British airways
OVERSEAS DIVISION

Concorde

FLYING MANUAL

Volume II (a)

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STATEMENT OF INITIAL CERTIFICATION.

This Manual is approved by British Airways Overseas Division in accordance with T.S.S. Standard No. 02.

This Publication forms part of the British Airways Overseas Division Approved Operations Manual.

Prepared by Technical Information Services.

REVISION RECORD

British airways
OVERSEAS DIVISION

Rev No	Date Entered	Initials	Rev No	Date Entered	Initials	Rev No	Date Fntered	Initials

British airways

CONCORDE FLYING MANUAL
Volume II(a)

LETTER OF TRANSMITTAL NO. 27

AND

LIST OF EFFECTIVE PAGES

The contents of this permanent revision are approved by BA-OD in accordance with TSS Standard No. O-2.

This manual consists of the following pages, listed to show the latest issue date of each enabling a complete check of all pages to be made.

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14	21.6.78	[illegible]						
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16	13.12.78	[illegible]						
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LETTER OF TRANSMITTAL

TEMPORARY REVISION NO. 19

The contents of this temporary revision index are approved by BA-OD in accordance with TSS Standard No. O-2.

PROCEDURE:
1. Insert attached pages.
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OVERSEAS DIVISION

CONCORDE FLYING MANUAL

Volume II (a)/(b)

This present copy of the Flying Manual has been prepared and printed from pages previously forming part of the Flight Crew Operating Manual.

Subsequent revisions will correct headings so that all pages will be entitled Concorde Flying Manual.

LIST OF CONTENTS

AIRPLANE CONTROL

MAXIMUM PERMISSIBLE WEIGHTS

Taxiing	186,880 kgs
Start of Take-off	185,070 kgs
Landing	111,130 kgs
Zero Fuel (includes unusable fuel)	92,080 kgs

NOTE

See Performance Manual for individual airfield structural take-off weight limitations

Baggage Holds

	LOAD		
	Total	Runway Load Limit	Floor Strength Limit
Under Floor Hold		320 kg/m(95 kg/ft)	488 kg/m^2(45 kg/ft^2)
Forward of door	995kg		
Aft of door	585kg		
Rear Hold		670 kg/m(205kg/ft)	488 kg/m^2 (45 kg/ft^2)
Lashed freight	2,767kg		
OR			
Unlashed freight	2,268kg		

(Unchanged)

PERFORMANCE

Snow, Frost and Ice

With the exception of the areas defined below, the aircraft must be clear of snow, frost and ice before take-off.

(1) Frost and ice are permissible on the underside of the wing, provided that they are confined to the general area of the fuel tanks and that the depth does not exceed 3mm.

(2) Thin hoar frost is permissible on all external surfaces provided that the ADC static vents and standby probe are clear.

Weight

The weights given in Vol.II.01.01.01 are maximum structural design weights. Lower take-off and landing weights may be required due to performance considerations. The limiting weights must be determined for each flight.

Airfield Altitudes

	Minimum	Maximum
For take-off and landing	-1,000 ft	8,000 ft

MAXIMUM CROSSWIND

The maximum crosswind component for take-off and landing is 30 kt.

Minimum Runway Width

150 ft

Runway Gradient

Maximum effective gradient for take-off and landing	±2%

Runway Conditions

Roughness

At weights above 130,000 kgs with passengers, or 135,000 kgs without passengers, operation of the aircraft is limited to runways listed in Performance Manual Section 1.

(Deletion)

Slush/Standing Water/Snow

(a) The aircraft is cleared to operate, without limitation, from "nominally clear" runways.

(b) The aircraft is cleared to operate from "precipitation covered" runways. See Performance Manual section 5 for performance penalty.

A 15 kt crosswind component limitation must be observed when operating from "precipitation covered" runways. Where the precipitation is water, slush, or wet snow, the maximum depth must not exceed 13 mm. Where the precipitation is dry snow, the maximum depth must not exceed 50 mm.

NOTE: A runway is considered to be "precipitation covered" when the average depth of precipitation which covers all or most of the runway exceeds 3 mm. Such water depths could occur when melted slush is trapped on the runway, but is extremely unlikely as a result of rain alone, unless torrential rain is combined with a crosswind which prevents water drainage from the runway. Such conditions are unlikely to persist for more than about 15 minutes.

Brake Energy for an Accelerate-Stop

Maximum permitted: 70×10^6 joules per brake.

AIRPLANE GENERAL

LEFT BLANK INTENTIONALLY

(Unchanged)

LOAD FACTOR AND CENTRE OF GRAVITY

Load Factor - -1.0 to +2.5g

Centre of Gravity

The aircraft must not be taxied with a PTOBO in excess of:-

3300 kgs for a 53.5% take-off
1800 kgs for a 54% take-off

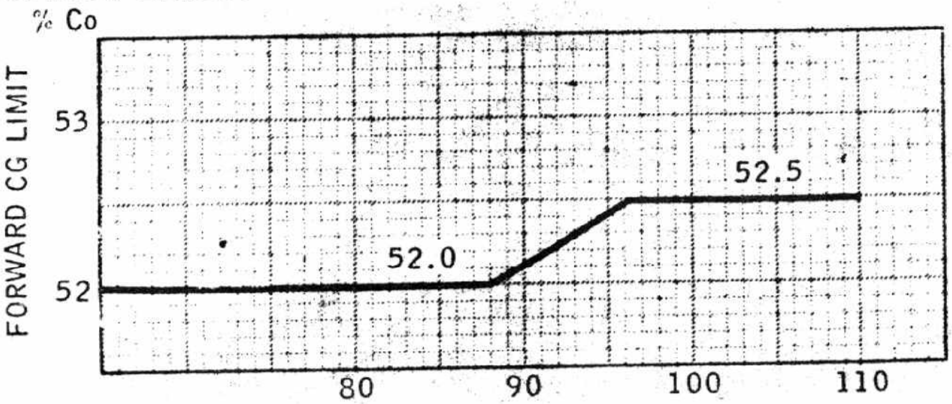
Take-off: Take-off is only permitted with the aircraft CG in one of the following three specified positions:-

53.0% for Take-off weights less than 140,000 kg. This is necessary to avoid spurious M/CG warnings. Take-off must not be commenced with a M/CG warning (See NOTE below)

53.5% for Take-off weights of 140,000 Kg or more and fuel loads up to the 53.5% Co maximum quoted in Table 5 of the Load & Balance Manual.

54.0% when it is necessary to carry a fuel load in excess of the 53.5% Co Take-off maxima quoted in Table 5 of the Load & Balance Manual.

Landing: Rear Limit: 53.5% Co
Forward Limit:



In-Flight: See pages 01.01.06 and 01.01.09 (CG and flight envelope limits are also given on Page 9).

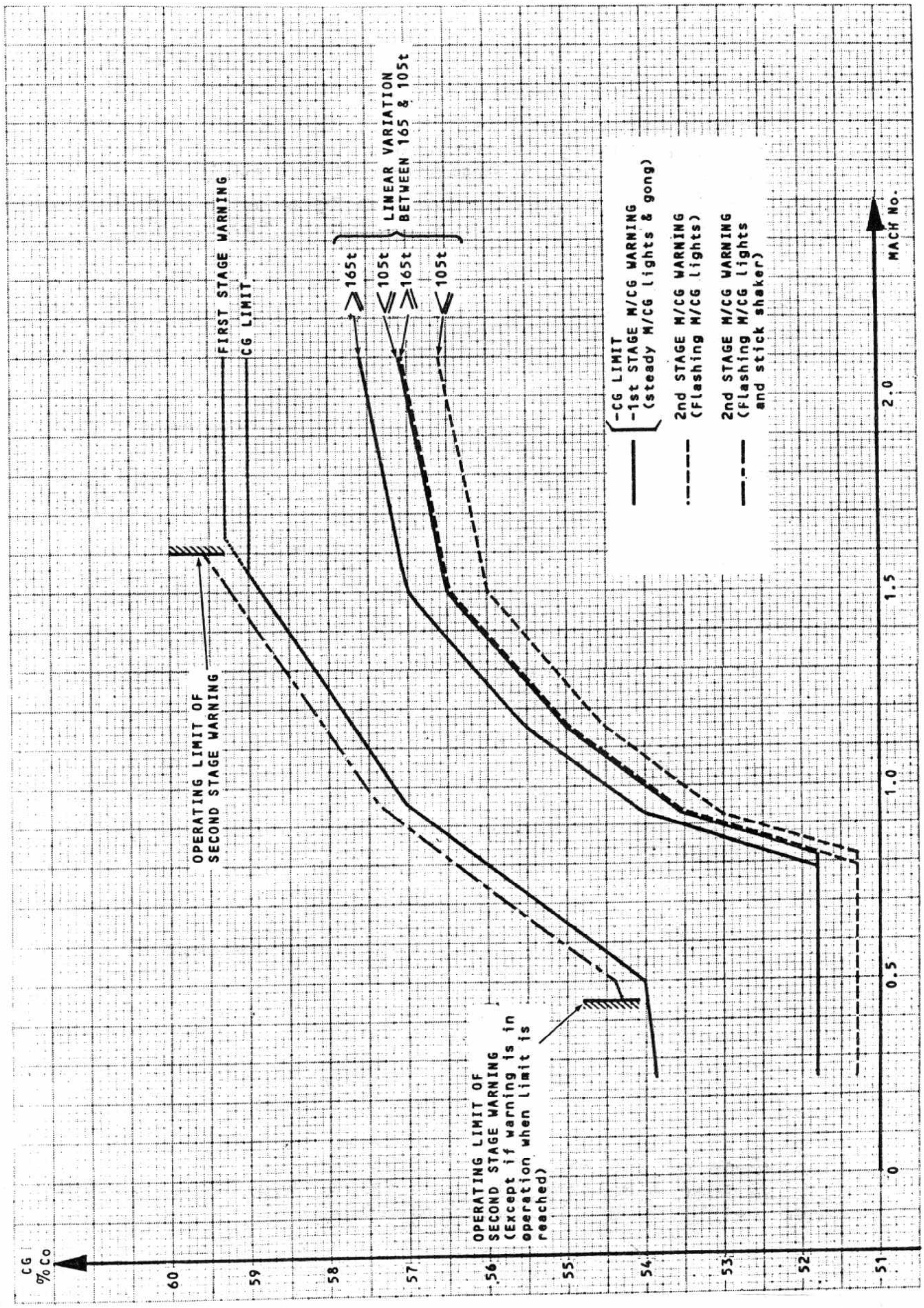
NOTE: Three balance charts are provided for 53.0, 53.5 and 54.0% Co Take-off CG and the standard fuel distribution together with the appropriate fuel transfer/fuel burn off quantities will ensure the respective nominal take-off CG position is achieved.

CG indication system errors of up to ± 0.3% are possible. Provided that the fuel is correctly distributed, take-off is permitted if the indicated CG position is within ± 0.3% of the Balance Chart value.

The RTOW data provided in the Performance Manual is calculated for a take-off CG of 53.5% Co. Use of 53.0% take-off CG is restricted to take-off weights less than 140,000 kg and the performance penalties given in the Performance Manual must be used.

Use of 54% take-off CG is limited to Take-off fuel quantities in excess of the maxima for 53.5% Take-off CG given in Table 5 of the Load & Balance Manual. There is a small improvement to RTOW weights - see Performance Manual.

IN-FLIGHT CG LIMITS
(Except for Take-off and Landing Phases)



(Unchanged)

SPEED

Flight Envelope
('No Fault' Condition)

V_{RA} Rough Air Speed

Below 32,000 ft

Aircraft weight below 140,000 kg : V_{RA} MAX = 300 Kts

Aircraft weight above 140,000 kg : V_{RA} MAX = 375 Kts

Above 32,000 ft

At all aircraft weights: V_{RA} MAX = Sufficiently below V_{MO}/M_{MO} to avoid frequent overspeed warnings.

V_{RA} MIN = 250 Kts or V_{LA} whichever is greater.

V_{MO}/M_{MO} Maximum permissible airspeed and mach number : See Flight Envelope on 01.01.08.

NOTE: The limits shown on this figure are based on the output from ADC 1. When operating at M_{MO} conditions the mach number output from ADC 2 will be approximately 0.01 M higher than the output from ADC 1.

The machmeter M_{MO} pointers are not affected by this difference.

V_{LA} Lowest authorised speed : See Flight Envelope on 01.01.08

NOTE: Below 15,000 ft it is superseded by the appropriate scheduled performance speeds (V_2 or V_{REF}).

T_{MO} Total temperature limit : 127°C.

NOTE: Any exceedance of T_{MO} which results in a total temperature in excess of the Engine Limit of 130°C must be reported after flight.

Maximum Altitude : 60,000 ft.

