** White Sands Missile Range (USA, not same as WSTF).

**WSMS** Windshear monitor system.

**WSO** 1 Weapon-system operator (or weapon-systems officer).

- 2 Weather Service Office.

**WSOp** WSO (1) in RAF style.

**WSP** 1 Weapon-system partnership.

- 2 Wx systems processor.

**WSPO** Weapon-system project (or program[me]) office.

**WSOA** Wide-swath ocean altimeter.

**WSPS** 1 Weapon-system physics section.

- 2 Wire-strike protection system.

**WSR** 1 Weather Service Radar.

- 2 Wet snow on runway.
- 3 Warning and surveillance receiver.

**WSRN** Western Satellite Research Network.

**WSS** 1 Weapon-specific simulator.

- 2 Weapon-system status.

**WSSA** Weapon-system support activity.

**WSSD** Weapon-system support development.

**WSSF** Weapon-system support facility.

**WSSG** Warning-system signal generator.

**WSSN** Worldwide seismic sensor network.

**WSSP** Weapon-system support program(me).

**WSSR** Weapon-system support rig (RAF).

**WSSS** Weapon storage and security system.

**WST** 1 Weapon-system trainer.

- 2 Weather Service advisory, convective Sigmet.

**W/STEP** With step-change in altitude.

**WSTF** White Sands Test Facility (NASA, Las Cruces, NM).

**WSW** Windshear warning; / RG adds recovery guidance, / RGS adds system.

**WT** 1 Waste-ticket (US manufacturing).

- 2 Water twister.
- 3 Wind tunnel.
- 4 Water tank.
- 5 Tornado watch.
- 6 Wake turbulence.

**WTI, w.t.** Wireless telegraphy.

**Wt, wt** Weight.

**WTA** Water, turbine aircraft; demineralized water for injection with or without methanol.

**wTa** Warm tropical Atlantic.

**WTC** 1 Windshield temperature controller.

- 2 Wake turbulence category.

**WTD** Wehrtechnischen dienstelle, military test (G).

**WTE** Wingtip extension.

**wTg** Warm tropical Gulf [of Mexico].

**WTI** Weapons and tactics instructor.

**WTMD** Walk-through metal detector.

**WTO** 1 World Trade Organization.

- 2 Warsaw Treaty Organization.

**Wto** Actual aircraft takeoff weight.

**wTp** Warm tropical Pacific.

**WTR** Western Test Range.

**WTS** 1 Two-seat trike (microlight class).

- 2 War Training Service (US, succeeded CPT Program 1942–44).

**WTSPT** Waterspout.

**WTSS** Wideband tactical surveillance system.

**WTT** Weapons tactics, or tactical, trainer.

**WTTC** World Travel and Tourism Council (Int.).

**WTU** Wing-tip (electronic) unit.

**W<sub>u</sub>** Useful load.

**WUF** Walk-up fare.

**WUI** Wildland/urban interface.

**Würzburg** Standard German aerial-target tracking radar, 1940–45.

**WV** 1 Warfighter visualization.

- 2 Wave(s).

**W/V, W<sub>v</sub>** Wind velocity.

**WVA** Wake-vortex avoidance [S adds system].

**WVG** Wingtip vortex generator.

**WVR** Within visual range.

**WW** 1 Present weather (ICAO).

- 2 White world.
- 3 Windshear warning; / RGS adds recovery guidance system.

**W/W** War weary (US, WW2, refers to hardware).

**WWABNCP** Worldwide airborne national command post(s) (US).

**WWACPS** Worldwide airborne command-post system (US).

**WWMCCS** Worldwide military command and control system (US).

**WWO** Wing Weapon Officer (RAF).

**WWP** World Weather Programme.

**WWS** Wild Weasel Squadron (USAF).

**WWSSN** Worldwide Standardized Seismograph Network.

**WW2** World War 2, (for UK, 1939–45).

**WW3** World War 3, so far avoided.

**Ww+u** Weight of wing plus undercarriage (landing gear).

**WWV** NBS exact-time service (US).

**WWW** 1 World Weather Watch (WMO).

- 2 World Wide Web.

**W(WW)** Past weather (ICAO).

**WX** 1 Weather.

- 2 Airborne weather radar.
- 3 Indefinite obscuration.

**WX/C** Weather-radar controller.

**Wxi** Weather-radar indicator.

**WX NIL** No significant weather.

**WXP** Weather-radar panel.

**WXR** Weather radar.

**WXS** Weather-radar system.

**WYPT** Waypoint altitude.

**WYSIWYG** What you see is what you get, usually pronounced wizzywig.

# X

**X** 1 Longitudinal axis (more strictly OX); all measurements parallel to this direction, esp. force; or a distance along a streamline.

2 Usual symbol for reactance.

3 US DoD aircraft designation mission prefix: research; and also modified-mission prefix: experimental.

4 JETDS code: (1) identification, recognition; (2) facsimile, TV.

5 Length of beam or other structural member.

6 IFR flight plan code; transponder, no code.

7 On request.

8 Closed or abandoned.

9 Ground-to-air visual code: require medical aid.

10 Weather: intense.

11 Sky obscured.

12 On request.

13 Prefix, piston engine with one crankshaft driven by four cylinders, or banks of cylinders, in form of X when viewed from front.

14 Generalized prefix: expendable.

15 Helicopter rotor side force.

**x** 1 Generalized term for unknown quantity.

2 Horizontal axis (abscissa) of cartesian coordinates or graphical figure.

3 Any value measured parallel to (2) or any coordinate point measured along that axis; in particular distance along OX axis from helicopter c.g. to intersection with thrust vector of main rotor.

4 Reactance (X is more common).

5 Longitudinal displacement; distances measured along OX axis.

6 Mole fraction.

**X<sup>1</sup>** Forward extent of VTO ground vortex.

**X̄** Chordwise distance from apex to centroid of wing area.

**ȏ** 1 Position of c.g. as co-ordinate along OX axis.

2 Average of several values of x.

**x̄** Wind axis, aligned with direction of flight.

**x̄'** Fore/aft axis relative to Earth or space.

**X-25** Istel communications network allowing dial-up access to 9.6 kb/s.

**X-aerial** Crossed rods, two longer (dipoles) and two shorter (director).

**X-allocation** First 126 paired (1–63, 64–126) DME interrogation frequencies [see X-channel].

**X-axis** X (1) or x (2).

**X-band** Former common-usage radar frequency band centred on wavelength of 3 cm, later amended to 2.73–5.77 cm (about 10.9–5.2 GHz), see *Appendix 2*.

**x-bar** Crossbar.

**X-box generation** Today's young, who from early childhood have been familiar with computers and [flight] simulators.

**X-C** Cross-country.

**X-channel** DME or Tacan channel associated or paired with another radio service on same frequency. There are 126, of which first 63 have ground/air 63 MHz below air/ground frequency and second 63 have ground/air 63 MHz above air/ground frequency.

**X-Cty** Cross-country; XC, X-C also common.

**X-cut crystal** Cut parallel to Z-axis, perpendicular to X-axis.

**X-engine** See X(13).

**X-Ger  te** Pioneer beam-riding aid to navigation and bombing (G, WW2).

**X-glider** Expendable glider (ASW).

**X-licences** Range of licences for ground engineers, with endorsements for many disciplines and equipments (UK).

**X-plates** Vertically parallel deflection plates in CRT whose potential difference deflects beam horizontally and creates timebase.

**X-ray** Extremely short-wavelength EM radiation, with frequency higher than any other except gamma and nuclear radiations; typical wavelengths 10–1,000 pm.

**X-ray analysis** Based on diffraction of X-rays by crystalline solids.

**X-ray astronomy** Study of X-rays arriving at Earth from space (not possible at surface of Earth because of attenuation by atmosphere).

**X-unit** Non-SI unit of length =  $10^{-13}$  m, =  $10^{-11}$  cm = 0.1 pm = 100 fm.

**X-wing** Aircraft able to operate as helicopter or, with special [usually four-blade] rotor stopped with blades diagonal to airstream, as aeroplane. Studied by NASA 1969–.

**XA** 1 Extended architecture, giving (for example) relief from storage and I/O constraints.

2 ARINC code.

**XB** IATA code.

**Xbar, XBAR** Crossbar (ICAO style).

**XC** Cross-country.

**Xc** Capacitive reactance.

**XCP** Except.

**X/C** Percentage of aerofoil chord.

**XCSRA** Cross-Channel Special Rules Area (UK).

**XCTR** Exciter.

**XCVR, Xcvr** Transceiver.

**X/d** Distance along jet as multiple of diameter.

**XDM** Experimental development model.

**XDR** 1 Extended [ie, high] data-rate.

2 External data representation.

**xducer** Transducer.

**Xe** Xenon.

**xenon** Xe, inert gas, density  $5.9 \text{ g l}^{-1}$ , BPt –107°C, used in lasers and gas-discharge tubes; best fuel for ion propulsion.

**xfer** Transfer.

**xfmr** Transformer.

**XFR, xfr** Transfer.

**XFSS** Auxiliary flight-service station.

**XFV** Exo-skeleton flying vehicle.

**XG** Centre of gravity (c.g. is preferred).

**XGA** Extra graphics array,  $1,024 \times 768$  pixels.

**XI** Central office for warfighting integration (USAF).

**x<sub>i</sub>** Chordwise position of a vertical web where i is web number 1, 2, 3 . . .

**XID** Exchange identification.

**XIPS** Xenon-ion propulsion system.

**XIR** X-ray image recording.

**XL** Inductive reactance.

**XL** Moment of total lift of aerodyne about c.g.

**XLTR** Translator.

**XM** 1 Extra marker.

2 External master.

**XMIT[S]** Transmit[s].

**XML** Extensible markup language.

**XMM** X-ray multi-mirror [mission].

**xmsm** Tramnsmission.

**xmt** XMIT.

**XMTR, xmtr** Transmitter.

**XN** Runway intersection.

**Xn** 1 Net thrust [at a specified condition].

2 The n<sup>th</sup> in-phase signal sample applied to digital filter during any one integration period.

**XNG** Crossing.

**XO** 1 Executive officer (USN).

2 Plans and operations [executive order] (USAF).

**XOE** Operational electronic-warfare branch.

**XPC** External power connector, or contactor.

**XPCD** Expected.

**XPD** XPDR.

**XPDR, xpdr** ATC transponder.

**xponder** XPDR.

**XPR** XPDR.

**XPS** X-ray photoelectron spectroscopy.

**XR** 1 Code: Office of CoS Plans and Programs (AFSC).

2 Extended-range.

**XRD** X-ray diffractometer or diffractometry.

**XRED** X-ray energy dispersion analysis.

**XRF/NAA** X-ray fluorescence neutron-activation analysis.

**XRL** X-ray laser.

**XRT** X-ray telescope.

**XS** 1 Atmospherics (ICAO).

2 Code: SITA.

**xsmn** Transmission (both radio and helicopter dynamic parts).

**XSS** 1 Expendable sonobuoy [or sonar or sonic] sensor(s).

2 Experimental small satellite.

**XST** 1 Experimental survivable technology.

2 Experimental supersonic transport.

**xtal** Crystal.

**XTI** X/open transport interface.

**XTK** Cross-track distance error.

**XTRA** X-band thin radar array (AFRL).

**XTP** Express transfer protocol.

**XTRM** Extreme.

**XUAV** Expendable UAV.

**XUV** Experimental unmanned vehicle (USA).

**XVGA** X-video graphics adapter.

**XW+u** Distance along OX axis of c.g. of wing and undercarriage (landing gear) from c.g. of complete aircraft.

**X-wind** Crosswind, crosswind component.

**XX** Heavy [stormy] weather.

**XXX** CW transmission for uncertainty or alert (Int.).

**Xydar** Liquid-crystal thermoplastic, good microwave transparency and often glass-reinforced (Dartco).

**xylene** Family of toxic aromatic and inflammable hydrocarbons in some ways resembling benzene, with general formula C<sub>8</sub>H<sub>10</sub>, widely used as solvent; trade name Xylol.