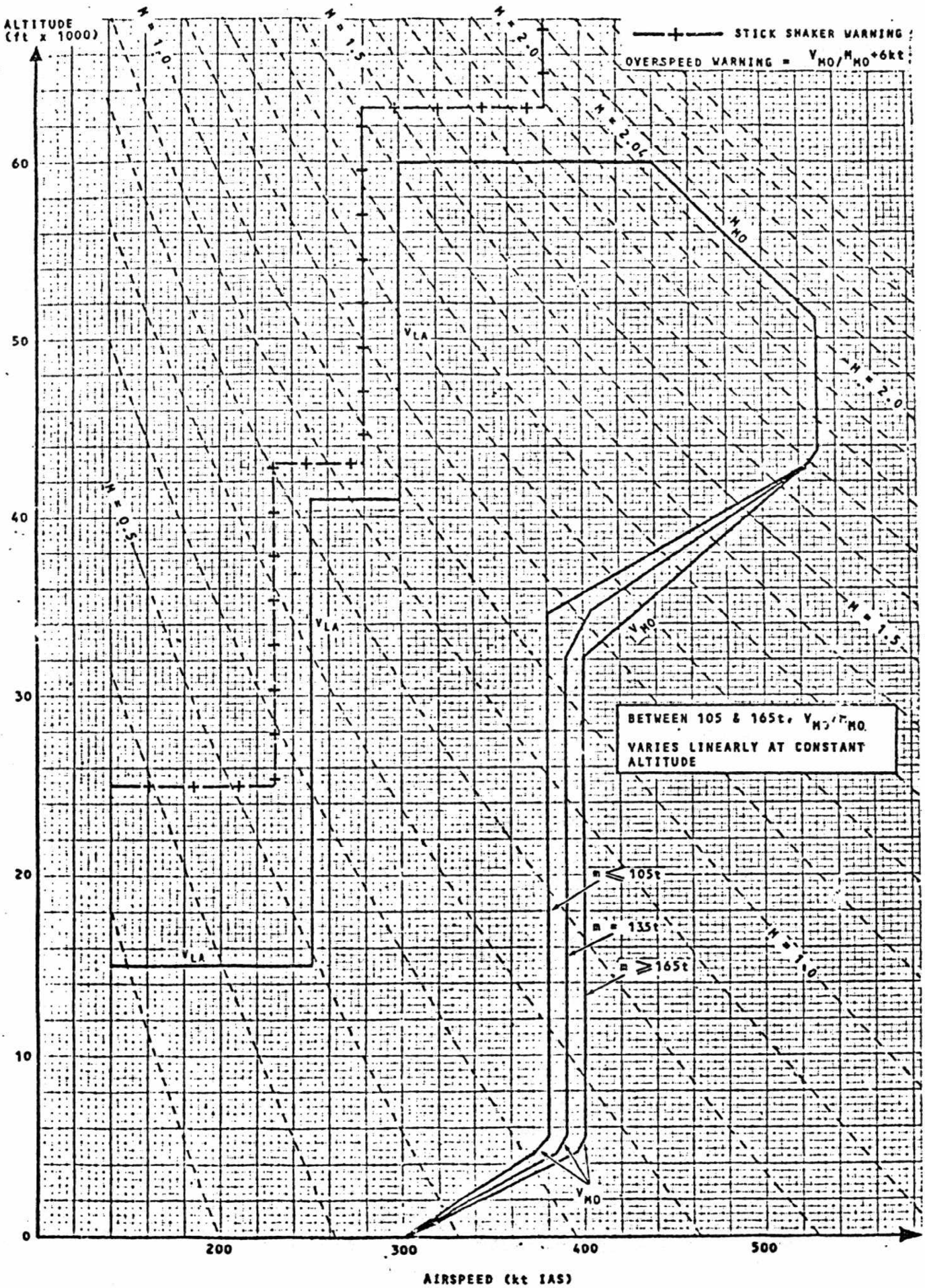
Maximum Incidence (ADC) : + 16.5° in quasi-static flight.

Minimum Pitch Attitude Above M = 1.0 : -5.5°

Maximum Mach No. in Subsonic Cruise:-

In manual control .... M = 0.93
With the autopilot engaged in ALT HOLD)
and the autothrottle engaged in MACH HOLD) .... M = 0.95

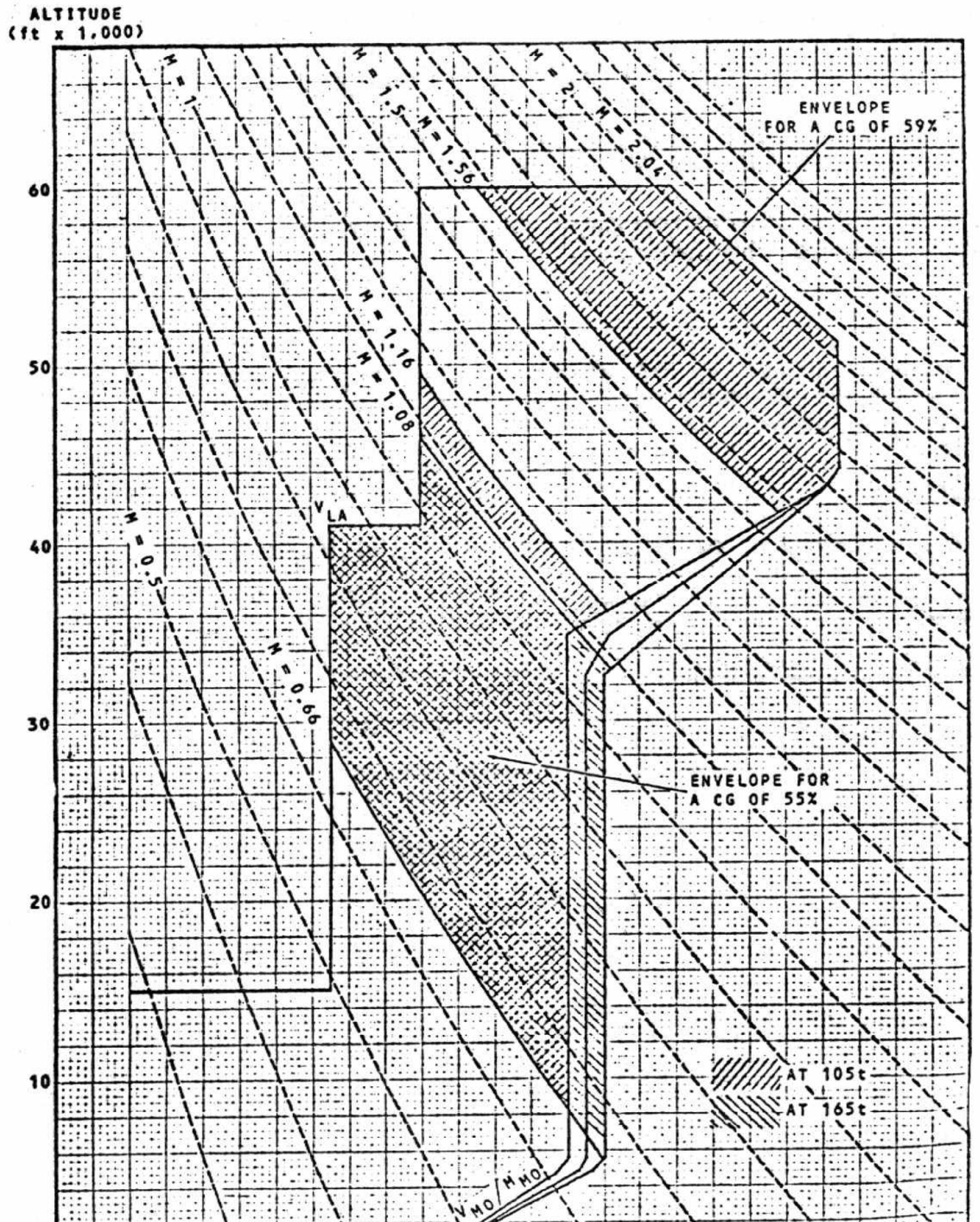
FLIGHT ENVELOPE LIMITATIONS



AIRPLANE GENERAL

MACH/CG

Mach number limitations vary with CG position and, to a lesser extent with weight, (see pages 01.01.05 and 01.01.06).
For example, the envelopes associated with supersonic and subsonic cruise, at CG positions of 59% & 55% Co respectively, are shown on the following figure:-



Failure Cases

The limitations are given with the associated procedures.

(Unchanged)

Nose/Visor

Visor Down, or operating Nose 5^{o} or operating between UP & 5^{o}	325 kt/M = 0.8
Nose Down, or operating between 5^{o} & DOWN	270 kt/20,000 ft
Nose and Visor up but unlocked	325 kt/M = 0.95

The nose must be in the 5^{o} position for take-off

Below 250 kt the visor must be in the DOWN position with the nose at 5^{o} or lower.

Nose and/or visor operation must not be made below 500 ft above the terrain.

Parking

To avoid the possibility of water being trapped in the manometric system, the aircraft must not be parked with the nose in the DOWN ($12\frac{1}{2}^{o}$) position.

Landing Gear

Retraction, extension or down	270 kt/M = 0.7
<u>Main Landing & Land/Taxi Lamps</u>	270 kt
<u>Windscreen Wiper Operation</u>	325 kt

<u>Side Vision Window</u> Not to be opened in flight

OPERATIONAL

Type of Operation

The aircraft is certificated in the Transport Category (Passenger).

Minimum Crew

Two Pilots and a Flight Engineer

Maximum Number of Occupants

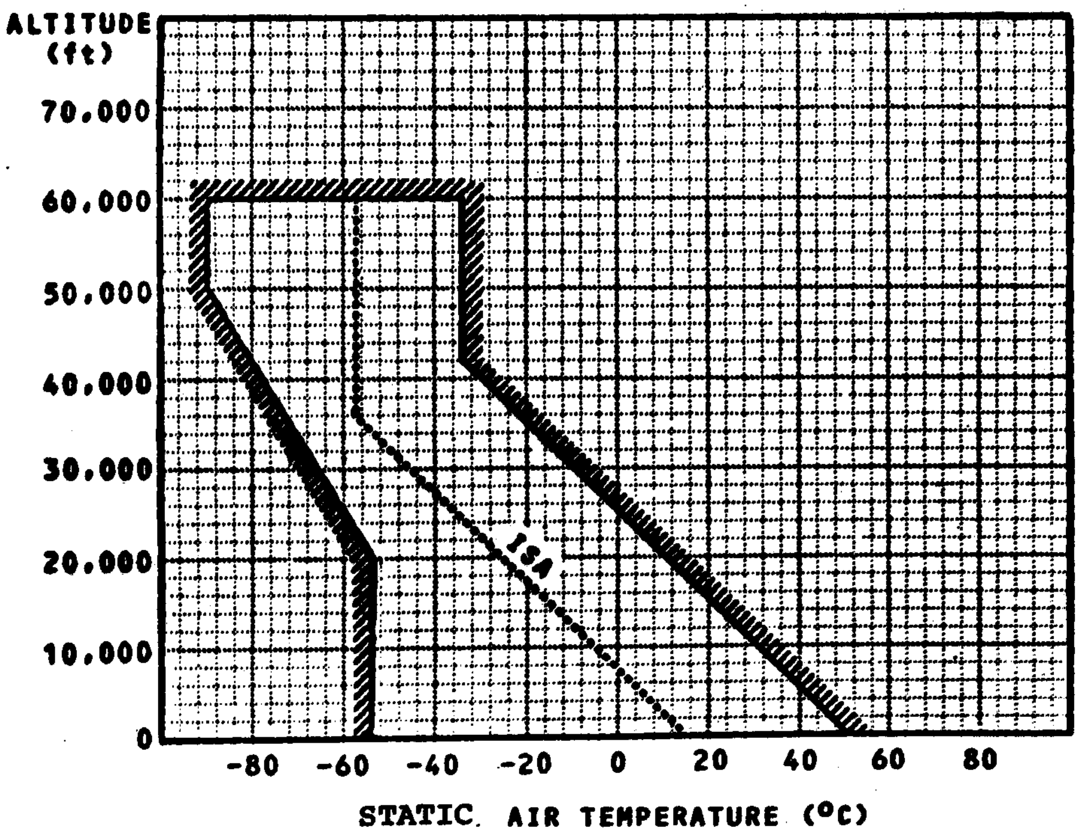
Not to exceed:	139
Maximum number of passengers:	128
Maximum number on the flight deck for take-off and landing:	5

The maximum number of occupants must not exceed the number of seats provided and approved for use during take-off and landing.

Children who are under the age of three years and who are carried in the arms of passengers may be left out of account for these purposes.

Altitude/Static Air Temperature Limits

The aircraft and its equipment are cleared to operate within the altitude/static air temperature limits shown below. It should be noted that more restrictive limitations are specified in 01.11 relating to the minimum oil and fuel temperatures for engine starting, relighting and running above Idle power.



(Unchanged)

AIRPLANE GENERAL

MISCELLANEOUS

Crew Seats

For take-off and landing the crew seats must be locked, and where power operated, with the power switched off. In addition the flight engineer's seat must be facing forward with the crash lock engaged and the seat indicator located within the white band painted on the scanning trolley.

Passenger Luggage Bins

To avoid influencing the local magnetic field near the flux valves, the presence of any metallic object, or object which might cause a magnetic disturbance, is prohibited in the passenger luggage bins labelled:- CREW USE ONLY
RESERVE A L'EQUIPAGE

Smoking

Smoking is permitted only in the passenger cabin (excluding the toilets) and the flight crew compartment.

Limits indicated by Instrument Colour Coding

The meaning of the colour code used on some instruments to indicate operating ranges and limits is as follows:-

Type & Colour of Marking	Meaning
Red line	Minimum & Maximum safe operating limits
Red Area	Prohibited range
Yellow Area	Precautionary range NOTE: The yellow areas on the EGT indicators have the following meaning : Narrow arc : precautionary range for take off and reheated climb rating Wide arc : precautionary range for the contingency rating
Green Area	Normal Operating range

(Compl ly Revise

MISCELLANEOUS

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Green Area	Normal Operating range

AIR CONDITIONING AND PRESSURIZATION

Rack Cooling and Air Generation

A conditioned air supply must be provided when the flight deck ambient temperature is greater than 25^{o}C and electronic/electrical equipment is being operated for longer than 45 minutes without the appropriate master circuit breakers being tripped.

With two generation groups inoperative:-
Total temperature limit = 100^{o}C T_T

With three generation groups inoperative:-
Mach No. limit : less than M = 1.0.

With four generation groups inoperative, or in unpressurized flight:-
The cabin altitude must not be allowed to exceed 15,000 ft.

Cabin Differential Pressure

Maximum in flight	:	11.7 psi
Normal Operating maximum	:	10.7 psi

I.N.S. Ground Running Limitations

Maximum running time with forward rack cooling fans inoperative is 2 minutes.

Automatic Flight Control

The autopilot approach modes must not be used unless autothrottle is engaged.

The flight director approach modes must not be used unless autothrottle is engaged.

In approach using the autopilot and/or flight director in the LAND mode the approach speed must be stabilized by 700 feet.

When an autopilot, or flight director, is engaged in the MAX CRUISE mode it is not permitted to engage the autothrottle associated with the non-engaged autopilot, or flight director, i.e. the following combinations are prohibited:-

AP 1/AT 2	and	AP 2/AT 1
FD 1/AT 2	and	FD 2/AT 1

Autopilot

(1) After take-off the following autopilot engagement limitations must be observed:-

(a) It must not be engaged below a height of 500 ft above the ground.

(b) If a noise abatement procedure is followed:-

(i) It must not be engaged before power has been reduced to the noise abatement setting.

(ii) It may be engaged during the noise abatement procedure only when the aeroplane is stabilised at the noise abatement speed.

(2) The aeroplane must not descend below a height of 1,000 ft above the ground with the autopilot engaged unless it is coupled to an ILS, or the autopilot is engaged in the INS and VERT SPEED modes and all the following conditions are observed:-

(a) The controlling autopilot is receiving data from an INS which had its position data updated shortly before the descent from 1,000 ft.

(b) The selected vertical speed is less than 1,000 ft/min rate of descent.

(c) The pitch attitude is never less than 5° nose up.

(d) Visual contact with the ground is established at not less than 800 ft above the ground.

(e) The autopilot does not remain engaged below a height of 500 ft above the ground.

(Unchanged)

(3) The GO-AROUND mode must not remain engaged above a height of 1,000 ft above the ground.

(4) An automatic approach may be made in GLIDE mode provided that:-

(a) The decision height is not less that 200 ft.

(b) The autopilot does not remain engaged below a height of 100 ft

AUTOMATIC FLIGHT

(5) An automatic approach and landing may be made in LAND mode provided that:-

(a) The reported headwind component is not more than 25 kt, the crosswind component is not more than 15 kt, the tailwind component is not more than 10 kt and the level of turbulence is not more than is normally associated with the wind speed.

(b) The nominal glide path angle is not less than 2.5^{o} or more than 3.1^{o}.

(c) The ILS beam is established to be suitable for automatic landing.

(d) The LAND button on the autopilot controller is illuminated at 700 ft.

(6) A category 2 ILS approach and landing may be made provided that the following limitations are observed:-

(a) The decision height must not be less than 100 ft.

(b) The autopilot must be used in LAND mode, (single or dual), and the limitations given in (5) above for the use of this mode must be observed.

(c) The runway has ICAO Category 2 localizer and glide path transmitters which are reported to be operating within Category 2 limitations, (See NOTE).

NOTE

Some monitor failures in the ground ILS would permit the radiation of erroneous signals if followed by a transmitter malfunction. There is no provision in the aeroplane for recognising such a condition. Category 2 operations can only take place with safety using ground stations whose maintenance procedures and design are such that the monitoring of the transmitted signal is reliable.

A Category 3 ILS approach and landing may be made provided that the following limitations are observed:-

(a) The decision height must be 15 ft. (radio height).

(b) The autopilot must be used in LAND mode and the limitations given in (5) above for the use of this mode must be observed.

(c) LAND 3 must be shown on the Warning and Landing Display at 300 ft. (radio height).

(d) The aerodrome must be reported to be operating in accordance with the requirements for Category 3 operation.

(e) The Obstruction Free Zone must be free of obstacles up to the Category 2 decision height.

(Deletion)

(f) The touch-down RVR value must be reported to be not less than 250 metres, and the mid-point RVR not less than 150 metres.

Flight Director

(1) The flight directors must not be engaged after take-off below a height of 500 ft above the ground.

(2) The aeroplane must not descend below a height of 1,000 ft. above the ground with a flight director engaged unless it is coupled to an ILS.

(3) The Flight Manual states that when the flight directors are used as the primary means of guidance in GLIDE or LAND modes, the decision height must not be less than 200 ft. However it is Flight policy not to use the flight director as the primary means of guidance in the LAND mode.

(4) The flight directors must not be used on the approach below a height of 160 feet above the ground, but may remain engaged.

contd

Autothrottle

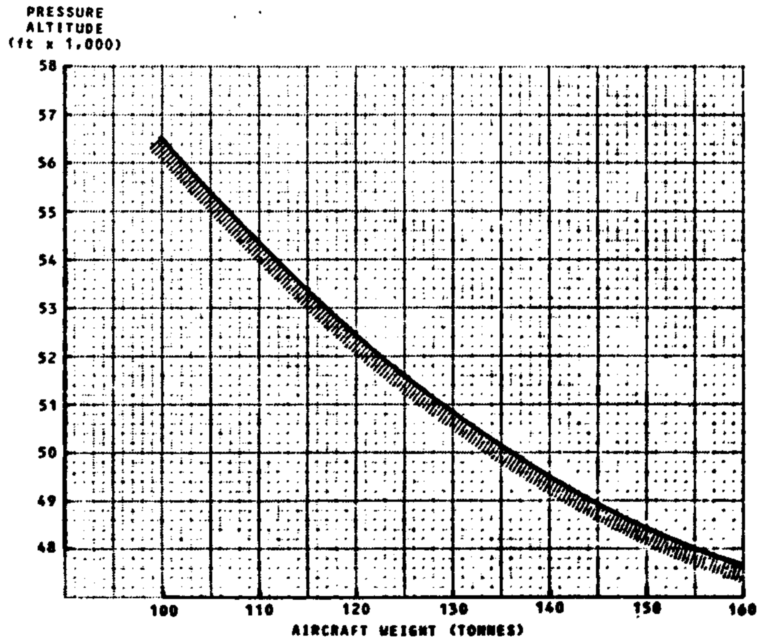
(1) The autothrottle must not be used in any of the following 3 conditions:-

(a) In IAS HOLD mode below a speed of 185 kt.

(b) With 2 engines inoperative.

(c) During supersonic cruise below the altitudes shown in the following figure:-

MINIMUM SUPERSONIC CRUISE ALTITUDE



NOTE:

The limit shown is valid for ambient temperatures of ISA + 4° C and below.

For ambient temperatures above ISA + 4° C the limiting altitude is reduced, from that shown, by 1,000 ft for each 2°C that the ambient temperature is above ISA + 4°C.

(2) The autothrottle must be disengaged at not less than 40 ft during an approach in manual control.

ELECTRICAL

Main Generators

Maximum continuous load per generator	54 kW or 36 kVAR
Maximum overload per generator (5 min limit)	80 kW or 60 kVAR
Maximum system load sharing between parallel generators	6 kW or 4 kVAR

Emergency Generator

Maximum load	30 kVA (25 kW)

Transformer Rectifier Units:

Maximum current per TRU	150 amp
Maximum overload per TRU (5 min limit)	200 amp

Constant Speed Drive

Oil Inlet Temperature	
Continuous Maximum	145°C
1 hour Limit	145°C to 155°C
5 minute Limit	Above 155°C
Maximum Oil Temperature Difference	20°C up to 30 kW 30°C above 30 kW

Split System Breaker (SSB)

If it is desired to open the SSB when only 3 main generators are on line, the Emergency Generator must be selected to Manual and left running for the remainder of the flight.

If the Emergency Generator voltage and frequency are outside the limits 110-118V and 390-410 Hz the SSB MUST NOT be opened except as part of the crew procedure to re-instate the generator system following malfunction or failure, (including the "Electrical Smoke or Fire" drill).

Batteries

Maximum initial charge rate is 100 amp

Maximum charge rate per battery, after 20 min, is 20 amp

Manual Paralleling

Manual Paralleling must not be attempted if there is a difference of more than 6HZ across the BTB.

FLIGHT CONTROLS

PITCH CONTROL FORCES

During turns at V_{REF}, pitch control forces must not be trimmed out.

BLUE OR GREEN SYSTEM SPOOL VALVE JAM

IF M $\leq$ 0.93

Replan for subsonic flight maximum speed of M : 0.93.

IF M $\geq$ 0.93

Reduce speed to 350 kt at constant altitude, then descend to FL 310 at speed 350 kt.
Replan for subsonic flight M : 0.93.

FLIGHT CONTROL POSITION INDICATOR WARNING

CONTROL SURFACES IN M MODE	MAX AFT CG	LANDING SPEED	M MAX
RUDDER			1.97
MID. OUTER or INNER or ALL ELEVONS	M < 1 55% M > 1 58.5%	MINIMUM V_{REF} +10 kt	1.97
If all surfaces are in M mode, before transonic acceleration, remain subsonic.			

INVERTER FAILURE WARNING

FLIGHT PHASE	M MAX	MAX AFT CG	V for Landing
BEFORE TRANS ACCEL	0.93	55%	V_{REF} + 10 kt
AFTER TRANS ACCEL	1.97	58.5%	

LOSS OF TWO ARTIFICIAL FEEL SYSTEMS

Control forces are reduced, fly the aircraft with care.

IF PITCH AXIS IS LOST

In subsonic cruise, limit the AFT CG to 55%.

IF YAW AXIS IS LOST

Avoid using the rudder pedals in subsonic flight above 250 kt.

EMERGENCY FLIGHT CONTROL

The Emergency Flight Control System is to be used only in those cases of jamming where force on the control column/wheel produces, in the particular axis, no movement of the column/wheel in the direction demanded.

FUEL SYSTEM

Fuel Loading

The refuelling of the aircraft is carried out to schedules which specify the fuel distribution according to the total fuel load and specific gravity.

When refuelling, the fuel must be distributed in accordance with these instructions.

Refuelling with Passengers on Board

Passengers must not be on board the aircraft when it is being refuelled with fuel which does not contain Shell ASA-3.

This limitation does not apply when "topping-up" Tank 11 to achieve the required fuel load.

Minimum Fuel Load for Go-around/Baulked Landing

A Go-around or baulked landing must not be attempted unless the collector tank total contents are greater than 2,500 kg. The total must be divided approximately equal between the four tanks.

A baulked landing with 2 engines inoperative must not be attempted if the fuel quantity in each collector tank supplying operating engines is less than 1,250 kg.

FUEL SYSTEM

Approved Fuels and Additives

Fuels

(1) Unlimited Use

Kerosine type, (AVTUR), fuels to the following specifications:-
D. Eng R.D. 2494 Iss.7 Amd. 1
AIR 3405/C Iss.4
ASTM D 1655-73 Jet A-1
3-GP-23 h
D. Eng R.D. 2453 Iss.3 Amd. 1

NOTE

Fuel specification D. Eng R.D. 2453 already includes Hitec E.515 and anti-icing additive to specification D. Eng R.D. 2451 Iss.2 The limitation on the use of this fuel is as specified subsequently in paragraph B (2) for all fuels containing Hitec E.515.

(2) Limited Use

The following fuels may be used on a non-routine basis when no fuels in the "unlimited use" category are available:-
ASTM ES2-74 Jet A-1
and, provided that the operational conditions are such that the fuel temperature will at no time, fall below -40°C:-
ASTM ES2-74 Jet A

Where the -40°C limitation specified above can be observed the following fuel may be used on a routine basis:-
ASTM D 1655-73 Jet A.

For use of Jet B, Wide-cut JP4 type of fuel, see Conditional Procedure entitled, "Use of JP4 type fuel".

Additives

(1) Icing Inhibitor

D. Eng R.D. 2451 Iss.2
AIR/3652/A
MIL - I - 27686 E.

The maximum permitted concentration of the additive is 0.15% by volume.

If any fuel heater is inoperative, use of fuel containing an approved icing inhibitor, at a concentration of not less than 0.1% by volume, is mandatory.

FUEL SYSTEM

(2) Corrosion Inhibitor

Hitec E.515 in concentrations not exceeding 21 mg/litre, (7.5 lb per 35,000 Imperial gallons).

TOLAD 245 in concentrations not exceeding 34 mg/litre, (12 lb per 35,000 Imperial gallons).

(3) Static Dissipator

In order to achieve a refuelling time of 20 minutes from normal reserve quantities to full tanks, Shell ASA-3 static dissipator must be present in the fuel at concentrations up to a maximum of 1.0 mg/litre, (0.35 lb per 35,000 Imperial gallons).

If ASA-3 is added to the fuel, concentrations may only be used which result in the electrical conductivity of the fuel remaining within the specification limits.

If fuel is used which does not have an appropriate concentration of static dissipator, the restrictions on refuelling rate must be observed. These are given in section 1-1 page 2 of the Refuelling Book.

(4) Combined Additives

AL 38

This is a combination of 99 parts by weight of fuel system icing inhibitor and 1 part by weight of Hitec E.515. The maximum permitted concentration is 0.13% by volume, provided that the fuel does not already contain either of the constituent additives, The use of AL.38 is subject to the limitations specified for Hitec E.515.

(5) Fuel Dye

Automate Yellow 662 or 662F

The maximum permitted concentration is 120 ppm by weight, (42 lb per 35,000 Imperial gallons).

(6) Anti-Microbial Additive

Biobar JF, in concentrations not exceeding 270 ppm and with a total boron content not exceeding 20 ppm, may be used on an intermittant basis. It is permitted to burn off the treated fuel provided that the fuel is not contaminated by microbiological or other debris.

FUEL SYSTEM (OILS)

Approved Oils

The following oils, to D. Eng R.D. 2497, are approved for use in the main engine, air starter and nozzle trim unit:-

BP ENERJET 523
Esso ETO 25
Shell ASTO 555
Mobil RM 193A-3

The only oils currently approved for use in the Integrated Drive Generator are:-

Esso ETO 25
Esso ENCO 2380

Different Oils must not be mixed in the same unit.

HYDRAULIC POWER

Engine Driven Pump Dry Running

When an engine driven pump has run for more than 30 minutes with the associated hydraulic Shut-Off Valve Shut, it must not be re-activated.

Hydraulic Auxiliary Compresser

Two operating cycles followed by a 10 minute cooling period.

LANDING GEAR

Landing Gear

Retraction, extension or down 270 kt/m = 0.7

Brakes

Take-off must not be commenced if any brake overheat warning light is illuminated.
Take-off is prohibited if any Anti-Skid 'R'light comes on during gentle braking above 10 kt, or is permanently on during the initial take-off roll.

> The take-off prohibition, when any 'R' light is permanently on, does not apply when the aircraft is being operated in accordance with the MEL concession which allows dispatch with a confirmed indication system fault, which results in one of the 'R' lights being permanently on.