**Xylonite** Proprietary thermosetting material similar to Celluloid.

# Y

**Y** 1 Yaw, yaw angle.

2 Lateral axis (strictly OY) or any measure or component along that axis, esp. lateral force [e.g., helicopter-rotor side force], or cross-stream distance in wind tunnel.

3 Admittance.

4 IATA symbol, tourist class.

5 US DoD aircraft designation prefix; prototype/service-test quantity.

6 Yttrium.

7 Year (eg in FY, fiscal \*).

8 Adiabatic factor.

9 Bessel function of the second kind.

10 Induced pressure, eg caused by presence of jet.

11 Rules governing change from IFR to visual.

12 Prefix yotta, multiplied by  $\times 10^{24}$ .

13 Other meanings include yes (affirmative) and yellow.

**y** 1 Vertical axis (ordinate) of cartesian coordinates or graphical figure.

2 Any value measured parallel to (1) or any co-ordinate point measured along that axis.

3 Admittance (Y is more common).

4 Perpendicular distance from extreme [surface] fibre to neutral axis.

5 Prefix octo,  $= \times 10^{24}$ .

6 Maximum transverse deflection of a beam.

7 Today often used instead of Y(2).

**ȳ** 1 Co-ordinate position of c.g. along OY axis (normally at or near origin).

2 Sample average value.

3 Spanwise c.p. position expressed as f(b/2).

**Ȳ** Spanwise location [distance from aircraft centreline] of centroid of wing area.

**Y', y'** Lateral axis fixed relative to direction of flight.

**Y', y** Lateral axis relative to Earth or space.

**Y-allocation** Second group of 126 frequency-paired Tacan/civil DME channels.

**Y-alloys** British aluminium alloys originally developed by Rolls-Royce and HDA for pistons, typically with 4% Cu, 2% Ni, 1.5% Mg and other elements, which because of their retention of strength to 250–300°C were chosen as ruling materials for Concorde with names RR.58 (UK) and AU2GN (F).

**Y-axis** See *Y*(2), *y*(1)

**Y-channel** See *Y-allocation*.

**Y-connection** One end of all three coils of 3-phase electrical machine connected to common point while other ends constitute 3-phase line; alternative to delta, also called star.

**Y-cut crystal** Cut parallel to Z-axis, perpendicular to Y-axis; thus parallel to one face of hexagon.

**Y-duct** Leads from two [usually lateral] inlets to single engine.

**Y-loader** Trolley with manually pumped hydraulic jack for loading bombs and other stores, picking them up from stillage.

**Y-plates** Horizontally parallel deflector plates whose potential difference positions electron beam vertically in CRT.

**Y-scale** Scale along line of principal vertical in oblique reconnaissance imagery, or along any other line which on ground area shown would be parallel to this.

**Y-section** Structural section resembling Y, often with flanged or beaded edges.

**Y-service** Electronic intelligence (UK, WW2).

**Y-valve** Lube-oil drain valve from dry sump.

**Y-winding** See *Y-connection*.

**YAF** Yesterday's Air Force, California (US).

**YAG, Yag** Yttrium aluminium garnet  $Y_3 Al_5 O_{12}$ .

**Yagi aerial** Directional aerial comprising driven dipole, reflector and one or more (usually linear array) parasitic dipole directors spaced at 0.15–0.25 wavelength; maximum radiation is projected parallel to long axis.

**yard** Traditional Imperial unit of length = 0.9144 m exactly.

**yaw** Rotation of aircraft about vertical (OZ) axis; positive = clockwise seen from above; symbol  $\psi$ .

**yaw damper** Automatic subsystem in aeroplane (usually jet) FCS which senses onset of yaw and immediately applies corrective rudder to eliminate it. Early types were called parallel because they operated whole circuit including pedals; modern series \*\* has no effect on FCS further forward than fin (though sensing gyro may be near c.g.) and its activity is unnoticed by pilot. Most aircraft are flyable throughout virtually whole flight envelope with \*\* inoperative.

**yawed wing** Wing proceeding obliquely to relative wind; slewed wing.

**yaw guy** Cable along ground under mooring airship for attachment of yaw-guy wires.

**yaw-guy wires** Ropes or cables dropped from bow of airship before mooring for securing to yaw guys; these stop nose from swinging.

**yawhead** Yaw sensor, eg angled pitots, on pivoted vane.

**yawing moment** Moment tending to rotate aircraft about vertical OZ axis, symbol usually  $N = qS\bar{c}c_n$  where  $q$  is constant,  $S$  is wing area,  $\bar{c}$  is mean chord and  $c_n$  \*\* coefficient; measured positive if clockwise seen from above.

**yaw lines** Yaw-guy wires (US).

**yawmeter** Instrument or sensor for detecting yaw; can be simple device, eg yaw string or two or more pitot tubes at different inclinations whose pressure difference is sensed, or electronic gyro-fed subsystem.

**yaw pointing** Additional flight-control mode for some modern fighters in which yaw can be controlled without changing flight trajectory by varying sideslip angle while holding zero lateral acceleration. Usually achieved by deflecting vertical canard while linked to rudder(s) and roll-control surfaces. Gives much quicker and better gun-aiming.

**yaw stability** Tendency to reduce yaw to zero, also called weathercock stability. The derivative can be written  $C_n\beta$ .

**yaw string** Crude yawmeter comprising string, wool or other filament allowed to align with relative wind, eg ahead of windscreen.

**yaw vane** Small vertical aerofoil on long pivoted arm giving weathercock indication of yaw.

**Yb** Ytterbium.

**YBC** Years between calibrations.

**YBCO** Yttrium barium copper oxide.

**YbYAG** Ytterbium/YAG.

**YC** 1 Tourist class.

2 Yaw computer.

**YCV** Ship class: aircraft transportation lighter (USN).

**YCZ** Yellow caution zone (runway lighting).

**YD, Y/D** Yaw damper.

**yd** Yards [rarely, yds].

**YDA** 1 Yesterday.

2 Yaw-damper actuator.

**YDC** Yaw-damper computer.

**YE** Young Engineers [Liphook, GU30 7AZ] (UK).

**yellow** General colour for caution [in many airborne and ground systems], also called amber.

**yellow arc** Range on dial instrument indicating caution, or higher than normal.

**yellow card** 1 Formal warning to airshow participant following single serious breach of rules or potentially serious flying error.

2 Warning notice from captain to passenger[s].

**yellow caution zone** Region (of runway or glideslope angle) marked by yellow or amber lights.

**yellow gear/stuff** Aircraft GSE vehicles on airfield or carrier (service carts, tugs, dollies, handling and store-loading equipment).

**yellow sector** 1 Area on left of ILS centreline (on right if using back course).

2 Arc on traditional ASI which should not be entered in severe turbulence.

**YES** Youth and Education Strut (PFA).

**yield** 1 Explosive power of NW, measured in TNT equivalent weights and usually given as: very low, under 1 kt; low, 1–10 kt; medium, 10–50 kt; high, 50–500 kt; very high, over 500 kt (0.5 Mt).

2 Revenue per traffic unit, eg per tonne-km, pax-mile, etc.

**yield factor of safety** Specified factor used in some airworthiness requirements to prevent permanent deformation of structures.

**yield load** Limit load  $\times$  yield factor of safety.

**yield point** Unit tensile stress at which deformation continues (to breakage) without further increase in applied load. Measured by loading specimen to point where a permanent set occurs, typically 0.2%. This is slightly higher than elastic limit and not normally approached in practice.

**yield strength** Unit stress corresponding to a specified permanent elongation, for light alloys usually taken as 0.2%.

**yield stress** Ambiguously, stress at yield point, which may be higher than at yield strength; except in the case of ductile materials that experience strain hardening, the greatest that material can reach.

**YIG** Yttrium indium garnet.

**YL** Year lease (suffix to two digits of year).

**YM** Young Members; B adds Board; S adds Section (RAeS).

**YMS** 1 Yield management system.

2 See YM.

**Y<sub>n</sub>** The n<sup>th</sup> quadrature signal sample applied to a digital filter during any one integration period.

**yocto** Prefix, multiplied by 10<sup>-24</sup>, symbol y; see *yotta*.

**Yoder rolling** Manufacture of complex sections by

sequential precision rolling operations tailored to each section.

**yoke** 1 Control column of large aircraft in which roll input is by two laterally pivoted handgrips in form of a Y. Occasionally refers to a wheel or spectacles.

2 Main magnetic structure of electrical machine supporting poles and conveying flux round linkage on each side of armature.

3 Frame on which are wound CRT deflection coils, or case of high-permeability metal surrounding such coils.

4 Interconnecting cross-member or tie.

5 In particular, tie linking helicopter main-rotor blade to hub.

6 Forked mounting, eg passing both sides of nosewheel.

**yoke clip** Alternative name for *yokemount*.

**yokemount** On centre of handwheel or spectacles (eg, for document or notepad).

**YOS** Years of service.

**YOT** “You over there,” man in right-hand seat of side-by-side military cockpit. (colloq.).

**yotta** Multiplied by 10<sup>24</sup> symbol Y; see *yocto*.

**Young-Helmholtz** Original theory of colour vision, based on receptors for red/green/blue.

**Youngman flap** Patented (Fairey) trailing-edge flap carried on struts below trailing edge and in addition to normal deflection also having a negative (usually -30°) setting for use as dive brake.

**Young's modulus** Basic measure of material strength under tension, ratio of normal stress (within limit of proportionality) to strain, ie ratio of tensile load per unit cross-section area to elongation per unit length, within elastic limit, symbol E. SI units kN/m<sup>2</sup> or MN/m<sup>2</sup>.

**yo-yo** Family of air-combat manoeuvres in horizontal and vertical planes intended to reduce angle-off or hold nose/tail separation and thus prevent overshoot of defender's turn. Hi-speed \* trades speed for height, lo-speed \* opposite.

**YP** Yield point.

**YPA** Young Pilots' Association (UK).

**YR** Your.

**yr** Year.

**YS** Yield strength (or stress).

**YSAS** Yaw-stability augmentation system.

**YSZ** Yttria-stabilized zirconia.

**YT** Side force due to asymmetric thrust.

**yr** Lateral offset distance of mean thrust.

**YTD** year to date.

**YTS** Youth training scheme (UK).

**Y<sub>Ts</sub>** Cross-stream distance across test section (tunnel).

**ytterbium** Yb, silvery metal, density 6.97, MPt 824°C, increasing use in electronics and steels.

**yttrium** Y, soft silvery metal, density 4.47, MPt 1,522°C, used in alloys, glasses, semiconductors and YAG, YIG.

**Y2K** 2000 AD.

**Y<sub>2</sub>O<sub>3</sub>** Yttrium oxide.

**yugging** Uncommanded rapid unsteadiness, usually up/down and rocking movements, between aircraft in formation aerobatic team, usually caused by turbulence.