The wheelbrakes must not be released at engine powers above Idle, when the aircraft is stationary.
When using the emergency braking system, (brake control lever in the EMERG position), the brake pressure must be limited, except in the case of an emergency, to a maximum of 900 psi when taxiing.
Except in the case of an emergency, or a failure condition where the drill requires such action, the brake control lever must not be moved to the PARK position unless the aircraft is at a complete standstill.
When the brake control lever is in the PARK position the engines must not be operated above 82% N_2 except under the following conditions:-

> Any one engine may be run at up to maximum take-off power with reheat, provided that the other engines are not above Idle power.

Gear O/Ride

Under certain failure conditions it is possible that damage could occur if the normal landing gear selector baulk is over-riden. Because of this the O/RIDE button must only be used if it is vital for the safety of the flight, (e.g. obstacle clearance in the event of engine failure(s)).

Taxiing

When taxiing at weights above 176,900 kgs.

1. Sharp turns above 40 kt must be avoided.
2. Full rudder pedal travel may be applied only below 40 kt.
3. The nosewheel steering tiller may be used only below 15 kt.

NOTE: The limitations are given in terms of speeds indicated by the INS at the start of the manoeuvre.

NAVIGATION SYSTEMS

INS Alignment

Maximum latitude for alignment .... 76°.
The aircraft must not be moved while the INS is in the ALIGN mode.

ADC Comparator Failure

The maximum operating speeds V_{MO}/M_{MO} must be reduced by 10 kt and by 0.05 mach respectively, when the ADC comparator is not functioning.

NOSE AND VISOR

Nose/Visor

Visor Down, or operating Nose 5° or operating between UP & 5°	325 kt/M = 0.8
Nose Down, or operating between 5° & DOWN	270 kt/20,000 ft
Nose and Visor up but unlocked	325 kt/M = 0.95

The nose must be in the 5° position for take-off

Below 250 kt the visor must be in the DOWN position with the nose at 5° or lower.

Nose and/or visor operation must not be made below 500 ft above the terrain.

Parking

To avoid the possibility of water being trapped in the manometric system, the aircraft must not be parked with the nose in the DOWN (12½°) position.

ENGINE

Introduction

In forward thrust the maximum permitted value of N_2 is a function of the engine rating being used as shown on the flight deck placard. Also, in forward thrust, the maximum permitted value of EGT depends on the engine rating being used and on the total temperature. The limiting value for any particular condition can be determined by reference to the figure on page 01.11.03.

In reverse thrust the maximum permitted value of N_2 depends on the total temperature.

Placarded Limitations

The principal engine limitations are placarded on the flight deck. For convenience of presentation, and to ensure consistency, the limitations for these parameters are covered by the figure below depicting the flight deck placard.

OLYMPUS 593 MK.610-14-28 LIMITATIONS

CONDITIONS		% RPM N_2	% RPM N_1	EGT °C	TIME LIMIT
CONTINGENCY		106.8	102.0	833 *	2½ MINS
TAKE-OFF		106.0	102.0	803 *	5 MINS
REHEATED CLIMB		105.6	102.0	772 *	15 MINS
MAX.CONTIN (CLB/CRS)		105.3	102.0	736 *	NO LIMIT
IDLING MINIMUM		60.0	-	-	NO LIMIT
REVERSE	FLIGHT	IDLE	-	-	4 MINS
	GRD.IDLE	IDLE	-	-	45 SECS TOTAL
	GRD.MAX	98.0*	-	-	30 SECS AT MAX
START & RELIGHT		-	-	550	2 SECS
AUTO DE-BOW		32.0	-	-	3 MINS

OIL
TEMP.FOR TAKE-OFF:125°C MAX

FRONT VIBRATION
MAX.CONTINUOUS: 5"/SEC

NOTE:
EGT & N_2 VALUES MARKED * VARY WITH TOTAL TEMP & ARE THE HIGHEST POSSIBLE. FOR EGT VARIATION WITH TOTAL TEMP. SEE PAGE 03 OF THIS SECTION.

Oil, Fuel, TCA, Air Turbine Starter and Throttle Limitations (non-placarded)

NOTE: CSD Oil temperature limitations are given on page 01.04.01.

Oil Pressure

(1) The normal operating oil pressure range is 18 to 30 psi.

(Deletion)

(2) The minimum oil pressure acceptable for flight = 18 psi with the GRD IDLE switch set at LO.

(3) The minimum oil pressure for continued engine operations = 15 psi.

Continued

4 OCT.79

British airways

TEMPORARY REVISION
Insert facing 01.11 page 01

REASON FOR ISSUE:

Incorporation of Olympus modification 8562 in order to reduce engine oil consumption due to internal leakage.

The modification lowers the operating pressure by introduction of a restrictor in an external feed pipe and resets the low pressure switch datum to 7 psi.

ACTION:

When Olympus modification 8562 is incorporated the following engine oil pressure limitations must be observed:-

(1) The normal operating oil pressure range is 10 to 20 psi.

(2) The minimum oil pressure acceptable for take-off is 10 psi with the Ground Idle switches at Low.

(3) The minimum oil pressure for continued engine operation is 7 psi.

Engines with the modification incorporated can be identified by an entry in Notes to Crew and Maintenance Engineers and by placarding of the oil pressure gauge.

POWER PLANT (continued)

Oil Temperature

(1) Minimum oil temperature for motoring cycle = -40°C.

(2) Minimum oil temperature for starting and relighting = -35°C.

(3) Minimum oil temperature before advancing the throttle above idle = -20°C

(4) Maximum continuous oil temperature = 190°C.

(5) Absolute maximum oil temperature = 195°C.

NOTE: 5 minutes operation is permitted in the range 190°C to 195°C.

Oil Contents

(1) Minimum oil contents for starting = 6.5 US QTS.

(2) Maximum oil contents = 14.0 US QTS. Exceedance of the maximum oil contents must be reported after flight.

NOTE: The characteristics of the oil system are such that with a satisfactory system the contents indicator warning light may be on prior to engine start, however it should always be out at Idle.

(3) Maximum permitted oil comsumption = 2.4 US QTS/Hr.

Fuel Temperature (As indicated on the Powerplant Management panel)

(1) Minimum fuel temperature for starting and relighting = -40°C

(2) Minimum fuel temperature before advancing the throttle above idle = 20°C.

(3) Maximum continuous fuel temperature = 150°C.

(4) Absolute maximum fuel temperature = 170°C.

NOTE: 2 minutes operation is permitted in the range 150°C to 170°C.

(Unchanged)

Turbine Cooling Air Temperature

(1) Maximum permitted = 640°C.

POWER PLANT (continued)

Air Turbine Starter

(1) Maximum air turbine starter supply pressure is 35 psi.

(2) Maximum number of consecutive air turbine start operations is two.

(3) Minimum time between groups of two air turbines start operations (for starter cooling):-

Using airstart truck - 10 min
Using crossbleeding from adjacent engine - 30 min

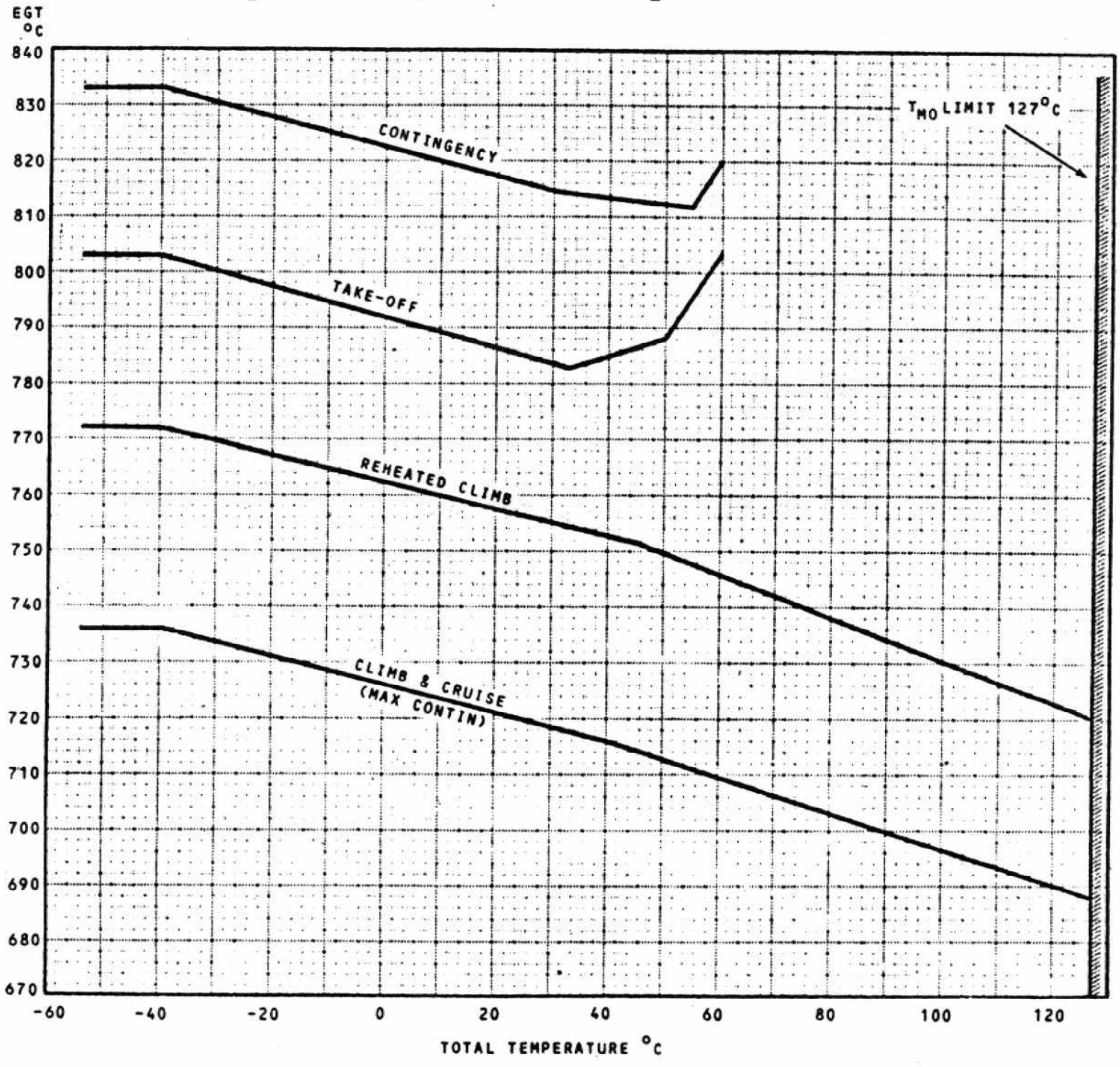
(4) The maximum duration of air turbine starter operation is 30 sec.

Throttle Lever

(1) The throttle lever must not be moved until the engine has run at idle for a minimum time of one minute.

EGT Limitations

The following graph gives the maximum values to which the engine must be manually limited, if necessary.



Ground Starting

Engine starting is not permitted with a tailwind component greater than 20 kt.

If more than 10 minutes and less than 5 hours have elapsed since the engine was last operated, it must be run at the debow condition for not less than 1 minute.

Following a false start on the ground, a 20 second dry motoring cycle is required before attempting another start. The aircraft pitch attitude during the dry motoring cycle and the subsequent start must not exceed 1° nose down as indicated on the ADI.

Restricted Speed Bands

Starting

The maximum stabilised debow speed is 32% N_2. An overshoot above this speed during attainment of the debow condition is permitted, provided that its duration does not exceed approximately 5 seconds.

Idle

Steady running at idle or between idle and rotating stall clearance speed is permitted only if rotating stall has been cleared.

Ground Running

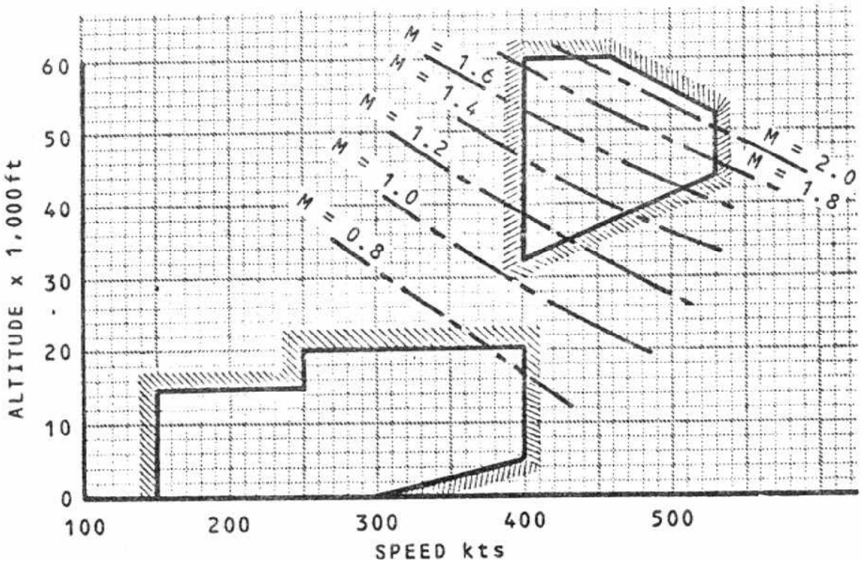
Ground running in the range of 88-93% N_1 must be limited to transient excursions. Ground running above this range must be kept to the minimum possible.

Engine No.4 must not be operated above 90% N_2 for more than 30 seconds with the ENG 4 T/O N_1 LIMITER switch set to 88%. If it is necessary to carry out more than one operation above 90% N_2, a cooling period of not less than 5 minutes must elapse with the engine at Idle between such operations.

POWER PLANT (continued)

Relight Envelope

Relights may be attempted outside the envelope shown below, although these may not be successful.



RELIGHT ENVELOPE

(NOTE: RELIGHTS MAY BE ATTEMPTED OUTSIDE THE ENVELOPE BUT MAY NOT BE SUCCESSFUL)

Ground Running in Icing Conditions

Engine anti-icing must be ON for ground running and take-off when the ambient temperature is below + 3°C and the visibility is less than 1000 metres.