**Yukawa potential** Describes meson field about a nucleon.

**Y<sub>V</sub>** Force derivations on the fuselage; (Y<sub>V</sub>)<sub>B</sub> is due to the fuselage, (Y<sub>V</sub>)<sub>F</sub> is due to the fin, and (Y<sub>V</sub>) is the actual aerodynamic side force.

**Y<sub>Vs</sub>** Cross-stream distance along vane set (tunnel).

**Y $\zeta$**  Y-zeta, side force due to rudder deflection.

# Z

**Z** 1 Vertical (normal) axis (OZ), or any parameter measured along that axis or parallel to it, eg normal force (also called N by some authorities) or structural depth. In particular, geopotential altitude.

2 Impedance; unit, ohm.

3 Zenith.

4 Section modulus (also called S).

5 Time suffix: GMT = Zulu.

6 US military aircraft designation prefix: obsolete (pre-1962).

7 US military aircraft modified mission designation prefix: planning (ie still a project).

8 USN aircraft modified mission suffix: administrative version (pre-1962).

9 USN aircraft designation prefix: airship (1922–62).

10 Fluid pressure-difference (dP) due to difference in level (in Earth gravity).

11 Viscosity relative to absolute viscosity of water.

12 Atomic number.

13 Reflectivity factor.

14 Tower.

15 Flight rules governing change visual to IFR.

16 Freezing rain.

17 Prefix zetta,  $= \times 10^{21}$ .

18 See *Zwilling*.

**z** 1 Normal axis of cartesian figure (ie perpendicular to plane of paper).

2 Distance measured along normal axis (also Z).

3 Impedance (Z more common).

4 Zone.

5 Ion valency [anion negative].

6 Now often used for aircraft vertical axis instead of Z.

7 Prefix zepto  $= \times 10^{-21}$ .

8 Number of teeth in a gearwheel.

**z̄** Co-ordinate position of c.g. measured along OZ normal axis.

**z̄'** Vertical (normal) axis relative to direction of travel.

**z̄''** Vertical (normal) axis relative to Earth or space.

**Z-axis** See *Z* (1).

**Z-battery** Fired unguided anti-aircraft rockets (UK, WW2).

**Z-beacon** See *Z-marker*.

**Z-correction** Correction for coriolis applied by moving celestial fix or PL at 90° to track (ASCC).

**Z-fibre** Process for curing laminates through which are passed small-diameter pins of pultruded CF or other material.

**Z-harness** See *Z-type*.

**Z-Hud, Z-HUD** HUD whose main optical power is a reflector subtending <10° from optical axis, reducing aberrations, and forming exit pupil in front of pilot's eye.

**Z-marker** Also called station locator, former fan or cone marker filling radio-range cone of silence, typically with audible 3 MHz tone (suggest obsolete).

**Z-meter** Impedance meter.

**Z-mill** Sendzimir [steel rolling mill].

**Z-optics** Device in which optical path has shape of Z, as in Z-Hud.

**Z-ring** Sharp zigzag discontinuity in wall of combustion

chamber [usually of gas turbine] containing numerous perforations admitting cooling air.

**Z-scale** Scale used in calculating height of object in oblique reconnaissance image.

**Z-section** Structural section in general form resembling Z, often with flanged or beaded edges and all angles 90°.

**Z-Stoff** Aqueous solution of calcium (rarely sodium) permanganate (G, WW2).

**Z-technology** IR sensor staring focal-plane array using chips along Z-axis.

**Z-type harness** Almost universal seat harness for military aircrew with four straps joined to common quick-release box.

**ZA** 1 Zone aerial (antenna).

2 Zenitnaya artilleriya, AA gun (USSR, R).

3 Zinc/air [battery].

**ZAB** Incendiary bomb or warhead (USSR, R).

**ZAD** Zone Aérienne de Défense (west, NE and SE, under Cafda, F).

**Zahn cup** Container with calibrated hole for measurement of liquid viscosity.

**Zamak** Family of Zn-based die-casting and stamping alloys, some of them important for rubber-press dies.

**ZAO** Zakrytoe Aktzionernoje Obshestvo, company constitution (R).

**ZAP** Box or dispenser of ZABs (USSR, R).

**zap** 1 To smash or render unserviceable (colloq.).

2 To adorn visiting friendly combat aircraft from competitor unit with unauthorized insignia or paint scheme.

3 To disable a (usually aerial) target in one pass.

**Zapp flap** Early form of trailing-edge flap resembling split type but with leading edge translated aft along guides and with pivoted arms holding surface at about mid-chord; thus small hinge moment or operating force.

**ZAR** 1 Zero-airspeed radius, at which retreating blade of helicopter is at rest with respect to local airflow.

2 Zeus acquisition radar.

**ZAW** Zentralausschuss der Werbewirtschaft (G).

**Zbrozek corrections** Refinements to alleviation factor.

**ZBTA** Zinc-base trial alloy; cheap material for NC reference plates.

**ZCET, Z-Cet** Zero CO<sub>2</sub> emissions.

**ZD** 1 Zero defects.

2 Zone de Défense (F, five departments in Pacific and Caribbean).

3 Zonal drying.

**ZD** Moment arm of total drag about c.g., ie vertical distance from drag resultant to c.g.

**ZDA** Zone défense aérienne (F, now RAs).

**ZDS** Zonal drying system.

**ZEDS** Zonal electrical distribution system of future CV.

**Zeeman** Effect in which line spectra, eg of incandescent gas, are each split up into two or more components by passage through magnetic field.

**Zell, ZEL** Zero-length launching, or to make such a launch; hence zelling.

**Zelmal** Zero-length launch and flexible-mat landing.

**zener current**

**zener current** That flowing in insulator in electrical field sufficiently intense to excite electrons direct from valence to conduction.

**zener diode** Si junction diode having specific peak inverse voltage, at which point it breaks down and suddenly allows flow.

**zener voltage** 1 Field strength needed to initiate zener current, about  $10^6$  V/mm.

2 That associated with reverse-VA of semiconductor, more or less constant over wide range of current.

**zenith** Point on celestial sphere directly overhead. Strictly this is observer's \*; astronomical \* is where plumb-line would intersect celestial sphere, and geographical \* is where line perpendicular to smooth Earth would do so. These are not all synonymous.

**zenith attraction** Effect of planetary gravity on free-falling body (originally, Earth on meteorite) of increasing velocity and moving radiant toward zenith.

**zenith distance** Angular distance from celestial body to zenith.

**zenographic** Of positions on surface of Jupiter, referred to planet's equator and specified reference meridian.

**zeolite** Natural hydrated silicate of Ca and Al; catalyst used in Obogs filter beds.

**zephyr** Light warm westerly wind [Mediterraneon].

**ZEPL** Self-forging fragment submunition (G).

**Zeppelin** Though a proper name, often used to mean any rigid airship.

**zepto** Multiplied by  $10^{-23}$ , symbol z; see *zetta*.

**zero defects** Conceptual (sometimes attainable) goal of perfection, esp. in manufacturing industry (chiefly US).

**zero-delivery pressure** In delivery line of variable-displacement pump at normal operating speed with zero stroke.

**zero-draft forging** One without draft, ie to finish dimensions.

**Zerodur** Glass ceramic with very low coefficient of expansion; used for LINS.

**zero-force separation** Interstage separation in which all mechanical links have already been broken, including all electrical connectors, etc.

**zero-fuel weight** MTOW minus total usable-fuel weight; usually limiting case for wing bending moment because wings are empty and fuselage is full. One symbol is  $W_e$ , from empty.

**zero-g** See *zero gravity*.

**zero-gravity** Free-fall, weightlessness; or in deep space remote from massive bodies.

**zero gross gradient** Altitude at which gross climb gradient (all engines operating, corrected for anti-icing) is zero.

**Zerol** Zero-spiral angle bevel gear.

**zero lash** Mechanism adjusted until there is no play or backlash, eg by using hydraulic valve lifters in piston engine.

**zero-length launch** Launching of vehicle from aircraft or surface launcher in such a way that it is free as soon as it begins to move; in case of aircraft rockets, hung on clips instead of being accelerated along tubes or rails; for surface launch, thrust away by rocket boost motors whose vertical component is greater than weight. Sometimes abb. to zero-launch; usually abb. Zell, \* launch(ing).

**zero-lifed** Restored to new condition after having seen service; applies esp. to airframe or engine and follows

meticulous inspection and rectification such that flight-time count may legally be restarted.

**zero lift** Angle of attack at which aerofoil generates neither positive nor negative lift, ie no force normal to airstream; usually an obvious negative AOA for traditional cambered wing at below  $M_{crit}$  but for supersonic wing can be positive angle.

**zero-lift line** Drawn through trailing edge of aerofoil parallel to relative wind when lift is zero.

**zero meridian** Prime Meridian,  $0^\circ$  longitude.

**zero point** Location of centre of NW at moment of detonation; usually above or below ground zero.

**zero-power transfer switch** Automatically switches load when waveform is passing through zero.

**zero-range ring** Circular arc forming range origin of most weather radars, and many other polar-type displays (most unusual to have origin as point).

**zero rate of climb speed** TAS at which, for an established engine power [not necessarily maximum], drag reduces climb gradient to zero.

**Zero Reader** Pioneer (Sperry) flight instrument with cross-pointers driven by various selectable sensors to control trajectory (vertical and lateral displacement), pilot steering aircraft so that both needles cross at origin of display in method first used on ILS meter. In most respects similar to ILS meter that can accept inputs from en route nav aids and attitude sensors.

**zero-splice** Monolithic, made in one piece.

**zero stage** Extra axial stage added on front of existing multi-stage axial compressor in new uprated version of gas-turbine engine; can be overhung ahead of front bearing and may or may not be preceded by inlet guide vanes. Hence, more rarely, zero-\*\*, for a second additional upstream stage.

**zero-thrust pitch** Distance propeller advances in one revolution when operating at normal speed but moved through still air by external force so that it generates no thrust; also called exponential mean pitch.

**zero-timed** Engine overhauled to Service limits, less rigorous than factory-remanufactured.

**zero-torque pitch** Distance propeller advances in one revolution when moved through still air by external force at such a speed that its drive torque is zero; ie when wind-milling in frictionless bearings. Symbol  $P_a$ .

**zero/zero landing** Totally blind helicopter landing enveloped in snow.

**zero/zero seat** Ejection seat qualified for operation at zero height, zero airspeed; ie pilot can safely eject from parked aircraft.