The engines must not be run at the debow condition for more than 1 minute if the ambient temperature is below + 3°C and the visibility is less than 1,000 metres.

Engine Overspeed

Unchanged

In the event of an overspeed above the maximum operating limits for the rating selected, continued engine operation is dependent upon the severity and duration of the overspeed, as defined below.

(1) N_2% rpm

A maximum of 20 seconds is permitted within the range maximum operating to 110%. If the time limit of 20 seconds is exceeded or N_2 exceeds 110%, the Precautionary Engine Shut Down procedure must be applied.

(2) N_1% rpm

A maximum of 20 seconds is permitted within the range maximum operating to 108.5%. If the time limit of 20 seconds is exceeded or N_1 exceeds 108.5%, the Precautionary Engine Shut Down procedure must be applied.

Engine Control Schedules

Schedule	Indication	Limitation
E Flyover	F/O (White)	Minimum Speed: 220 kt Maximum Mach No: 1.0 M
E High	HI (White)	Minimum Speed: 220 kt
E Mid	MID (White)	For use in flight only
E Low	LO (Green)	No Limitation

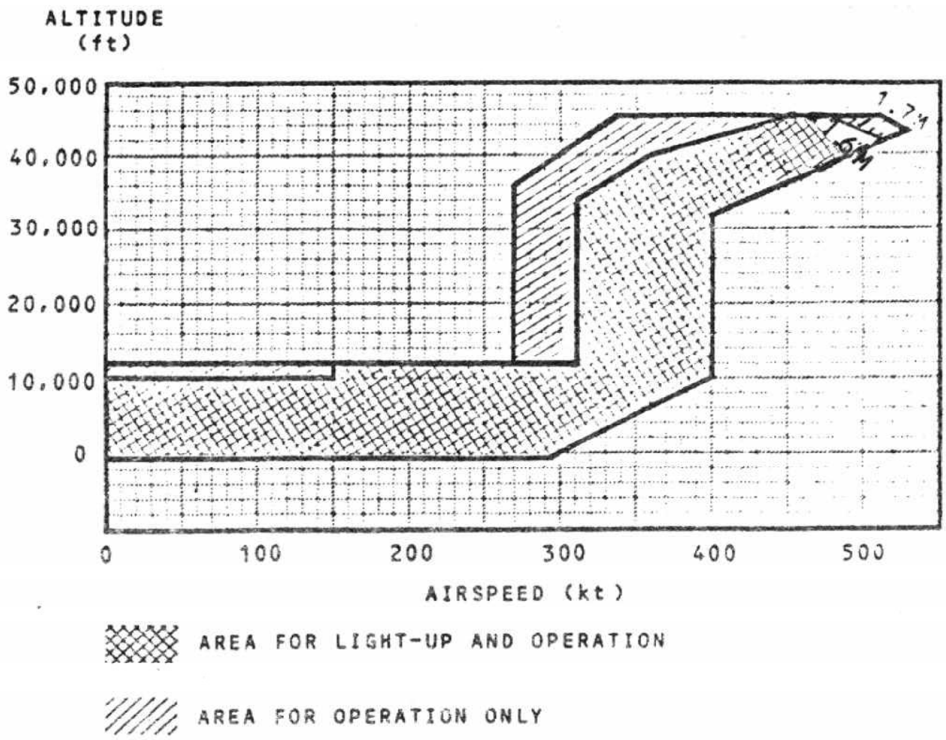
Use of Reheat

Reheat is not normally required for a baulked landing or go-around When 3 or 4 engines are operating it must not be used for these or similar manoeuvres unless the collector tanks are above "Underfull".

NOTE: Minimum permitted collector tank contents for a baulked landing or go-around are given on page 01.01.12.

Reheat should not be used for longer than 15 min per flight, during use of "Engine Flight Rating".

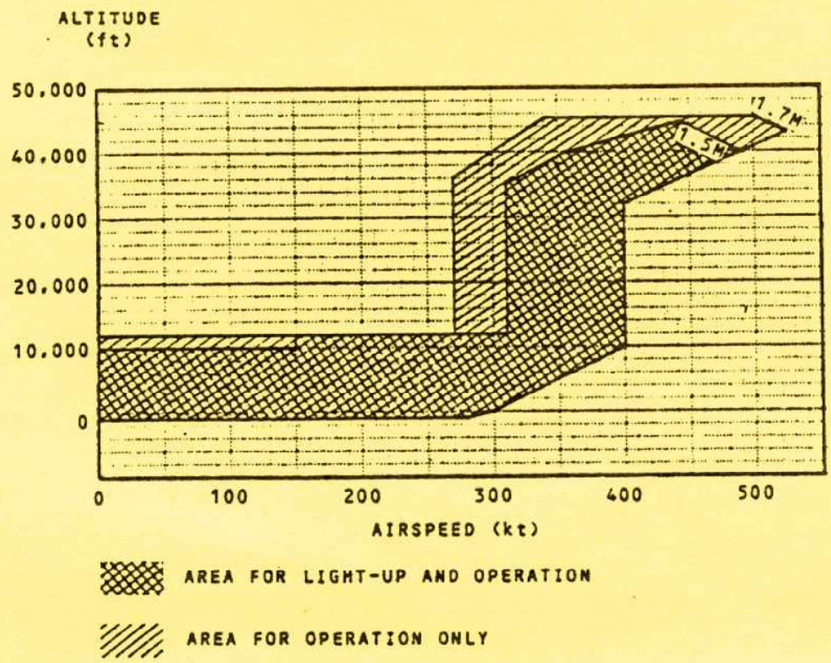
Reheat must not be used outside the envelope shown below.



REASON FOR ISSUE:

To raise the upper limit of the reheat operating envelope to 45,500 ft

When the aircraft is being operated to a reduced limit speed of 500 kt, the reheat envelope shown opposite is replaced by the following:-



TEMPORARY REVISION
Insert facing 01.11 page 07

REASON FOR ISSUE:
To clarify that the existing forward thrust limitation applies only when ground running.

ACTION:

Ignore the existing para 'Forward Thrust' at the top of the page and in its place read:

Forward Thrust

When ground running, the engines must not be operated continuously above 93% N_1 for more than 3 minutes. A cooling period of at least 5 minutes must elapse with the throttle levers at Idle before a second operation above 93% N_1. The cooling period between subsequent operations above 93% N_1 must be increased to a minimum of 13 minutes.

NACELLE

Forward Thrust

When ground running, the engines must not be operated continuously above 93% N_1 for more than 1½ minutes. A cooling period of at least 1 minute must elapse with the throttle levers at Idle before each of the next two operations above 93% N_1. After three such operations a cooling period of at least 5 minutes must elapse with the throttle levers at Idle, before a further operation above 93% N_1, is carried out. After this operation, the engine must be either shut down or run at Idle for 13 minutes before the complete sequence of events can again be started.

Reverse Thrust

GROUND

(1) Successive Reverse Thrust Selections

To ensure adequate cooling the following minimum periods in forward thrust must be observed between selections of reverse thrust:-

Reverse Thrust Level	Subsequent Period in Forward Thrust
$N_2 < 80\%$	2 min
$N_2 \geq 80\%$	5 min

(2) Landing

In normal use, the reduction in reverse thrust power to idle must be made on two symmetrical engines at 100 kt and on the other two engines at 75 kt. Reverse thrust should be cancelled at about 40 kts.
When landing with one engine inoperative, the reduction in reverse thrust power to idle on the asymmetric engine must be made at 100 kt and on the other two engines at 75 kt. Reverse thrust should be cancelled at about 40 kts.

NOTE:

See NOTE overleaf

(3) Accelerate - Stop

The reduction in reverse thrust power to idle must be made on two symmetrical engines at 100 kt and on the other two engines at 75 kt. Reverse thrust should be cancelled at about 40 kt.

With one engine inoperative the reduction in reverse thrust power to idle must be made on the asymmetric engine at 100 kt and on the other two engines at 75 kt. Reverse thrust should be cancelled at about 40 kt.

NOTE:

See NOTE overleaf

NOTE:

1. The speeds quoted in paragraphs (2) and (3) overleaf have been selected to avoid re-ingestion problems.
2. On a slippery runway Reverse Idle may be maintained until the aircraft has stopped,

(4) Use of ARM Button

The FLIGHT REV ARM button must not be used during reverse thrust operation on the ground.

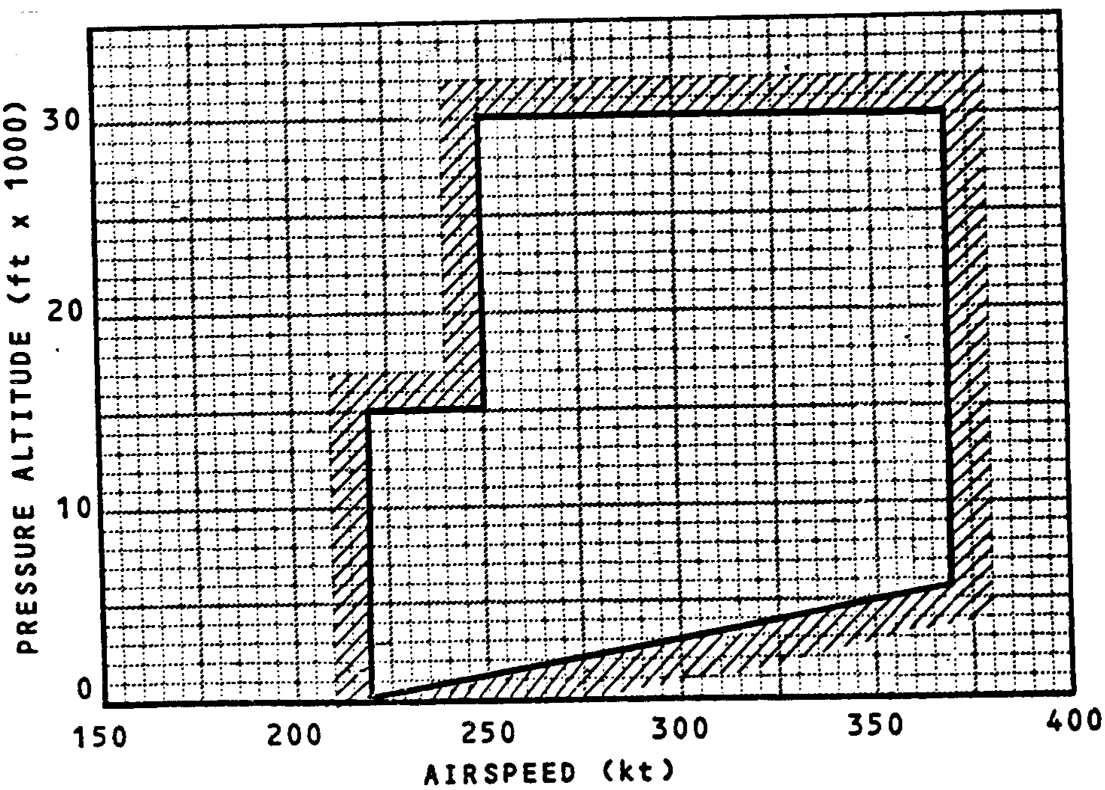
(5) Maximum Altitude

Thrust reverse operation on the ground is limited to a maximum airfield altitude of 8,500 ft.

FLIGHT

Use of reverse thrust in flight is permitted within the envelope shown below subject to the following conditions:-

1. Use limited to application of reverse idle power on either or both inner engines only.
2. Maximum period of use, 4 minutes.
3. It must not be used when the terrain clearance is less than 3,000 ft.



(Unc ged)

INTAKE AND SECONDARY NOZZLE

Secondary Air Doors

The maximum permitted speed with the doors shut is M = 0.95. The doors must be in the SHUT position before take-off.

Secondary Nozzle

If during transonic acceleration the secondary nozzle position is greater than 15°, the use of reheat on the associated engine is prohibited.

EMERGENCY PROCEDURES - CONTENTS

ENGINE FIRE (OVERHEAT OR SEVERE DAMAGE)

NOTE

Judgement and precision are as important as speed when putting out an engine fire. Actuating a wrong control could cause more trouble than a few seconds delay in taking the correct action.

AUDIO .... CANCEL E

Press and release the AUDIO CANCEL push button to cancel the engine fire warning audio (bell).

ENGINE SHUT DOWN HANDLE .... PULL E

All operations of the engine shut down handle must be recorded.

Pulling the engine shut down handle, when its lights (red) are flashing, dims the lights or, when the lights are steady. cancels the lights and:-

-Shuts the HP VALVE
-Switches the HP VALVE switch light (white) on
-Shuts the LP VALVE
-Shuts the hydraulic SHUT OFF VALVE(S)
-Shuts the air BLEED VALVE
-Shuts the air CROSS BLEED valves.
-Shuts the cabin inlet safety valve
-Shuts the SECONDARY AIR DOORS and engine bay vents, thus causing the FIRE FLAPS light (green) to come on.
-Onloads the standby (yellow) hydraulic system pumps
-Opens the ENGINE RECIRCULATION VALVE
-Inhibits the engine ignitors
-Inhibits the T1 ENGINE PROBE HEATER, thus causing the T1 light (yellow) to come on
-Shuts the reheat fuel shut off valve

As the engine RPM decreases the intake ramps are automatically lowered and the spill door is opened to match the intake air supply to the reduced engine demand.

(Deletion)

As the engine is shut down it will cause the following warnings:-

-Engine inlet LOW PRESS light (amber) on accompanied by a master warning system FUEL light (amber) on and audio (gong).

-Hydraulic LOW PRESS light(s) (amber) on accompanied by a master warning HYD light (amber) on and audio (gong).

-GEN light (amber) on, accompanied by a master warning ELECT light (amber) on and audio (gong) when aircraft speed is less than M = 1.10.

-The N1 SIG light (amber) may come on accompanied by a master warning INT light (amber) and audio (gong) when aircraft speed is subsonic.

WHEN FIRE FLAPS LT ON (OR HANDLE PULLED + 7 SEC)

Up to 7 seconds is the operating time required to close the fire flaps.
If the FIRE FLAPS light is not on within 7 seconds the indicator may be at fault or one or more of the doors may not have completely closed.