**zero-zero stage** See *zero stage*.

**Zerstörer** Destroyer, large or long-range fighter (G, WW2).

**zetta** Multiplied by  $10^{21}$  symbol Z; see *zepto*.

**ZF** Zero force (separation).

**$z_F$**  Moment arm about c.g. of net propulsive force; usually acts in purely vertical plane, ie in pitch.

**ZFCG** Zero-fuel c.g.

**ZFGW** Zero-fuel gross weight [= ZFW].

**ZFT** Zero flight time (of hardware, or pilot recurrent training or type-conversion entirely on simulator).

**ZFW** Zero-fuel weight.

**ZG** 1 Zero gravity (also Z-g).

2 Zerstörergeschwader (G, WW2).

**ZGG** Zero gross gradient.

**ZHR** Zenithal hourly rate (measure of meteor shower).

**ZHUD** See *Z-HUD*.

**Zhukovsky theory** Original (1907) description of airflow round wing in which viscous effects transmit disturbance far from solid surface and lift is direct function of airflow.

**ZI** Zone of the Interior (US).

**zinc** Zn, blue-white metal, density 6.92, MPt 907°C, cheap and important in alloys for casting (esp. die-casting) and dies, form blocks and other press tooling, see Prestal, and in surface galvanizing, and electric batteries (see next).

**zinc/air** Electrical battery in which KOH (potassium hydroxide) electrolyte is pumped through cell with Zn cathode (converted to oxide) and anode of porous Ni through which is pumped air (oxygen). Much higher energy density than lead/acid.

**zinc chromate** ZnCrO<sub>4</sub>, yellow pigment used as basis for yellow-green \* primer; mixed with alkyd resins to give strongly adhering anticorrosive treatment almost universal in metal aircraft construction whose chromate ions are released by moisture.

**zinc sulfide** ZnS, important phosphor in electronic screens and lighting.

**zinger** Snag (US colloq., especially in air combat).

**zip fuel** Exotic or high-energy fuel for airbreathing engines, esp. ethyl diborane and other liquids based on boron compounds.

**ZIPO** Zone indicate [or indicating] position officer [helicopter landing].

**zipped, zipped up** Blast/radiation shields in place over all glazed areas of bomber after release of NW.

**Zipper** 1 Target CAP (combat air patrol) at dawn or dusk (DoD).

2 ZIPO.

**ZIPS** See *XIPS*.

**zip strap** Sharp-edge adhesive sealing strip covering gap or joint in LO aircraft, renewed after maintenance.

**zipstring** Something simple and cheap.

**zirconia** Zirconium oxide ZrO<sub>2</sub>, important refractory (MPt 2,500+°C) ceramic and abrasive.

**zirconium** Zr, white, ductile metal, density 6.48, MPt 1,857°C; important as alloying element and in nuclear applications.

**ZL** 1 Freezing drizzle.

2 Zero-lift.

**ZLA** Zero-lift angle.

**ZLa** Zero-lift angle of attack.

**ZLBH** Zero-lifed bare hull.

**ZLDI** Zentralstelle für Luft- und Raumfahrt-dokumentation und Info (G).

**ZM** 1 Z-marker, v.h.f. station location.

2 Zettametre, see *zetta*.

**zm** Zeptometre, see *zepto*.

**Z<sub>mo</sub>** Maximum operating height [usually expressed in feet].

**ZN** Azimuth.

**Zn** Zinc.

**ZNKJRK** All-Japan Air Transport and Service Association.

**ZnSe** Zinc selenide.

**Z<sub>o</sub>** Drift (1).

**ZOC** Zone of convergence (Eurocontrol).

**zodiac** Band of celestial sphere centred on ecliptic extending 8° on either side and containing Sun, Moon and

all planets used for navigation purposes (except, sometimes, Venus).

**zodiacal counterglow** See *gegenschein*.

**zodiacal light** Faint cone of light seen (esp. in tropics) pointing towards ecliptic after sunset or before sunrise.

**ZOE** Zone of exclusion.

**zogging** Directing accompanying aircraft by means of hand signals [from 1915] (UK).

**ZOH** Zero-order hold in FCS sampling.

**ZOK** Factory for experimental construction (USSR).

**Zombie** Soviet strategic-reconnaissance aircraft intruding [legally] into Western airspace.

**ZOMP** Weapon(s) of mass destruction (USSR).

**zonal comfort system** Use of evaporative cooling to manage moisture in passenger compartment (trademark, CTT).

**Zonal Drying** Removal of water condensate from thermal and acoustic insulation of transport aircraft (CTT).

**zonal wind** In N hemisphere, wind's westerly component.

**Zone 1, 2 and 3** Surface skin areas whose smoothness and perfect profile are of high [1], medium [2] or low [3] sensitivity for causing aerodynamic drag.

**zone** 1 Administrative region of airspace, esp. controlled airspace.

2 Portion of drawing (see *zoning*).

3 Quadrant of radio range, portions of (early-type) Decca coverage and other navaid subdivisions.

4 Sector of Earth sharing common time, bounded by two standard meridians; there are 24.

5 Circular areas centred on NW explosion: I, within MSD (minimum safe distance), within which all friendly forces evacuated; II, all personnel maximum protection: III, minimum protection.

6 Regions of aircraft surface: \* 3 combines thick boundary layer with modest local flow velocity; \* 2 is intermediate; \* 1 combines thin boundary layer with high local velocity, and is acutely sensitive to any disturbance [eg, caused by a rivet head].

7 Portion of aircraft/spaceship with separately controllable ECS.

**zone marker** See *Z-marker*.

**zone numbers** Those locating an item on zoned drawing.

**zone of intersection** Portion of civil airway overlapping or lying within any other airway (US chiefly, eg CAR 60.104).

**zone of protection** Within cone of 45° total apex angle whose apex is top of lightning conductor (eg on airport building or tower).

**zone signals** Radio-range quadrant signals (see *zone* [3]).

**zone time** 1 Civil time of meridian passing through centre of a time zone.

2 Time kept in sea areas in 15° zone of longitude or multiple of 15° from prime meridian (ASCC).

**zoning** 1 Dividing large engineering drawing into numbered/lettered grid so that items can more quickly be located by assigning each a grid reference.

2 Division of parts of aircraft into \*, esp. for fire-protection purposes.

3 "Delimitation of areas surrounding an aerodrome to permit freedom of flight to aircraft approaching and leaving" [1936, suggest archiac].

**zoom** 1 Abnormally steep climb trading speed for height; applies chiefly to majority of aeroplanes whose T/W ratio is much less than 1 even at near SL; normally a manoeuvre in low-level display flying.

2 Optimized steep climb by high-performance jet (which at SL might have T/W greater than 1, and thus could make sustained climb at 90°) at high altitude, normally starting at maximum level Mach, trading speed for height in order to reach exceptional height far above sustained level ceiling.

3 To enlarge or reduce image of object in TV, video, camera, etc, using lens of continuously variable focal length (\* lens).

4 In air-combat, unloaded low-alpha climb to gain maximum height for minimum dissipation of energy.

**zoom boundary** Limits of flight envelope (in which ordinate is altitude) attained by zooming (see *zoom* [2]).

**zoom ceiling** That attained with a zoom (2).

**zoom climb** Zoom (1); second word redundant.

**zoom domain** The extension of the design envelope above the 1g ceiling which can be reached in a zoom.

**Zorflex** Activated-charcoal cloth (CCI).

**ZOS** Zone of separation.

**ZP** Zone of protection.

**ZPI** Zone position indicator radar.

**ZPU** Hostile AAA using close-range automatic weapons (US colloq., from a Soviet 14.5 mm AA gun designation).

**ZR** 1 Freezing rain.

2 Zenitnaya raketnaya = SAM; K adds system, PVO has its own entry, SD adds medium-range, V troops (USSR, R).

**Zr** Zirconium.

**ZrB<sub>2</sub>** Zirconium boride.

**ZRE** Plus suffix numeral, British Mg-Zr alloys.

**ZROC** Zero rate of climb; hence \* speed, that (on back of drag curve) at which slender delta can just hold height at full power near SL.

**ZSA** Zonal safety analysis.

**ZST** Zone standard time.

**ZTA** Ceramic comprising tetragonal zirconia in alumina.

**ZTC** Zero temperature controller.

**ZTDL** Zero-thrust descent and landing.

**ZTP** Zero-thrust point.

**ZTV** Zone trim valve, governs each zone (7) in controlling ECS.

**Zulu, zulu** 1 Phonetic word for Z, thus \* time = UTC, \* flightplan = one wherein all times are UTC [previously GMT].

2 Denotes QRA status (USAF).

3 Airmet advisory: freezing, icing.

**ZVEI** Zentralverband der Elektrotechnik-Industrie und Elektronikindustrie [electronics manufacturers; office D-60596 Frankfurt am Main] (G).

**Zwilling** Twin or coupled, esp. twin-fuselage (G).

**Zyglo** NDT process in which part is coated with penetrant dye, cleaned, coated with powder developer (which extracts dye from any cracks) and examined in UV when dye fluoresces.

**Zytel** Nylon materials which remain flexible at extreme cryogenic temperatures (registered name).

**Z<sub>0</sub>** Z-zero, a factor determining buckling characteristics of fibre-reinforced panels, varying with the ply directions.

# Appendix 1:

## Greek symbols

The following are some of the aerospace usages of letters of the Greek alphabet. In almost all cases the meaning is refined by a selection of suffixes or other additions.

**$\alpha$  (alpha)** 1 Angle of attack, or tilt angle of primary nozzle ( $\dot{\alpha}$ , AOA rate;  $\alpha_{\text{frl}}$ , relative to fuselage reference line;  $\alpha_e$ , effective;  $\alpha_{\text{ind}}$ , induced  $\alpha_{\text{geo}}$ , geometric;  $\alpha_o$ , difference in AOA between wing and horizontal tail,  $\alpha_o$  also aerofoil at zero lift).

2 Generalized symbol for acceleration, angular as well as linear.

3 Absorption factor.

4 Propeller or compressor axial inflow factor.

5 Decay or attenuation coefficient (radio).

6 Coefficient of linear thermal expansion.

7 Degree of dissociation.

8 As subscript, free-stream conditions.

9 See *Alpha eta rho* in body of dictionary.

**$\beta$  (beta)** 1 Angle of sideslip ( $\beta$ , sideslip rate).

2 Angle between fluid and tangentially moving blade; pitch angle;  $\beta_0$ , helicopter coning angle.

3 Particular operating regime of propeller when pilot selects pitch directly (available on ground only).

4 Angle of incidence of tailplane relative to main wing.

5 Angle of yaw (airships).

6 Coefficient of cubic thermal expansion ( $\gamma$  preferred).

7 Luminance factor.

8 Diffuser angle.

9 Angle between thrust line and body datum.

10 Tip-back angle.

11 Helical-gear skew angle.

**$\gamma$  (gamma)** 1 Ratio of specific heats of gas (at constant pressure and constant volume).

2 Surface tension.

3 Dihedral angle.

4 Flight path (or gliding) angle, relative to horizontal; common suffixes are: c, climb; CMD, commanded by pilot; CON, commanded by an AFCS; D, d, dive or descent; DISP, displayed in cockpit; S, corrected to sea level.

5 Electrical conductivity.

6 Free-stream velocity (non-dimensional).

7 Magnetometer field strength, in MAD operations usually =  $10^{-5}$  oersted.

8 Coefficient of cubic thermal expansion.

9 Shear strain (also  $\phi$ ).

10 Suffix TiAl, low-density titanium aluminide (<850°C).

11 Second Townsend coefficient.

12 Confusingly, some aerodynamicsists use this lower-case symbol for circulation, vortex strength.

13 Aspect ratio (width/length) of cut-out in uniformly loaded panel.

14 Often used for density.

15 Lock number.

**$\Gamma$  (capital gamma)** 1 Circulation, vortex strength, rotation in fluid flow. Thus,  $\Gamma_w$  is wing-tip vortex.