1 SHOT .... PRESS E

Press 1 SHOT push button of affected engine.

At the same time as the 1 SHOT push button is pressed the clock should be started to time the action.
The engine fire should be extinguished within 30 seconds of discharging the fire extinguisher, this will be indicated by the light in the engine shut down handle going out. Pressing the 1SHOT push button also causes the FIRE FLAPS light to go out.

— — — — — — — — — — —

<u>IF ENGINE SHUT DOWN HANDLE LT FLASHING AFTER 30 SECS</u>
2 SHOT .... PRESS E

Press 2 SHOT push button of affected engine.

Pressing the 2 SHOT push button discharges the adjacent engine fire extinguisher bottle into the affected engine bay. When an engine first and second shot has been used there is no extinguishant remaining on that side of the aircraft.

(Unchanged)

SPEED .... SUBSONIC C

Reduce speed to subsonic using normal engine throttling technique during descent at 350 kts.

contd.

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ADJACENT ENGINE THROTTLE MASTER..........................MAIN E

Verify the THROTTLE MASTER selector of the adjacent engine at MAIN

The T1 ENGINE PROBE supplies temperature information to the MAIN throttle control system of its own engine and the ALTERN throttle control system of the adjacent engine. Therefore to ensure, following an engine shut down that the adjacent engine throttle control system is receiving correct temperature information, the MAIN system should be selected.

AUTO THROTTLE MASTER....................................OFF E

Verify AUTO THROTTLE MASTER switch of affected engine off.

The AUTO THROTTLE MASTER switch is set to OFF isolating the associated engine from the auto throttle system.

CSD...DISC E

Unguard and set associated CSD disconnect switch to DISC and release.

The CSD is disconnected to prevent over-heating of the CSD oil due to loss of cooling fuel flow across CSD oil cooler.

Reset of the CSD is only possible on the ground with the engine stopped.

<u>IF FIRE PERSISTS</u>
<u>CLEAN UP DRILL</u> ....APPLY E
IMMEDIATELY

If the fire persists the only possible action is to confirm operation of the fire handle. Therefore the entire CLEAN UP DRILL should be completed without delay.

APPROPRIATE WARNING.....................................RESET E

(Unchanged)

TCA OVERHEAT

Rotate the ENG O/HEAT TEST rotary selector to RESET then OFF.
The relevant warning light should be observed off.

ENGINE OVERHEAT

Rotate the ENG O/HEAT TEST rotary selector to RESET then OFF.
The relevant warning light should be observed off.

contd.

POWER PLANT

OTHER WARNINGS

The OIL ENG low pressure lights and LEAK lights have no cancel facility and will therefore remain on for the remainder of the flight.

The engine inlet LOW PRESS, blue and green hydraulic LOW PRESS, GEN, CSD lights and T1 probe heater light once activated, will remain on for the remainder of the flight. Yellow hydraulic pump LOW PRESS lights will go off when associated pump selector is set to SHUT.

SYSTEM FAILURE PROCEDURES .... APPLY E

Carry out CLEAN UP DRILL on Captains' command when aircraft is established in its new flight regime.

END//

CLEAN UP DRILL

AUTO IGNITION	OFF	E
HP VALVE	SHUT	E
THROTTLE LEVER	IDLE	E
REHEAT	OFF	E
ENGINE RECIRCULATION VALVE	OPEN	E
SECONDARY AIR DOORS	SHUT	E
BLEED VALVE	SHUT	E
CROSSBLEED VALVE	SHUT	E
LP VALVE	SHUT	E
HYD PUMP(S)	SHUT	E
APPROPRIATE WARNING	RESET	E
SYSTEM FAILURE PROCEDURES	APPLY	E

FOUR ENGINE FLAME OUT ABOVE M = 1.2

FUEL FWD TRANS sw .... O/RIDE C

Unguard and set the FUEL FWD TRANS switch to O/RIDE to initiate the forward transfer of fuel. Monitor the CG position and use the FUEL FWD TRANS switch to control fuel transfer until manual control by Flight Engineer.

TANK 9 & TANK 10 PUMP sels ....VERIFY OFF E

This action ensures that 9 & 10 tank pumps do not interfere with forward trim transfer.

SERVO CONTROLS YELLOW rty sel .... YELLOW GREEN C

Pull and rotate SERVO CONTROLS yellow rotary selector to YELLOW/GREEN position to ensure the maximum green system hydraulic power is available for the emergency generator.

ENGINE FEED PUMPS .... ALL ON E

Verify all ENGINE FEED PUMPS are switched on since some pumps will be lost when the generators go off-line at M = 1.10

FWD EXTRACT FANS .... ALL ON E

Set the FWD EXTRACT FANS to ALL ON to ensure a cooling air-flow for the forward equipment bay when air conditioning is lost.

— — — — — — — — — — —

After the initial indication of malfunction the N2 should be monitored carefully to establish if the engine is being auto-relit, indicated by N2 above 75% with a rising EGT.

If N2 less than 75%

THROTTLES .... IDLE E

The throttles are retarded since the manual relight system is inhibited with them away from idle.

(Deletion)

POWER PLANT

HP VALVES .... SHUT E

Set the HP VALVES to SHUT to prevent flooding the engine with fuel.

AUTO IGNITION .... OFF E

Set the AUTO IGNITION switches to OFF to prevent interaction between auto ignition systems and attempts at manual relighting.

ENGINE FUEL FEED .... CHECK E

Scan the FUEL MANAGEMENT PANEL to ensure correct engine fuel feed.

TRIM TRANSFER .... CHECK E

Check state of fuel transfer.

START RELIGHT sels .... RELIGHT E

Set the START RELIGHT selectors to RELIGHT in preparation for relight of engines.

30 SECS AFTER CLOSURE OF HP VALVES

30 secs is the minimum time to allow for drainage of fuel from engines.

HP VALVES .... OPEN E

Set the HP VALVES switches to OPEN to initiate the relight, this being indicated by a rising EGT. The rise in EGT should take place within 20 secs of opening the HP VALVE. At N2 of 68% the START/RELIGHT selector is set to OFF.

ON ANY ENGINE THAT FAILS TO RELIGHT WITHIN 20 SECS

HP VALVE .... SHUT E

Set HP VALVE switch to SHUT to stop the engine from flooding with fuel.

Allow engine to drain and continue with relight attempts.

30 secs is the drainage time required after HP VALVE closure for the first relight attempt.
If circumstances permit and further relight attempts are required allow a drainage time of 1 minute between each attempt.

(Unchanged)

IF ALL ENGINES FAIL TO RELIGHT

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AT APPROXIMATELY M = 1.20
In anticipation of loss of main electrics if no engines relit

TANK 9 INLET VALVES O/RIDE sels .... OPEN E

Set tank 9 INLET VALVES O/RIDE selectors to OPEN. The O/RIDE selectors are used because they are electrically supplied from the essential busbars.

TANK 11 PUMP GREEN AND PUMP BLUE sels .... ON E

Set TANK 11 PUMP GREEN AND PUMP BLUE selectors ON.

The hydraulic pumps in tank 11 are used to transfer the fuel forward since the electric pumps will not be powered with loss of main electrics.

Tank 11 hydraulic pumps together with tank 9 inlet valves are used to transfer fuel forward to obtain CG of 53.5%. The rate of CG movement can be controlled by switching of tank 11 pumps.

TRIM TRANS AUTO MASTER sel .... OFF E

Verify the TRIM TRANS AUTO MASTER selector at OFF to prevent inadvertent transfer should main electrics be restored

FUEL FWD TRANS sw .... GUARDED E

Set the guard of the FUEL FWD TRANS switch since control of the forward fuel transfer should be manually controlled to obtain a CG of 53.5% by operation of tank 9 inlet valve.

RAM AIR TURBINE .... DEPLOY E

Unguard and set the left hand RAM AIR TURBINE selector to ON to deploy the RAT, if the RAT light is not on within 2 sec set the right hand selector to ON.

NOTE
The RAM AIR TURBINE cannot be retracted in flight.

REAR EXTRACT STANDBY FAN .... ON E

Set the REAR EXTRACT STANDBY FAN switch to ON, to ensure rear equipment rack cooling with loss of air generation supply flow.

EMERG GEN .... MANUAL E

Unguard and set the EMERG GEN selector to MANUAL and observe the SELECTED light (blue) on, to confirm the emergency generator selection

When the N2 of engines 1 and 2 falls below 58% the auto shed breaker opens shedding No 3 and No 4 a.c. essential busbars.

AIR INTAKE LANE rty sel ....1 & 3 TO A
2 & 4 TO B E

With the AIR INTAKE, LANE rotary selector for intakes No.1 and No.3 at the non-auto A position and intakes No. 2 and No. 4 at the non-auto B position, the A control lanes of intakes No.1 and No.3 and the B control lanes of intakes No. 2 and No. 4 are powered from the a.c. essential busbars.

AIR INTAKE HYD sel .... 1 TO GREEN
3 TO BLUE
2 & 4 TO YELLOW E

Selecting the INTAKE HYD selectors to GREEN, BLUE or YELLOW selects the appropriate hydraulic system since loss of the d.c. busbars loses the ability to select the standby hydraulic system to intakes 1 & 3 and the main hydraulic systems to intakes 2 & 4.

THROTTLE MASTERS ....MAIN E

The THROTTLE MASTER selectors are set to MAIN since all MAIN throttle control lanes are supplied from the a.c. essential busbars.

F/O ASI AND ALTIMETER .... STANDBY MODE P

Rotate First Officer's ASI and Altimeter mode selectors to S (Standby) in preparation for the loss of ADC No.2.

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

ADC 2 .... OFF P

ADC No.2 will be lost with main electrical supply at approximately M = 1.10. To prevent the nuisance of spurious overspeed warnings due to circuit design ADC No.2 can be switched off.

EMERG RELIGHT BUSBAR .... 2 E

Rotate the EMERG RELIGHT BUSBAR selector to position 2 to power No. 2 engine relight busbar 25X.

ENGINE FUEL FEED ....CHECK E

Scan FUEL MANAGEMENT PANEL to ensure engine feed preparatory to starting engine No. 2.

TRIM TRANSFER ....CHECK E

Concurrent with the relight attempts monitor the forward fuel transfer to achieve a CG position of 53.5%.

<u>30 SECS AFTER CLOSURE OF HP VALVES</u>

NO.2 ENGINE HP VALVE ....OPEN E

Setting the HP VALVE switch to OPEN initiates the relight attempt, successful light up is indicated by rising EGT and N2, there will be no N1 indication at this time since power to the N1 instrument is taken from the sheddable busbar.

<u>IF NO 2 ENGINE FAILS TO RELIGHT IN 20 SEC</u>
NO 2 ENGINE HP VALVE ....SHUT E

EMERG RELIGHT BUSBAR .... 4 E

Rotate the EMERG RELIGHT BUSBAR selector to position 4 to power engine No. 4 relight busbar 27X.

NO 4 ENGINE HP VALVE .... OPEN E

<u>IF NO 4 ENGINE FAILS TO RELIGHT IN 20 SEC</u>
NO 4 ENGINE HP VALVE .... SHUT E

REPEAT FOR ENGINES 3 & 1, THEN AS NECESSARY

Attempt to relight engines No 3 and No 1 using the EMERG RELIGHT busbar rotary selector position 3 & 1, then as necessary at positions 1,2,3 and 4 until a relight is obtained.

<u>IF ALL ENGINES FAIL TO RELIGHT</u>

<u>AT M = 0.90</u>
SERVO CONTROLS BLACK rty sel ....GREEN ONLY C

Setting the SERVO CONTROL black rotary selector to GREEN only ensures that blue hydraulic system power is available to drive the blue trim transfer pump. A flight control channel change, indicated by the flight control channel MIs (8) reading G also takes place. If they do not read G press the appropriate O & M ELEVONS, IN ELEVONS or RUDDER reset push button.

DITCHING & EMERGENCY LANDING DRILLS ....REVIEW ALL

RELIGHT ATTEMPTS .... CONTINUE E

(Deletion)

<u>WHEN VISOR/NOSE LOWERING REQUIRED</u>
<u>LOWER VISOR/NOSE USING VISOR/NOSE</u> STANDBY LOWERING

contd.

AT 10,000 FT

CAPTAINS ASI AND ALTIMETER ....STANDBY MODE C

Rotate Captain's ASI and Altimeter mode selectors to S (Standby) in preparation for the loss of ADC No.1.

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

ADC 1 .... OFF P

ADC 1 will be lost with essential electrical supply when the emergency generator is isolated. To prevent the nuisance of spurious overspeed warnings due to circuit design ADC No. 1 can be switched off.

SPEED ....270 KT C

Reduce aircraft speed to 270 kt.

EMERG GEN ....ISOL E

Set the EMERG GEN selector to ISOL to cut off hydraulic supplies to the emergency generator since the available hydraulic supply is required for flying controls.

With the loss of emergency generator relight attempts should cease.

RAMP/SPILL MASTERS ....MAN E

Set the RAMP/SPILL MASTER switches to MAN to cut off hydraulic supplies to the air intakes.

IF LANDING GEAR LOWERING REQUIRED
LOWER LANDING GEAR USING LANDING GEAR STANDBY LOWERING

BRAKES .... EMERG C

Set BRAKES lever to EMERG

APPROACH SPEED ....250 KT C

MINIMUM LANDING SPEED .... 200 KT C

END//

FOUR ENGINE FLAME OUT BELOW M = 1.2

RAM AIR TURBINE ....DEPLOY E

Unguard and set the left hand RAM AIR TURBINE selector to ON to deploy the RAT, if the RAT light is not on within 2 sec set the right hand selector to ON.

NOTE
The RAM AIR TURBINE cannot be retracted in flight.

TANK 9 INLET VALVES O/RIDE sels ....OPEN E

Set tank 9 INLET VALVES O/RIDE selectors to OPEN.
The O/RIDE selectors are used because they are electrically supplied from the essential busbars.