2 Gamma function (mathematics).

3 Momentum conservation along streamlines.

4 Dihedral angle ( $\gamma$  more common).

**$\delta$  (delta)** 1 Small increment.

2 Control-surface or jet-deflection angle or deflection angle across shockwave [ $\delta_a$  often used for aileron,  $\delta_e$  for elevator, but see other letters for angles of individual surfaces] or bevel-gear cone angle. Suffix F for USB, flap deflection angle, TE flaperon.

3 Unit elongation or structural deflection.

4 Atmospheric pressure ratio, or relative pressure.

5 Slope of runway.

6 Boundary-layer thickness.

7 Blade elementary drag coefficient, suffixes A/E/F for aileron/elevator/flap.

8  $\delta_{MS}$ ,  $\delta_{MT}$ , maximum vertical deflection of shock strut (MS) and tire [tyre] (MT) on landing.

**$\Delta$  (capital delta)** 1 Generalized prefix, difference, differential.

2 Deflection of panel point of truss.

3 Increment, not necessarily small; thus  $\Delta_f$  for fuel.

4 Load on water, hydrostatic lift.

5  $\Delta\alpha$  change in local AOA due to roll.

6 Offset from datum or desired value.

7 Suffix 3 or H, Diamond tail rotor.

8 Suffix t = time difference.

9 Differential pressure, i.e. relative to local atmosphere.

**$\nabla$**  Operator del (mathematics).

**$\epsilon$  (epsilon)** 1 Angle of downwash. For a wing, often written  $\epsilon_d$ ; for a propeller blade, most notation uses  $\epsilon_b$  for total angle at radius r,  $\epsilon_\alpha$  advance angle and  $\epsilon_i$  induced angle.

2 Permittivity (dielectric constant).

3 Eccentricity or (suffix) eccentric load.

4 Emissivity.

5 Strain, direct (also e).

6  $\epsilon_e$  Elevator effectiveness.

7  $\epsilon_u$  Angle of upwash.

8  $\epsilon_y$  Wash-in or washout.

9 Complementary angle to sweepback, angle between leading edge and aircraft centreline.

**$\zeta$  (zeta)** 1 Rudder angle; or helicopter rotor blade-lag angle.

2 Damping ratio.

3 Electrokinetic potential.

## Appendix 1

## Greek Symbols

**η**(eta) 1 Generalized symbol for efficiency, with suffixes indicating which, eg  $\eta_a$  antenna aperture,  $\eta_m$  mechanical,  $\eta_o$  overall,  $\eta_p$  propulsive,  $\eta_r$  radiation,  $\eta_t$  thermal, or tailplane setting angle,  $\eta_v$  volumetric.

2 Elevator angle.

3 Ratio of wing lifts (biplane).

4 Electrolytic polarization.

5 Dynamic viscosity [ $\mu$  is more common].

6 Normalized incremental coefficient of backscatter.

7 First Townsend coefficient.

8 Fraction of semi-span  $2y/b$ .

**θ**(theta) 1 Generalized symbol for bearing, azimuth direction, angular distance, birdstrike impact angle, polar co-ordinate angle, etc, denoted by suffixes a [azimuth], e [elevation], etc.

2 Angle of pitch (all meanings, eg of fuselage attitude, propeller or rotor blade, etc); subscripts many, eg bl blade pitch angle, T, thrust-vector angle, 0 collective.

3 Angle of twist or torsional strain.

4 Phase displacement (also  $\phi$ ).

5 Temperature or temperature ratio.

6 Semi-vertex angle of Mach cone.

7 Spherical co-ordinate measures.

**θ/R** Bearing and range.

**Θ**(capital theta) 1 Absolute temperature, or temperature ratio.

2 Pitch attitude, usually in radians.

3 Often with subscript n, deflection of total gross thrust vector from aircraft datum.

4 Subscript a, scan width in azimuth.

5 Subscript e, scan width in elevation.

6 Subscript F, deflection of forward nozzle(s).

7 Antenna beamwidth; subscript NN, null-to-null.

8 Subscript R, deflection of rear nozzles.

9 Subscript 3dB; 3dB antenna beamwidth.

10 Subscript XG, inclination of total gross thrust vector to flight path.

**ι**(iota) No common meanings.

**κ**(kappa) 1 Permittivity (dielectric constant) (also  $\epsilon$ ).

2 Compressibility.

3 Conductivity, esp. in electrochemistry.

4 Helicopter induced power factor.

5 Radius of gyration of strut or other structural part.

**K**(capital kappa) Equivalent spring rate or stiffness.

**λ**(lambda) 1 Wavelength.

2 Area ratio of wing  $S/b^2$ ; also taper ratio, tip/root chord.

3 Damping coefficient.

4 Scale ratio (model: full size).

5 Thermal conductivity [also k].

6 Longitude (terrestrial or celestial).

7 Solid rocket volumetric loading.

8 Eigenvalues, with suffixes such as ph = phugoid mode, sp = short-period.

9 Aerodynamic pitch of propeller.

10 Landing-gear reaction factor.

11  $\lambda_c$  = Compton wavelength.

**Λ**(capital lambda) 1 Angle of sweepback, measured at

0.25 chord; if leading or trailing edge, with subscripts LE, TE.

2 Permeance.

3 Ionic/molar conductance.

**μ**(mu) 1 Generalized prefix, micro ( $\times 10^{-6}$ , one millionth), thus  $\mu m = 10^{-6}$  metre.

2 Without any other symbol, micrometre or micron.

3 Coefficient of friction.

4 Permeability;  $\mu_0$ , of vacuum.

5 Joule-Thomson coefficient.

6 Dynamic viscosity.

7 Aircraft velocity (non-dimensional).

8 Ratio of spans (biplane).

9 Amplification factor (radio).

10  $\mu_i$ , relative density of aircraft (aerodyne);  $\mu_G$  is in response to a gust.

11  $\mu'$ , specific fuel consumption of jet engine (normally air-breathing). Not to be confused with fact that sfc of shaft-drive engines is measured in  $\mu g/J$  (microgrammes per joule).

12 Helicopter rotor-blade advance ratio or [in US] tip-speed ratio.

13 Engine bypass ratio.

14 Subscript FORS, microfibreoptic rate sensors.

15  $\mu s$ , microsecond[s].

16 Refractive index.

17 Crossfeed phasing parameter.

18 Diffusion coefficient of a stressed panel.

19 Mass per unit length.

20 In the US, Poisson's ratio [elsewhere, v].

**v**(nu) 1 Kinematic viscosity; suffix t, effective turbulent.

2 Wave, or phase, velocity.

3 Reluctance, reluctivity.

4 Number of molecules (stoichiometric);  $V_c$ , molecular diffusivity.

5 Frequency in  $s^{-1}$ .

6 Poisson's ratio.

7  $\tilde{v}$ , wave number (also v).

**ξ**(xi) 1 Aileron angle.

2 Damping, for each mode;  $\xi$  is average.

3 Shielding factor of spacecraft.

**ο**(omicron) Too like o to be used separately.

**π**(pi) 1 Ratio of circumference of circle to diameter, 3.141592653.

2 Solar parallax.

3 Generalized multiplying factor in failure-rate analysis.

**Π**(capital pi) 1 Generalized symbol for a product (math).

2 Often italic, osmotic pressure.

**ρ**(rho) 1 Generalized symbol for density;  $\rho_0$  air density at SL.

2 Radius of curvature.

3 Resistivity.

4 Reflection factor, reflectance.

5 Electric charge density (MHD, C/m<sup>3</sup>).

**σ**(sigma) 1 Relative density, eg to standard atmosphere,  $\rho/\rho_0$ .

## Appendix 1

- 2 Poisson's ratio ( $\nu$  preferred).  
 3 Prandtl interference factor (biplane).  
 4 Stefan-Boltzmann constant.  
 5 Electrical conductivity.  
 6 Velocity error, eg in INS readout.  
 7 Standard deviation.  
 8 Normal stress (also  $f$ ) ; at least 15 variations, with suffixes; also surface tension ( $\gamma$  more common).  
 9 Radar cross-section.  
 10 Subscript zero, incremental backscatter coefficient.  
 11 Generalized symbol for solidity.  
 12 Ratio of chordwise position of leading edge at tip to length of root chord.  
 13 Subscript  $y$ , aircraft response to gust or turbulence.  
 14 Subscript  $H$ , Hertz pressure.
- $\Sigma$** (capital sigma) Generalized symbol for a summation.
- $\tau$**  (tau) 1 Temperature (also  $\theta$ ).  
 2 Transmission factor or coefficient.  
 3 Shear stress in fluid (also  $q$ ).  
 4 Period (growth or decay), or time delay; also translational time response, distance constant divided by TAS.  
 5 Radar pulse width [subscript comp, compressed pulse width].
- $\upsilon$**  (upsilon) No aerospace meanings, loosely used interchangeably with  $v$ .
- $\phi$**  (phi) 1 Generalized function symbol.  
 2 Angle of bank or roll.  
 3 Angle between flight path and local horizontal; also induced angle of attack.  
 4 Slope of runway.  
 5 Rotor inflow angle.  
 6 Effective helix angle.  
 7 Latitude, terrestrial, celestial etc.  
 8 Shear strain (also  $\gamma$ , also called fluidity).  
 9 Polar co-ordinate angle.  
 10 Radian [luminous] or magnetic flux (also capital).  
 11 Entropy.  
 12 Velocity potential.  
 13 Phase displacement (also  $\theta$ ); subscript m, phase margin.  
 14 Cos  $\phi$ , electrical power factor.  
 15 Flight-control input frequency.  
 16 Wagner function.

## Greek Symbols

- $\Phi$** (capital phi) 1 Flux, magnetic or luminous.  
 2 Thrust or lift augmentation ratio in ejector.  
 3 Phase angle between input signal and polar coordinates of digital filter.  
 4  $\Delta\Phi$  Frequency difference between input signal and digital filter.  
 5  $\Phi_0$  Power spectral density.
- $\chi$** (chi) 1 Mass.  
 2 Magnetic susceptibility.  
 3 Symbol for probability.  
 4 Helicopter-rotor wake skew angle.
- $\psi$**  (psi) 1 Stream function.  
 2 Angle of yaw.  
 3 Azimuth angle.  
 4 Electrostatic, dielectric or luminous flux.  
 5 Helmholtz free energy.  
 6 Sweep angle of fin (vertical stabilizer), often with suffix number giving % chord of point of measurement.  
 7 Helicopter rotor-blade azimuth position, or Küssner function.  
 8 Rate of turn [ $^{\circ}/s$ ].
- $\Psi$** (capital psi) Electric flux.
- $\Psi_w$**  Age of a wake, especially from a rotating blade.
- $\omega$**  (omega) 1 Frequency (suffix c, carrier; n, natural or damped; r, resonant).  
 2 Angular velocity in rad/s.  
 3 Vorticity.  
 4  $\bar{\omega}$ , Specific weight, esp. piston engines.  
 5  $\omega_g$ , Gust frequency.
- $\Omega$**  (capital omega) 1 Ohms resistance.  
 2 Resultant velocity.  
 3 Solid angle (also  $\omega$ ).  
 4 Angular velocity, or rotational frequency, e.g. of helicopter rotor, or vorticity.  
 5 Turn rate, essentially same as 4.  
 6 Spatial frequency,  $\omega$  divided by TAS.
- $\Omega_s$**  Ohm-second, = henry.
- $\Omega_s$**  Spin rate, rad/s.
- $\mathfrak{D}$**  Conductance.

## Appendix 2: Powers of 10

<b>Y yotta</b>	<b>=</b>	$\times 10^{24}$	<b>d deci</b>	<b>=</b>	$\times 10^{-1}$
<b>Z zetta</b>	<b>=</b>	$\times 10^{21}$	<b>c centi</b>	<b>=</b>	$\times 10^{-2}$
<b>E exa</b>	<b>=</b>	$\times 10^{18}$	<b>m milli</b>	<b>=</b>	$\times 10^{-3}$
<b>P peta</b>	<b>=</b>	$\times 10^{15}$	<b><math>\mu</math> micro</b>	<b>=</b>	$\times 10^{-6}$
<b>T tera</b>	<b>=</b>	$\times 10^{12}$	<b>n nano</b>	<b>=</b>	$\times 10^{-9}$
<b>G giga</b>	<b>=</b>	$\times 10^9$	<b>p pico</b>	<b>=</b>	$\times 10^{-12}$
<b>M mega</b>	<b>=</b>	$\times 10^6$	<b>f femto</b>	<b>=</b>	$\times 10^{-15}$
<b>k kilo</b>	<b>=</b>	$\times 10^3$	<b>a atto</b>	<b>=</b>	$\times 10^{-18}$
<b>h hecto</b>	<b>=</b>	$\times 10^2$	<b>z zepto</b>	<b>=</b>	$\times 10^{-21}$
<b>da deca</b>	<b>=</b>	$\times 10$	<b>y yocto</b>	<b>=</b>	$\times 10^{-24}$

### [Other symbols]

- × Available quickly on receipt of request.
- § Facility available if arrangements are made [suggest days] prior to takeoff.
- % Emergency frequency [monitored].
- %X Emergency frequency [available but not monitored].
- ‡ Times UTC but varied by DST [daylight-saving time].

## Appendix 3:

# Electromagnetic frequency bands

For convenience, the EM frequency spectrum has been divided up into arbitrary ‘bands’, each of which has been allotted an identifying number (radio) or letter (radar):

### Radio

The following terminology is that agreed by the CCIR: Band 4, v.l.f. (very low frequency), 3–30 kHz; Band 5, l.f., 30–300 kHz; Band 6, m.f. (medium), 300–3,000 kHz (3 MHz); Band 7, h.f. (high), 3–30 MHz; Band 8, v.h.f. (very high), 30–300 MHz; Band 9, u.h.f. (ultra-high), 300–3,000 MHz (3 GHz); Band 10, s.h.f. (super-high), 3–30 GHz; Band 11, e.h.f. (extremely high), 30–300 GHz; Band 12 (awaiting a name), 300–3,000 GHz (3 THz).

### Radar

During World War 2, to assist security, radar wavebands were given arbitrary letters: P-band, 0.225–0.39 GHz; L, 0.39–1.55; S, 1.55–5.2; X, 5.2–10.9; K, 10.9–36; Q, 36–46; V, 46–56.

From 1946 several schemes proliferated. For radar, one authority divided the spectrum into convenient wavelengths, resulting in (figures rounded off): L, 1–2 GHz; S, 2–4; C, 4–8; X, 8–13 [in US sometimes 12.5]; Q (changed to Ku), 13–20; K, 20–30; Ka, 30–40.

European usage centred on: P, 80–390 MHz; L, 390–2,500 MHz (2.5 GHz); S, 2.5–4.1 GHz; C, 4.1–7.0 GHz; X, 7.0–11.5 GHz; J, 11.5–18.0 GHz; K, 18–33 GHz; O, 33–40 GHz; Q, 40–60 GHz; V, 60–90 GHz.

The ITU refined this to the following, now [from 1984] actually nominated for worldwide use: v.h.f., 138–144 and 216–225 MHz; u.h.f., 420–450 and 890–942 MHz; L, 1.215–1.4 GHz; S, 2.3–2.5 GHz; C, 5.25–5.925 GHz; X,

8.5–10.68 GHz; Ku, 13.4–14.0 and 15.7–17.7 GHz; K, 24.05–24.25 GHz; Ka, 33.4–36.0 GHz; V, 59–64 GHz; W, 76–81 GHz, 92–100 GHz; mm, 126–142, 144–149, 231–235 and 238–248 GHz.

A different rationalized version has been adopted for space communications (not with GPS):

L, 0.39–1.55 GHz; S, 1.55–5.2 GHz; C [overlapping S and X], 3.7–6.2 GHz; X, 5.2–10.9 GHz; Ku, 15.35–17.25 GHz; K, 10.9–36.0 GHz; Ka, 33–36 GHz.

In 1977 the US introduced a supposed definitive system covering an expanded range. This was adopted for electronic countermeasures, but the ‘old’ systems are still commonly used for military radar:

h.f., 10–30 MHz; v.h.f., 30–100 MHz; A, 100–300 MHz; B, 300–500 MHz (0.5 GHz); C, 0.5–1 GHz; D, 1–2 GHz; E, 2–3 GHz; F, 3–4 GHz; G, 4–6 GHz; H, 6–8 GHz; I, 8–10 GHz; J, 10–20 GHz; K, 20–40 GHz; L, 40–60 GHz; M, 60–100 GHz.

This system was adopted by NATO, but with the longer wavelengths changed to: A, 0–250 MHz; B, 250–500 MHz.

### Light

For completeness, at frequencies higher than those listed above, the microwaves of radar give way to IR (infra-red). From this point it is more common to cite wavelength, the reciprocal of frequency. IR covers a range of wavelengths roughly extending from  $100\ \mu$  ( $10^{-4}\text{ m}$ ) down to  $0.75\ \mu$ . As wavelength is reduced further, the light becomes visible to the human eye, disappearing again into the UV (ultra-violet) at about  $0.75\ \mu$ .

# Appendix 4:

## FAI categories

For the purpose of homologating records the FAI groups all aircraft into the following categories:

### A (Free balloons)

**AA** Gas balloons,

**AM** Mixed (hot air plus gas),

**AX** Hot air. The following suffix numbers indicate envelope volume:

1 up to 250 m <sup>3</sup> ,	2 250–400,
3 400–600,	4 600–900,
5 900–1,200,	6 1,200–1,600,
7 1,600–2,200,	8 2,200–3,000,
9 3,000–4,000,	10 4,000–6,000,
11 6,000–9,000,	12 9,000–12,000,
13 12,000–16,000,	14 16,000–22,000,
15 22,000+.	

### B (Dirigibles)

**BA** Gas filled

**BM** Mixed

**BX** Hot-air airships, suffixes:

3 900–1,600 m <sup>3</sup> ,	4 1,600–3,000,
5 3,000–6,000,	6 6,000–12,000,
7 12,000–25,000,	8 25,000–50,000,
9 50,000–100,000,	10 100,000 +.

### C (Aeroplanes)

**Group I** Piston-engined.

**C-1-a/o** Landplanes up to 300 kg empty weight,

**C-1-a** 300–500,  
c 1,000–1,750,  
e 3,000–6,000.

**b** 500–1,000,  
**d** 1,750–3,000,  
**f** 6,000–8,000.

**C-2** Seaplanes.  
**b** 600–1,200,  
**d** 2,100–3,400.

**C-3** Amphibians. Weight classes as C-2.

**Group II** Turboprops. As Group I plus

**C-1-g** 8,000–12,000 kg,  
i 16,000–20,000,

**h** 12,000–16,00  
**j** 20,000–25,000.

**Group III** Turbojets and turbofans. As above plus

**C-1-k** 25,000–35,000 kg,  
m 45,000–55,000.

**Group IV** Rocket aircraft. As Group I.

### D (Gliders):

**D-1** Single-seat, **D-2** Multi-seat.

### DM (Motor-gliders):

**DM-1** Single-seat, **DM-2** multi-seat.

### E (Rotorcraft)

**E-1** Land rotorcraft. Weight categories as for Group I landplanes.

**E-2** Convertiplanes, **E-3** Autogyros, **E-4** Vertiplanes.

### F (Model aircraft):

Various subsections.

### G (Parachuting):

Various subsections.

### H (Jet-lift VTOL aircraft):

This section is growing.

### I (Human-powered aircraft)

### K (Spacecraft):

Various types of mission.

### M (Tilt-wing/engine aircraft)

**N (STOL aircraft):** The FAI is having difficulty in drawing demarcation lines for this category.

### O (Hang-gliders and paragliders):

Various subsections.

### P (Aerospace craft):

Category new in 1985.

### R (Microlights):

Category new in 1985, various subsections.

### S (Space models)

Category new in 1999.

### U (Unmanned aerial vehicles)

Category new in 2001.

# Appendix 5:

## Phonetic alphabets

Early radios suffered severely from interference, which often made messages almost impossible to understand. The meaning was greatly clarified by inventing a word to confirm each letter, as far as possible with no two words

sounding similar. Even with modern clear electronic communications a phonetic alphabet is often helpful. The following alphabets are those used in English-language aviation:

---

### **UK usage 1912 to October 1942**

Ack	Johnny
Beer	King
Charlie	London
Dog	Monkey
Emma, later Edward	Nuts
Freddie	Orange
George	Pip
Harry	Queen, or Queenie
Ink	Robert

---

Sugar
Toc
Uncle
Vic
William
X-ray
Yorker, later York
Zebra

---

### **US/UK Combined Phonetic Alphabet**

#### **October 1942**

Adam; from Nov 42 Able	Jig	Sugar
Baker	King	Tare
Charlie	Love	Uncle
Dog	Mike	Victor
Easy	Negat (USAAF); from Nov 42 Nan	William
Fox	Oboe	X-ray
George	Prep (USAAF); from Nov 42 Peter	Yoke
How	Queen	Zed (USAAF); from Nov 42 Zebra
Item	Roger	

---

### **ICAO, from 1952**

Alpha; in US often Alfa	Juliet, in US often Juliett	Sierra
Bravo	Kilo	Tango
Coca or Coco, from 1953 Charlie	Lima	Union, from 1953 Uniform
Delta	Metro, from 1953 Mike	Victor
Echo	Nectar, from 1953 November	Whiskey
Foxtrot	Oscar	Extra or X-extra, from 1953 X-ray
Golf	Papa	Yankee
Hotel	Quebec	Zulu
India	Romeo	

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There are many such phonetic alphabets. The following is one used by German-speakers:

Anton	Heinrich	Siegfried
Berta, or Bruno	Ida	Toni
Cäsar	Josef	Ulrich
Dora	Kurfürst	Viktor
Emil	Ludwig	Wilhelm
Friedrich, or Fritz	Martha	Xantippe
Gustav	Nordpol	Ypern
	Otto	Zeppelin
	Paula	
	Quelle	
	Richard	

# Appendix 6:

## US military aircraft designations

Since 1962 all US military aircraft have been designated according to a common system which assigns a letter for the basic mission, followed after a hyphen by a number for the aircraft basic type. A simple example is B-1, signifying bomber type 1. Modifying letters are then added to give information on permanent changes to the basic mission, and occasionally a status prefix is added to show that the vehicle is ‘not standard because of its test, modification, experimental, or prototype design’. Between the basic mission letter and the hyphen a further letter can be added to denote the following ‘vehicle types’: rotary-wing, V/STOL, glider, lighter-than-air. To the right of the

number is added a series number, running consecutively from A (for the first production version) onwards, omitting I and O; the series letter is changed for each ‘major modification that alters significantly the relationship of the aerospace vehicle to its non-expendable system components or changes its logistics support’. Finally, in the fullest form of each designation, a block number is added to identify identical aircraft forming one production ‘block’; these numbers are usually multiples of 5, intermediate numbers then being assigned to identify later field modifications.