TANKS 5,7 & 11 INLET VALVES
O/RIDE sels ....SHUT E

Tanks 5,7 & 11 VALVES O/RIDE selectors are used to shut the associated tank inlet valves to prevent fuel being transferred into these tanks should they be open when main generation power is lost. The O/RIDE sels are powered from the essential busbar.

TANK 11 PUMP GREEN AND PUMP BLUE sels .... ON E

Set TANK 11 PUMP GREEN AND PUMP BLUE selectors ON.
The hydraulic pumps in tank 11 are used to transfer the fuel forward since the electric pumps will not be powered with loss of main electrics.

Tank 11 hydraulic pumps together with tank 9 inlet valves are used to transfer fuel forward to obtain CG of 53.5%.
The rate of CG movement can be controlled by switching of tank 11 pumps.

SERVO CONTROLS YELLOW rty sel ....YELLOW GREEN C

Pull and rotate SERVO CONTROLS yellow rotary selector to YELLOW/GREEN position to ensure the maximum green system hydraulic power is available for the emergency generator.

SERVO CONTROLS BLACK rty sel
(IF LESS THAN M = 0.90) ....GREEN ONLY C

POWER PLANT

Setting the SERVO CONTROL black rotary selector to GREEN only ensures that blue hydraulic system power is available to drive the blue trim transfer pump. A flight control channel change, indicated by the flight control channel MIS (8) reading G also takes place. If they do not read G press the appropriate O & M ELEVONS, IN ELEVONS or RUDDER reset push button.

ENGINE FEED PUMPS ....ALL ON E

Verify all ENGINE FEED PUMPS are switched on since some pumps will be lost when the generators go off-line at M = 1.10

REAR EXTRACT STANDBY FAN ....ON E

Set the REAR EXTRACT STANDBY FAN switch to ON, to ensure rear equipment rack cooling with loss of air generation supply flow.

EMERG GEN .... MANUAL E

Unguard and set the EMERG GEN selector to MANUAL and observe the SELECTED light (blue) on, to confirm the emergency generator selection

When the N2 of engines 1 and 2 falls below 58% the auto shed breaker opens shedding No 3 and No 4 a.c. essential busbars.

AIR INTAKE LANE rty sel .... 1 & 3 TO A
2 & 4 TO B E

With the AIR INTAKE LANE rotary selector for intakes No. 1 and No. 3 at the non-auto A position and intakes No. 2 and No. 4 at the non-auto B position, the A control lanes of intakes No. 1 and No. 3 and the B control lanes of intakes No. 2 and No. 4 are powered from the a.c. essential busbars.

AIR INTAKE HYD sel .... 1 TO GREEN
3 TO BLUE
2 & 4 TO YELLOW E

Selecting the INTAKE HYD selectors to GREEN, BLUE or YELLOW selects the appropriate hydraulic system since loss of the d.c. busbars loses the ability to select the standby hydraulic system to intakes 1 & 3 and the main hydraulic systems to intakes 2 & 4.

After the initial indication of malfunction the N2 should be monitored carefully to establish if the engine is being auto-relit, indicated by N2 above 75% with a rising EGT.

If N2 less than 75%

THROTTLES .... IDLE C

The throttles are retarded since the manual relight system is inhibited with them away from idle.

HP VALVES ....SHUT E

Set the HP VALVES to SHUT to prevent flooding the engine with fuel.

AUTO IGNITION ....OFF E

Set the AUTO IGNITION switches to OFF to prevent interaction between auto ignition systems and attempts at manual relighting.

THROTTLE MASTERS ....MAIN E

The THROTTLE MASTER selectors are set to MAIN since all MAIN throttle control lanes are supplied from the a.c. essential busbars.

F/O ASI AND ALTIMETER .... STANDBY MODE P

Rotate First Officer's ASI and Altimeter mode selectors to S (Standby) in preparation for the loss of ADC No.2.

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

ADC 2 .... OFF P

ADC No.2 will be lost with main electrical supply at approximately M = 1.10. To prevent the nuisance of spurious overspeed warnings due to circuit design ADC No.2 can be switched off.

START RELIGHT sels ....RELIGHT E

Set the START RELIGHT selectors to RELIGHT in preparation for relight of engines.

EMERG RELIGHT BUSBAR ....2 E

Rotate the EMERG RELIGHT BUSBAR selector to position 2 to power No. 2 engine relight busbar 25X.

ENGINE FUEL FEED ....CHECK E

Scan FUEL MANAGEMENT PANEL to ensure engine feed preparatory to starting engine No. 2

TRIM TRANSFER ....CHECK E

Concurrent with the relight attempts monitor the forward fuel transfer to achieve a CG position of 53.5%.

30 SECS AFTER CLOSURE OF HP VALVES

NO.2 ENGINE HP VALVE ....OPEN E

Setting the HP VALVE switch to OPEN initiates the relight attempt, successful light up is indicated by rising EGT and N2, there will be no N1 indication at this time since power to the N1 instrument is taken from the sheddable busbar.

IF NO.2 ENGINE FAILS TO RELIGHT IN 20 SEC
NO 2 ENGINE HP VALVE ....SHUT E

EMERG RELIGHT BUSBAR .... 4 E

Rotate the EMERG RELIGHT BUSBAR selector to position 4 to power engine No. 4 relight busbar 27X.

No. 4 ENGINE HP VALVE ....OPEN E

IF NO 4 ENGINE FAILS TO RELIGHT IN 20 SEC
NO 4 ENGINE HP VALVE ....SHUT E

REPEAT FOR ENGINES 3 & 1 THEN AS NECESSARY

Attempts to relight engines No.3 and No.1 using the EMERG RELIGHT busbar rotary selector position 3 & 1, then as necessary at positions 1,2,3 and 4 until a relight is obtained.

IF ALL ENGINES FAIL TO RELIGHT

AT M = 0.90
SERVO CONTROLS BLACK rty sels .... GREEN ONLY C

Setting the SERVO CONTROL black rotary selector to GREEN only ensures that blue hydraulic system power is available to drive the blue trim transfer pump. A flight control channel change, indicated by the flight control channel MIS(8) reading G also takes place. If they do not read G press the appropriate O & M ELEVONS, IN ELEVONS or RUDDER reset push button.

DITCHING & EMERGENCY LANDING DRILLS ....REVIEW ALL

RELIGHT ATTEMPTS ....CONTINUE E

IF THE VISOR IS DOWN
VISOR/NOSE STBY CONTROL sw ....VISOR LOWER P

With the visor down the VISOR/NOSE STBY CONTROL switch is set to VISOR LOWER to ensure that no green hydraulic system fluid circulates through the nose/visor system.

IF VISOR/NOSE LOWERING REQUIRED
LOWER VISOR/NOSE USING VISOR/NOSE STANDBY LOWERING and/or NOSE STANDBY LOWERING

contd.

AT 10000 FT

CAPTAINS ASI AND ALTIMETER .... STANDBY MODE C

Rotate Captain's ASI and Altimeter mode selectors to S (Standby) in preparation for the loss of ADC No.1.

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

ADC 1 .... OFF P

ADC 1 will be lost with essential electrical supply when the emergency generator is isolated. To prevent the nuisance of spurious overspeed warnings due to circuit design ADC No.1 can be switched off.

SPEED .... 270 KT C

Reduce aircraft speed to 270 kt.

EMERG GEN ....ISOL E

Set the EMERG GEN selector to ISOL to cut off hydraulic supplies to the emergency generator since the available hydraulic supply is required for flying controls.

With the loss of emergency generator relight attempts should cease.

RAMP/SPILL MASTERS ....MAN E

Set the RAMP/SPILL MASTER switches to MAN to cut off hydraulic supplies to the air intakes.

IF LANDING GEAR LOWERING REQUIRED
LOWER LANDING GEAR USING LANDING GEAR STANDBY LOWERING

BRAKES ....EMERG C

Set BRAKES lever to EMERG

APPROACH SPEED ....250 KT C

MINIMUM LANDING SPEED ....200 KT C

END//

(Deletion)

SERVO CONTROL SPOOL VALVE JAM

SERVO CONTROLS BLACK rty sel .... TOWARDS JAM LT C

Rotate the SERVO CONTROLS BLACK rotary selector towards the illuminated GREEN JAM or BLUE JAM light. This cuts off the hydraulic supply to the associated side of the eight servo controls, i.e. BLUE JAM selection cuts off BLUE hydraulics supply. Control of the servos is regained but they are now operating on half bodies, reducing their power by approximately half.

IF THE BLACK rty sel WILL NOT MOVE
SERVO CONTROLS YELLOW rty sel .... NORMAL C

Rotate the SERVO CONTROLS YELLOW rotary selector to NORMAL.

If the SERVO CONTROLS YELLOW rotary selector had been previously selected to the affected system the SERVO CONTROLS panel interlock mechanism will not allow movement of the BLACK rotary selector towards the BLUE JAM OR GREEN JAM light until the YELLOW rotary selector is at NORMAL.

Rotating the YELLOW selector to NORMAL cuts the yellow hydraulic supply to the previously selected systems, bringing on its L PRESS light.

SERVO CONTROLS BLACK rty sel .... TOWARDS JAM LT C

Rotate the SERVO CONTROLS BLACK rty sel towards the illuminated GREEN JAM or BLUE JAM light.

If the BLACK rotary selector did not move because of a yellow/green selection the returning of yellow rotary selector to NORMAL and selection of BLUE ONLY loses the anti skid braking therefore the BRAKE lever should be set to EMERG.

IF SPEED GREATER THAN M = 0.93
REDUCE SPEED TO 350 KT AT CONSTANT PRESSURE ALTITUDE
THEN DESCEND AT 350 KT TO M = 0.93

Replan flight at Subsonic speed.

END//

NOTE

Should low pressure occur in the remaining main system, yellow system will be automatically selected to replace it.

CONTROL COLUMN JAM IN PITCH OR ROLL

CAUTION

THE EMERGENCY FLIGHT CONTROL SYSTEM IS TO BE USED ONLY IN THOSE CASES OF JAMMING WHERE FORCE ON THE CONTROL COLUMN/WHEEL PRODUCES IN THE PARTICULAR AXIS NO MOVEMENT OF THE COLUMN/WHEEL IN THE DIRECTION DEMANDED.

AUTOSTAB (PITCH & ROLL) .... ENGAGED C

Verify AUTOSTAB No. 1 PITCH and ROLL or AUTOSTAB No. 2 PITCH and ROLL sws are engaged.

NOTE

It is essential for operation of the emergency flight controls that the autostab pitch and roll axis of the same system be engaged.

CONTROL FORCES .... RELAX C

Release pressure on control column/wheel at moment of engaging the emergency flight controls to avoid sudden or perhaps excessive control input.

EMERGENCY FLIGHT CONTROLS .... ENGAGE C

Press the EMERG CONT push button once to engage the pitch and roll emergency flight controls
Observe EMERG CONT lt (green) on

NOTE

If a pitch autostab disengages whilst Emergency Flight Control is in use, the associated roll autostab disengages: similarly, if a roll autostab disengages whilst Emergency Flight Control is in use, the associated pitch autostab disengages.

Re-engagement of the pitch or roll autostab is inhibited when the EMERG CONT push button is in the engaged position.

END//

(Unchanged)

LOW HYDRAULIC PRESSURE AT FLYING CONTROLS

SERVO CONTROLS YELLOW rty sel .... OBSERVE C

IF SERVO CONTROLS YELLOW rty sel AT NORMAL

SERVO CONTROLS YELLOW rty sel .... TOWARDS L/PRESS LT C

Pull and turn SERVO CONTROLS yellow rotary selector towards the illuminated L/PRESS light and observe the L/PRESS light goes off, pea lights (green) (4) associated with system status, on and MWS PFC light off.

Moving the SERVO CONTROLS yellow rotary selector away from NORMAL automatically on-loads the yellow hydraulic system engine driven pumps.

FLYING CONTROL SIGNALLING MODE .... CHECK.RESET IF REQ'D C

On flight controls position indicator observe channel MIs and if necessary press the appropriate O&M ELEVONS, IN ELEVONS or RUDDER, RESET push button to attempt a reset to the selected signalling mode.

END//

CAUTION
IF, AFTER SELECTION, A FALL IN THE LEVEL OF THE YELLOW TANK IS NOTED, AWAIT AUTOMATIC ISOLATION OF THE FAILED SYSTEM BY THE 1ST LOW LEVEL WARNING ON THE YELLOW TANK. THIS PRODUCES THE SECOND LOW PRESSURE WARNING. LEAVE THE SELECTOR IN ITS EXISTING POSITION AS IN THE FOLLOWING CASE.

IF SERVO CONTROLS YELLOW rty sel AT YELLOW BLUE OR YELLOW GREEN AND ONE L/PRESS LIGHT ON

SERVO CONTROLS YELLOW rty sel .... LEAVE IN EXISTING POSITION C

The SERVO CONTROLS yellow rotary selector is left in the selected position because:-

1. if the L/PRESS light is on due to a loss of the yellow system, the first low level cut-out will have operated. Any subsequent selection causes the loss of the low level protection and therefore NO selection should be made unless a further failure occurs.

contd.

2. if the L/PRESS light is on due to the loss of the other main system the yellow system must be left supplying the original failed main system.

FLYING CONTROL SIGNALLING MODE .... CHECK.RESET IF REQ'D C

On flight control position indicator observe channel MIs and if necessary, press the appropriate O&M ELEVONS, IN ELEVONS or RUDDER, RESET push button to attempt a reset to the selected signalling mode.

— — — — — — — — — — —

END//

IF SERVO CONTROLS YELLOW rty sel AT YELLOW BLUE OR YELLOW GREEN AND TWO L/PRESS LTS ON

SERVO CONTROLS YELLOW rty sel .... TOWARDS OTHER L/PRESS LT C

Pull and turn SERVO CONTROLS yellow rotary selector towards the other L/PRESS light

FLYING CONTROL SIGNALLING MODE .... CHECK.RESET IF REQ'D C

On flight control position indicator observe channel MIs and if necessary, press the appropriate RESET push button to attempt a reset to the selected signalling mode.