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<b>Status prefix</b>		<b>Basic mission</b>	
<b>G</b>	Permanently grounded	<b>A</b>	Attack
<b>J</b>	Special test (temporary)	<b>B</b>	Bomber
<b>N</b>	Special test (permanent)	<b>C</b>	Transport
<b>X</b>	Experimental	<b>E</b>	Special electronic installation
<b>Y</b>	Prototype	<b>F</b>	Fighter
<b>Z</b>	Planning	<b>O</b>	Observation
		<b>P</b>	Patrol
		<b>R</b>	Reconnaissance
		<b>S</b>	Anti-submarine
		<b>T</b>	Trainer
		<b>U</b>	Utility
		<b>X</b>	Research
<b>Modified mission</b>			
<b>A</b>	Attack	<b>Vehicle type</b>	
<b>C</b>	Transport	<b>G</b>	Glider
<b>D</b>	Director	<b>H</b>	Helicopter
<b>E</b>	Special electronic installation	<b>V</b>	VTOL/STOL
<b>F</b>	Fighter	<b>Z</b>	Lighter-than-air vehicle
<b>H</b>	Search and rescue		
<b>K</b>	Tanker		
<b>L</b>	Cold weather		
<b>M</b>	Multi-mission		
<b>O</b>	Observation		
<b>P</b>	Patrol		
<b>Q</b>	Drone UAV		
<b>R</b>	Reconnaissance		
<b>S</b>	Anti-submarine		
<b>T</b>	Trainer		
<b>U</b>	Utility		
<b>W</b>	Weather		

As an example of how the system works, if there were a special-test version of the trainer variant of the US Marine Corps Harrier it would be the NTAV-8B (ignoring any block number) = N, special test; T, trainer; A, attack; V, V/STOL; 8, eighth V/STOL type; B, second production model.

# Appendix 7:

## US engine designations

Each US engine manufacturer has its own entirely individual designation system. Department of Defense designations for jet engines are governed by a common scheme, though the Navy still uses a strictly numerical

sequence of Mk (Mark) numbers for its solid rocket motors. The following is the DoD scheme for jet and turbine engines:

### **Status prefix**

<b>J</b>	Special test
<b>X</b>	Experimental
<b>Y</b>	Prototype

### **Engine category**

<b>F</b>	Turbofan (current)
<b>J</b>	Turbojet
<b>LR</b>	Liquid rocket
<b>RJ</b>	Ramjet
<b>SR</b>	Solid rocket
<b>T</b>	Turboprop/turboshaft
<b>TF</b>	Turbofan (formerly)

### **Manufacturer code**

<b>A</b>	Allison, now Rolls-Royce
<b>AJ</b>	Aerojet-General
<b>GA</b>	Garrett, now Honeywell
<b>GE</b>	General Electric
<b>L</b>	Textron Lycoming, Stratford, now Honeywell
<b>LD</b>	Textron Lycoming, Williamsport
<b>MA</b>	Marquardt
<b>NA</b>	Rocketdyne (North American)
<b>P</b>	Pratt & Whitney (formerly)
<b>PW</b>	Pratt & Whitney (current)
<b>RR</b>	Rolls-Royce
<b>T</b>	Teledyne CAE
<b>TC</b>	Morton Thiokol
<b>WR</b>	Williams Research

Designations are completed by a suffix model number. In 1945 these began at 1 for AF numbers, using odd numbers only, and at 2 for the Navy, using even numbers. Thus the prototype C-130 had YT56-A-1 turboprops, while the first F-8 Crusader had a J57-P-12 turbojet. Today AF

numbers start at 100 or 200 and Navy numbers at 400. Thus the F-15C has F100-PW-220 turbofans.

Piston engines are designated by a letter giving the geometrical configuration of the cylinders, followed by a number giving the cubic capacity (displacement, or swept volume) in cubic inches rounded off to the nearest multiple of 5. Prefix letters can then be added (if necessary in multiple) giving further information. Suffix letters (previously numbers) indicate successive models of the same basic design.

### **Status prefix**

<b>X</b>	Experimental
<b>Y</b>	Prototype

### **Prefix letter**

<b>A</b>	Aerobatic
<b>G</b>	Gearred
<b>H</b>	Helicopter
<b>I</b>	Direct fuel injection
<b>T</b>	Turbosupercharged
<b>V</b>	Vertical mounting

### **Configuration letter**

<b>L</b>	Inline (upright or inverted)
<b>O</b>	Horizontally opposed
<b>R</b>	Radial
<b>RC</b>	Rotating combustion (Wankel type)
<b>V</b>	Vee

Thus Textron Lycoming's TIGO-541-E is the fifth model in a family of opposed engines of 541.5 cu in capacity (in a new series distinguished by the number 541 from the original series rounded off to 540) with turbocharger, direct injection and geared drive.

# Appendix 8:

## US missile and RPV designations

US unmanned air vehicles have their own designation system. This works in the same way as that for military aircraft, though it should be noted that manned aircraft converted as remotely piloted drones or targets retain

their original designation, with the drone prefix (Q) added. An exception is the Sperry (Convair) PQM-102, which is in accord with neither system.

Status prefix		Mission	
C	Captive	D	Decoy
D	Dummy	E	Special electronic installation
J	Special test (temporary)	G	Surface attack
M	Maintenance	I	Aerial intercept
N	Special test (permanent)	Q	Drone
X	Experimental	T	Training
Y	Prototype	U	Underwater attack
Z	Planning	W	Weather
Launch environment		Type	
A	Air	M	Guided missile/drone
B	Multiple	N	Probe
C	Coffin	R	Rocket
F	Individual		
G	Runway		
H	Silo-stored		
L	Silo-launched		
M	Mobile		
P	Soft pad		
R	Ship		
U	Underwater attack		

As an example, the original experimental Lockheed Aquila RPVs were designated XMQM-105: X, experimental; M, mobile launcher; Q, drone; M, guided (missile or drone); 105th guided type.

# Appendix 9:

## Joint electronics type designation system

US military electronic equipment is designated with the following series of letters and numbers, reading left to right:

1 Prefix AN, indicating that the equipment is a formally designated military system.

2 Three-letter equipment indicator code. The first letter indicates the platform from which the equipment operates, the second its type and the third its function. Platform letters are: **A** Piloted aircraft, **B** Underwater mobile (submarine), **D** Pilotless carrier, **F** Fixed ground, **G** General ground use, **K** Amphibious, **M** Mobile (ground), **P** Portable, **S** Water (surface), **T** Ground-transportable, **U** General utility, **V** Vehicular (ground), **W** Water (surface and underwater combination), **Z** Piloted/pilotless airborne vehicle combination.

Type indicators are: **A** Invisible light/heat radiation, **C** Carrier, **D** Radiac, **G** Telegraph or teletype, **I** Interphone/public address, **J** Electro-mechanical or inertial wire-covered, **K** Telemetry, **L** Countermeasures, **M** Meteorological, **N** Sound in air, **P** Radar, **Q** Sonar/underwater sound, **R** Radio, **S** Special or combination of types, **T** Telephone (wire), **V** Visual and visible light, **W** Armament, **X** Facsimile or television, **Y** Data-processing.

Function indicators are: **A** Attachment, **B** Bombing, **C** Communications, **D** Direction-finding, reconnaissance and/or surveillance, **E** Ejection and/or release, **G** Fire control or searchlight direction, **H** Recording and/or reproducing, **K** Computing, **M** Maintenance and/or test assembly, **N** Navigation aid, **Q** Special or combination of purposes, **R** Receiving/passive detection, **S** Detection and/or range and bearing search, **T** Transmitting, **W** Automatic flight/remote control, **X** Identification and recognition, **Y** Surveillance and control.

3 Number indicating place in the chronological sequence of all such systems to have entered service.

4 Designation modifying suffix giving additional information: **A**, **B**, **C** etc Successive major variants, **(V)** available in various configurations, **(V)1, 2, 3** etc indicates the variant used in a particular installation, **(X)** under development, **( )** not yet formally designated.

As an example, AN/ALR-62(V)4 indicates the 62nd type of piloted-aircraft countermeasures receiver/passive-detection system; this variant, the fourth, was specific to the EF-111A electronic-warfare aircraft.

# Appendix 10:

## Civil aircraft registrations

AP	Pakistan	HL	Korea, Republic of
A2	Botswana	HMAY	See MT
A3	Tonga	HP	Panama
A4O	Oman	HR	Honduras
A5	Bhutan	HS	Thailand
A6	United Arab Emirates	HV	Vatican City
A7	Qatar	HZ	Saudi Arabia
A8	Liberia	H4	Solomon Islands
A9C	Bahrain	I	Italy
B	China, also Taiwan	JA	Japan
B-H	Hong Kong	JU	Mongolia
B-M	Macao	JY	Jordan
C, CF	Canada	J2	Djibouti
CC	Chile	J3	Grenada
CN	Morocco	J5	Guinea-Bissau
CP	Bolivia	J6	St Lucia
CR, CS	Portugal	J7	Dominica (not Dominican Republic)
CU	Cuba	J8	St Vincent and Grenadines
CX	Uruguay	LN	Norway
C2	Nauru	LQ, LV	Argentina
C3	Andorra	LX	Luxembourg
C5	The Gambia	LY	Lithuania
C6	Bahamas	LZ	Bulgaria
C9	Mozambique	MT	formerly Mongolia, now JU
D	Germany	N	United States of America and outlying territories
DQ	Fiji	OB	Peru
D2	Angola	OD	Lebanon
D4	Cape Verde	OE	Austria
D6	Comoro, Republic of	OH	Finland
EC	Spain	OK	Czech Republic
EI, EJ	Ireland	OM	Slovakia
EK	Armenia	OO	Belgium
EL	was Liberia, now A8	OY	Denmark
EP	Iran	P	Korea, Democratic People's Republic of
ER	Moldova	PH	Netherlands, Kingdom of the
ES	Estonia	PJ	Bonaire (Netherlands Antilles)
ET	Ethiopia	PK	Indonesia
EW	Belarus	PP, PT	Brazil
EX	Kyrgyzstan	PZ	Suriname
EY	Tajikstan	P2	Papua New Guinea
EZ	Turkmenistan	P4	Aruba, Netherlands Caribbean
E3	Eritrea	RA, RF	Russian Federation
E5	Cook Islands	RDPL	Lao, People's Democratic Republic of
F	France	RP	Philippines
F-O	French overseas departments and territories [no longer active]	SE	Sweden
G	United Kingdom	SP	Poland
HA	Hungary	ST	Sudan
HB + national emblem	Switzerland and Liechtenstein	SU	Egypt
HC	Ecuador	SU-YA	Palestine
HH	Haiti	SX	Greece
HI	Dominican Republic	S2	Bangladesh
HK	Colombia	S5	Slovenia

## Appendix 10

## Civil aircraft registrations

S7	Seychelles	YS	El Salvador
S9	São Tôme and Principe	YU	Yugoslavia, Serbia, Montenegro
TC	Turkey	YV	Venezuela
TF	Iceland	Z	Zimbabwe
TG	Guatemala	ZA	Albania
TI	Costa Rica	ZK, ZL, ZM	New Zealand
TJ	Cameroon	ZP	Paraguay
TL	Central African Republic	ZS, ZT, ZU	South Africa, Transkei, Bophuthatswana
TN	Congo, People's Republic of the	Z3	Macedonia
TR	Gabon	3A	Monaco
TS	Tunisia	3B	Mauritius
TT	Chad	3C	Equatorial Guinea
TU	Ivory Coast	3D	Swaziland
TY	Benin	3X	Guinea, Republic of
TZ	Mali	4K	Azerbaijan
T2	Tuvalu	4L	Georgia, Republic of
T3	Kiribati	4R	Sri Lanka
T8A	Palau	4W	Yemen, Arab Republic of the [inactive 2005-]
T9	Bosnia-Herzegovina	4X	Israel
UK	Uzbekistan	5A	Libyan Arab Jamahiriya
UN	Kazakhstan	5B	Cyprus
UR	Ukraine	5H	Tanzania, United Republic of
VH	Australia	5N	Nigeria
VN	Vietnam	5R	Malagasy Republic (Madagascar)
VP-A	Anguila	5T	Mauritania
VP-B	Bermuda	5U	Niger
VP-C	Cayman Islands	5V	Togo
VP-F	Falkland Islands	5W	Western Samoa
VP-G	Gibraltar	5X	Uganda
VP-LA	Leeward Islands	5Y	Kenya
VP-LM	Montserrat	6O	Somalia
VP-LP	British Virgin Islands	6V, 6W	Senegal
VQ-H	St Helena and Ascension	6Y	Jamaica
VQ-T	Turks and Caicos Islands	7O	Yemen, Democratic People's Republic of the
VR-H, now B-H	Hong Kong	7P	Lesotho
VT	India	7Q	Malawi
V2	Antigua and Barbuda	7T	Algeria
V3	Belize	8P	Barbados
V4	St Kitts and Nevis	8Q	Maldives
V5	Namibia	8R	Guyana
V6	Micronesia	9A	Croatia
V7	Marshall Islands	9G	Ghana
V8	Brunei Darussalam	9H	Malta
XA, XB, XC	Mexico	9J	Zambia
XT	Burkina Faso (formerly Upper Volta).	9K	Kuwait
XU	Democratic Kampuchea (Cambodia)	9L	Sierra Leone
XV	Vietnam	9M	Malaysia
XY, XZ	Myanmar	9N	Nepal
YA	Afghanistan	9Q	Zaire, Democratic Republic of Congo
YI	Iraq	9U	Burundi
YJ	Vanuatu	9V	Singapore
YK	Syrian Arab Republic	9XR	Rwanda
YL	Latvia	9Y	Trinidad and Tobago
YN	Nicaragua		
YR	Romania		

# Appendix 11:

## British military aircraft damage categories

<b>Prior to 1941</b>			
Cat. U	Undamaged		repaired at a contractor's works after temporary repair, if necessary, and under restricted flight conditions
Cat. M(U)	Capable of being repaired on site by the operating unit		The parent unit and/or controlling authority have conducted technical investigations and air tests and are satisfied that the aircraft has unsatisfactory flying characteristics
Cat. M(C)	Beyond the unit's capacity to repair	Cat. 4 (Rogue)	Beyond economical repair or surplus, but recoverable for breakdown to components, spares and scrap
Cat. R(B)	Repair on site is not possible; the aircraft must be dismantled and sent to a repair facility		Beyond economical repair or surplus, and fit only for disposal as scrap
Cat. W	Write-off	Cat. 5(c)	Beyond economical repair or surplus, but suitable for ground instructional use
			Missing
<b>1941–1952</b>			
Cat. U	Undamaged	Cat. 5(s)	Repairable on site by first-line maintenance personnel
Cat. A	Aircraft can be repaired on site		Repairable on site by second-line maintenance personnel
Cat. Ac	Repair is beyond the unit capacity, but can be repaired on site by another unit or a contractor		Repairable on site but beyond the technical resources of the unit.
Cat. B	Beyond repair on site, but repairable at a Maintenance Unit or at a contractor's works	Cat. 5(gi)	Repairs will be done by a Service repair party (Cat.3(SER)), or civilian contractor's working party (Cat. 3(CWP)). Aircraft may be flown under limitations until repaired
Cat. C	Allocated to Instructional Airframe duties, for ground training	Cat. 5(m)	The damage sustained requires special equipment not available on site, and the aircraft must be moved for repair at an established Service repair depot (Cat.4(SER)) or to a contractor's works (Cat. 4(WKS))
Cat. E	Write-off	Cat. 1	Damaged beyond economic repair
Cat. E	Write-off, but suitable for component recovery	Cat. 2	Damaged or surplus, but suitable for ground instructional use
Cat. E2	Write-off and suitable only for scrap	Cat. 3	Beyond economical repair or surplus, but salvage of components or spare parts is possible
Cat. E3	Burnt out		Beyond economical repair or surplus, and suitable for scrap only
Cat. Em	Missing from an operational sortie; missing aircraft were thus categorised after 28 days		Missing, presumed lost
<b>1952–1961</b>			
Cat. 1	Undamaged and can remain in service.	Cat. 4	
Cat. 2	Aircraft can be repaired within second-line servicing capability of the parent or nearest unit		
Cat. 3 (Rep)C	Aircraft is repairable on site by a contractor's working party	Cat. 5	
Cat. 3 (Rep)S	Aircraft is repairable on site by a suitably qualified Service unit	Cat. 5(GI)	
Cat. 3 (Rep)C Fly	Aircraft can be flown to the contractor's works after temporary repair, if necessary, under restricted flight conditions	Cat. 5(COMP)	
Cat. 3 (Rep)C Deferred	The aircraft may be flown under limiting conditions specified by the holding unit until a suitable repair date is agreed with the controlling authority	Cat. 5(SCRAP)	
Cat. 4 (Rep)	Not repairable on site because special facilities and/or equipment is required. Aircraft will be	Cat. 5(MISSING)	

# Appendix 12:

## NATO Reporting Names

Since WW2 there have been three successive series of ‘type numbers’ or ‘reporting names’ assigned to Soviet aircraft by the NATO Air Standardization Co-ordinating Committee. When first assigned each new name was classified; this extended even to the suffix letters which identify important modifications of each basic design. For some reason the practice of assigning invented names has

continued even though the correct designations are known. Bomber and reconnaissance names begin with B, transports with C, fighters with F, helicopters with H and other types with M. A single-syllable name (except for helicopters) denotes a propeller aircraft. Older aircraft are omitted from the following list.

<b>Backfire</b>	Tu-22M	<b>Firebar</b>	Yak-28P
<b>Badger</b>	Tu-16 (Tu-88 and Chinese H-6)	<b>Fishbed</b>	MiG-21 (single-seaters and Chinese J-7)
<b>Beagle</b>	Chinese H-5 (licence-built Il-28)	<b>Fishpot</b>	Su-11 (single-seater)
<b>Bear</b>	Tu-95, Tu-142	<b>Fitter</b>	Su-7, Su-17, Su-20 and Su-22 (including some two-seaters)
<b>Blackjack</b>	Tu-160	<b>Flagon</b>	Su-15 and Su-21 (including two-seaters)
<b>Blinder</b>	Tu-22 (Tu-105)	<b>Flanker</b>	Su-27, Su-30, Su-32, Su-33, Su-35, Su-37
<b>Brewer</b>	Most Yak-28 tactical versions	<b>Flogger</b>	MiG-23 and MiG-27 (including trainers)
<b>Camber</b>	Il-86	<b>Forger</b>	Yak-38
<b>Candid</b>	Il-76	<b>Foxbat</b>	MiG-25 (including reconnaissance and trainer versions)
<b>Careless</b>	Tu-154, Tu-164	<b>Foxhound</b>	MiG-31
<b>Cash</b>	An-28	<b>Frogfoot</b>	Su-25, Su-28
<b>Clank</b>	An-30	<b>Fulcrum</b>	MiG-29
<b>Classic</b>	Il-62	<b>Fullback</b>	Su-34, Su-38
<b>Cline</b>	An-32	<b>Halo</b>	Mi-26
<b>Clobber</b>	Yak-42	<b>Harke</b>	Mi-10
<b>Coaler</b>	An-72, An-74	<b>Havoc</b>	Mi-28
<b>Cock</b>	An-22	<b>Haze</b>	Mi-14
<b>Codling</b>	Yak-40	<b>Helix</b>	Ka-27, Ka-28, Ka-29, Ka-31, Ka-32
<b>Coke</b>	An-24 (Chinese Y-7)	<b>Hermit</b>	Mi-34
<b>Colt</b>	An-2 (Chinese Y-5)	<b>Hind</b>	Mi-24, Mi-25, Mi-35
<b>Condor</b>	An-124	<b>Hip</b>	Mi-8, Mi-9, Mi-17
<b>Coot</b>	Il-18 and variants	<b>Hokum</b>	Ka-50
<b>Crate</b>	Il-14	<b>Hoodlum</b>	Ka-26
<b>Crusty</b>	Tu-134	<b>Hook</b>	Mi-6, Mi-22
<b>Cub</b>	An-12 and variants	<b>Hoplite</b>	Mi-2 (excluding PZL variants)
<b>Cuff</b>	Be-32	<b>Hormone</b>	Ka-25
<b>Curl</b>	An-26	<b>Hound</b>	Mi-4 (and Chinese Z-5)
<b>Farmer</b>	MiG-19 (and Chinese J-6, including trainer)	<b>Madcap</b>	An-71
<b>Fencer</b>	Su-24		
<b>Fiddler</b>	Tu-28P/128 (Tu-102)		

## Appendix 12

## NATO Reporting Names

<b>Maestro</b>	Yak-28U	<b>Mongol</b>	MiG-21U variants
<b>Mail</b>	Be-12/M-12	<b>Moose</b>	Yak-11
<b>Mainstay</b>	Beriev A-50M	<b>Moss</b>	Tu-126
<b>Mascot</b>	Chinese HJ-5 (licence-built Il-28U)	<b>Moujik</b>	Su-7U (but not later trainer versions)
<b>Max</b>	Yak-18 (and most variants except Yak-50/52/55 and Chinese CJ-6)	<b>Chinese aircraft</b>	Most indigenous Chinese designs have not been assigned NATO reporting names. Two exceptions which have been published are:
<b>May</b>	Il-38	<b>Fantán</b>	Nanchang Q-5
<b>Midas</b>	Il-78M	<b>Finback</b>	Shenyang J-8
<b>Midget</b>	MiG-15UTI		