END//

REASON FOR ISSUE:

Fitment of modified Servo Control Panel.

When a modified Servo Control Panel is fitted the following notes supplement the existing expansion and cautions:-

IF SERVO CONTROLS YELLOW rty sel AT YELLOW BLUE OR YELLOW GREEN AND TWO L/PRESS LTS ON

Servo Controls Yellow rty sel ....TOWARDS OTHER L/PRESS LT. C

Pull and turn the Yellow rty sel towards the other Low Pressure light. An autochangeover will already have taken place. The hard selection confirms the autochange-over and extinguishes the Low Pressure light on the side to which the Yellow rty sel is set.

NOTES

Should a low pressure occur in a flying control hydraulic system that is being powered by the standby system and a low pressure exists in the other flying control main hydraulic system, an automatic change, of the standby (yellow) system to power the failed second system occurs.

This will be indicated by the pea lights associated with the yellow rotary selector position going off and the non-selected position pea lights coming on.

The L/PRESS light of the second main system will remain on until yellow SERVO CONTROLS rotary selector is rotated to the correct position.

If a PCU internal failure joins blue and green system then ultimately all the usable hydraulic fluid may be in the Yellow system which would, in this case, power both the green and blue sides of the PCU jacks. For these conditions to exist an autochangeover and a rise in Yellow contents above first low level must have taken place.

This will be indicated by both the Yellow Blue and the Yellow Green pea lights being on at the same time.

The flying controls are still powered by one hydraulic system in this condition.

HYDRAULIC POWER

CAUTION
WITH THE FLYING CONTROLS POWERED BY A SINGLE HYDRAULIC SYSTEM, MANOEUVRABILITY IN THE TRANSONIC REGION IS RESTRICTED.

<u>IF FAILURE OCCURS AT LESS THAN M = 0.93</u>

DO NOT EXCEED M = 0.93

<u>IF FAILURE OCCURS ABOVE M = 0.93</u>

DECELERATE TO THE AUTHORISED SUBSONIC REGIME USING THE FOLLOWING TECHNIQUE, AVOIDING THE CG BOUNDARIES.

REDUCE SPEED TO 350 KT AT CONSTANT ALTITUDE THEN DESCEND AT 350 KT TO M = 0.93

A complete summary of the effects of loss of hydraulic systems is given in the CHECKLISTS Vol.II.07.04.05/06.

DISCREPANCY BETWEEN ADC 1 AND ADC 2

FLY ATTITUDE

Fly the aircraft using basic attitude information presented by the ADI or the Standby Horizon.

STANDBY ASI/MACHMETER .... USE CP

The Captain should call speeds using the Standby ASI/Machmeter which is immediately available without switch selection.

In the event of the Co-pilot flying the aircraft, control should immediately be handed over to the Captain.

ADS PROBE HEATERS .... VERIFY ON E

AUTOTHROTTLE 1 & 2 .... DISENGAGE C

Set AT 1 and AT 2 switches to off since the autothrottle system may be receiving false information.

FAULTY SYSTEM .... IDENTIFY CP

Should a discrepancy warning between the two systems be received it is necessary to diagnose which system is at fault, particularly since some related systems will accept erroneous information without signalling an error.

The faulty system may be identified by comparing each Machmeter and ASI with the Standby ASI/Machmeter or by comparing the calculated angle of attack with readings on both angle of attack indicators. Angle of attack in level flight can be determined by direct comparison with pitch attitude.

When faulty system identified
APPLY PROCEDURE: ADC FAILURE

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LOSS OF A SECOND ADC

If transient failure of an ADC occurs it may be possible to regain it by reset action. At least two seconds must elapse after failure indication before reset is effective.

If the ADC fails after glide slope capture below 1,500 ft the affected autopilot, flight director and electric trim will not disengage.

The affected anti-stall SYSTEM FAIL light will come on only when the air speed is less than 270 kt.

FLY ATTITUDE

Fly the aircraft using basic attitude information presented by the Attitude Director Indicator or the Standby Horizon.

STANDBY ASI/MACHMETER .... USE CP

Captain should call speeds using STANDBY ASI MACHMETER which is immediately available for reference without switch selection.

ASI & ALTIMETERS .... STANDBY MODE CP

Rotate Captain's and First Officer's ASI and Altimeter mode selectors to S (Standby).

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

Resume normal use of ASIs and altimeters.

IF LOSS OCCURS DURING TRANSONIC ACCELERATION

TRIM TRANSFER .... HOLD E

SPEED & ALTITUDE .... HOLD C

FAILED ADC .... OFF P

Set failed ADC switch to off.

(Deletion)

NAVIGATION SYSTEM

Loss of both ADCs will result in the loss of the following significant services:-

(a) all speed warnings and CG boundary warnings

(b) both artificial feel, both electric trims, both autostab systems, both APs, ATs and FDs.

(c) all high incidence protection systems.

(d) all power plant speed switched or controlled functions Note, buckets run to zero degree position.

ENGINE CONTROL SCHEDULE .... ABOVE 220 KT HI
BELOW 220 KT LO E

The aircraft speed should be observed and if greater than 220 kt set the ENGINE CONTROL SCHEDULE selector to HI.
If aircraft speed less than 220 kt set the ENGINE CONTROL SCHEDULE selector to LO.

SECONDARY AIR DOORS .... ABOVE 220 KT OPEN
BELOW 220 KT SHUT E

Set the SECONDARY AIR DOORS selectors to OPEN at speeds greater than 220 KT and to SHUT at speeds less than 220 KT.

ANTI-STALL SYSTEMS .... OFF P

Set the ANTI-STALL SYSTEM switches to OFF.

AUTOSTAB .... RE-ENGAGE ONE SYSTEM P

Set the AUTOSTAB No.1 or No.2 switches (3) to ON . System will operate on "fixed gains".

N2 N1 and EGT .... MANUAL CONTROL
TO CRUISE RATING E

Manual control of N2, N1 and EGT by the throttle will be necessary, because with the ADCs off the engines will operate at the maximum (i.e. warm day) level regardless of the actual temperature.

NOTE
The total temperature on the Flight Engineer's panel is the only temperature source available with both ADCs inoperative.

contd.

NAVIGATION SYSTEM

IF SPEED ABOVE M = 1.70

MAXIMUM SPEED .... VMO MINUS 10 KT
MMO MINUS .05M C

Continue the flight with the following limitation,
Maximum speed less than VMO minus 10 kt
Mach No. less than MMO minus 0.05 M

IF SPEED BETWEEN M = 0.93 and M = 1.70

SPEED .... REDUCE TO
M = 0.93/V ≤ 380 KT C

CG ....53% BELOW M = 0.85
55% ABOVE M = 0.85 E

IF SPEED M = 0.93 OR LESS

MAXIMUM SPEED .... M = 0.93/V ≤ 380 KT C

CG ....53% BELOW M = 0.85
55% ABOVE M = 0.85 E

AT LANDING

CG .... 52.5% E

On landing to compensate for the loss of artificial stability aids the CG should be adjusted to 52.5% and reference speed should be increased to take account of the loss of all high incidence protection systems.

MINIMUM SPEED .... VREF PLUS 10 KT C

END//

NOTES

1. The restrictions on speed and requirements for CG position are because with both ADCs inoperative:

   a) CG limitation data is lost
   b) Only standby Airspeed/Mach number information is available.

2. There is no protection against an inadvertent selection of the Flyover Schedule at speeds above M = 1.0 or below 220 kt.

A complete summary of the effects of ADC failure is given in the CHECKLIST Vol.2B 07.05.04/07.

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FAILURE OF FOUR MAIN GENERATORS

With the four main generators offline the a.c. main busbars and the d.c. main busbars are inoperative with the consequent loss of all services powered from them.

EMERG GEN .... MANUAL E

Unguard and set the EMERG GEN selector to MANUAL and observe the SELECTED light (blue) on.

The emergency generator should come on-line automatically, this action is therefore only confirmatory.

ENGINE FEED PUMPS .... ALL ON E

Verify all ENGINE FEED PUMPS are switched on since some pumps will be lost.

ENGINE RECIRCULATION VALVES .... ALL SHUT E

Set the ENGINE RECIRCULATION VALVES switches to SHUT.

This ensures maximum fuel flow to the engines while only one fuel pump is operating.

CAUTION
THE ENGINE RECIRCULATION VALVE MUST NOT BE OPENED UNTIL AFTER MAIN GENERATION IS RESTORED.

SERVO CONTROLS YELLOW rty sel .... YELLOW GREEN C

Pull and rotate SERVO CONTROLS yellow rotary selector to YELLOW GREEN position to ensure that maximum green hydraulic power is available for the emergency generator.

REAR EXTRACT STANDBY FAN .... ON E

Set the REAR EXTRACT STANDBY fan switch to ON.

The rear extract standby fan is powered from essential busbars.

ELECTRICAL

NOTE
Forward rack extract fans are not powered in this condition.
Maintain cabin differential pressure above 1 PSI as long as possible.

F/O ASI AND ALTIMETER .... STANDBY MODE P

Rotate First Officer's ASI and Altimeter mode selectors to S (Standby).

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

ADC 2 .... OFF P

ADC No.2 will be lost with loss of main electrical supply. To prevent the nuisance of spurious overspeed warnings due to circuit design ADC No.2 can be switched off.

AC ESS BUS sws .... ALL EMERG E

Set AC ESS BUS, NORM EMERG switches (4) to EMERG

This confirms that the emergency generator is on and the a.c. essential busbars are locked on to it therefore even if main generation is re-instated, the a.c. essential busbars cannot revert to a.c. main busbars as a power source.

AC essential busbar NORM EMERG switch must only be set to EMERG if the emergency generator is serviceable.

No.2 AC ESS BUS switch sheds the avionics A busbar 10X and the 26V a.c. main A busbar 12X.
No. 3 AC ESS BUS switch, sheds the avionics B busbar 11X and the 26V a.c. main B busbar 13X.

AIR INTAKES LANE rty sel .... 1 & 3 TO A
2 & 4 TO B E

With the AIR INTAKE LANE rotary selector for intakes No.1 and No.3 at the non-auto A position and intakes No.2 and No.4 at the non-auto B position, the A control lanes of intakes No.1 and No.3 and the B control lanes of intakes No.2 and No.4 are powered from the a.c. essential busbars.

(Deletion)

AIR INTAKES HYD sel .... 1 TO GREEN
3 TO BLUE
2 & 4 TO YELLOW E

Selecting the INTAKES HYD selectors to GREEN,BLUE or

ELECTRICAL

YELLOW selects the appropriate hydraulic system since loss of the d.c. busbars loses the ability to select the standby hydraulic system to intakes 1 & 3 and the main hydraulic system to intakes 2 & 4.

ENGINE CONTROL SCHEDULE .... ABOVE 220 KT HI
BELOW 220 KT LO E

The aircraft speed should be observed and if greater than 220 kt, set the ENGINE CONTROL SCHEDULE selector to HI If aircraft speed less than 220 kt set the ENGINE CONTROL SCHEDULE selector to LO. On emergency electrics the operating schedule will be MID with HI selected and gear up: it will be LO with any other selection.

BATTERY sels ....ESS MAIN SPLIT E

This ensures that the battery is connected to its associated d.c. essential busbar which stays disconnected from the d.c. main busbar. Subsequent restoration of main generation power will not cause reconnection of d.c. essential busbar to d.c. main busbar.

THROTTLE MASTER .... MAIN E

The THROTTLE MASTER selectors are set to MAIN since all MAIN throttle control lanes are supplied from the a.c. essential busbar.

WING & INTAKE ANTI-ICING .... OFF E

While on emergency generator supply only, the wing and intake anti-icing is not powered but, if a main generator is subsequently regained with wing and intake anti-icing selected on, the heavy anti-icing load may put the main generator at risk.

NOTE
Avoid icing conditions as anti-icing is inoperable during flight on emergency electrical power except for the left hand W/S de-ice which is operable at low only, and heating for the standby pitot/static probe and ADS 1 sensors.

ELECTRICAL

GALLEYS .... SHED E

Set GALLEYS, GEN 1&3, GEN 2&4 switches to SHED.

While on emergency generator supply only, the galleys are not powered but, if a main generator is subsequently regained with galleys selected ON the galley load may put the main generator at risk.

GENERATORS .... RECOVER E

For each failed main generator in turn

Set the generator selector to TEST, the AC FREQ/VOLTS rotary selector to the relevant GEN number and observe the frequency and volts are normal.
Set the generator selector to ON, observe the GEN light is off and the GCB MI shows inline.

Systems data:

AC frequency	396 to 404 Hz
AC voltage	110 to 118 volts

▶ <u>IF GENERATOR(S) RECOVERED</u>
<u>APPLY APPROPRIATE PROCEDURES</u>

If 4, 3 or 2 generators are recovered, systems should be restored to normal status where possible.

▶ <u>IF ONLY ONE GENERATOR IS RECOVERED</u>
<u>REVIEW THE DRILL:FAILURE OF THREE</u> MAIN GENERATORS and apply as necessary.

<u>IF ALL GENERATORS REMAIN OFFLINE</u>
No 3 INS MODE .... ATT E

Set No.3 INS mode rotary selector to ATT.

No 3 INS BAT light (amber) should be observed on.

ATT switches off the INS navigation computer and allows No 3 INS to function as attitude reference only, thus reducing the electrical load and approximately doubling the battery life to about 30 minutes, after which the BAT light goes off and the BAT light (red) comes on to show that the battery power is inadequate.

The No 1 INS is powered from a.c. essential busbar No 2 and d.c. essential busbar A.

The No 2 INS will be powered from its own battery. It is operative for approximately 15 minutes in NAV mode or 30 minutes in ATT mode.

W/SHIELD DE-ICE L sel .... LOW P

(Uncha...ged)

Set the W/SHIELD DE-ICE L selector to LOW.

The left side windshield de-icing is powered from No. 1 a.c. essential busbar.

No. 1 & 2 ANTI-STALL .... OFF P

Set No.1 and No.2 ANTI-STALL switches to OFF.

The anti-stall systems are powered from main busbars and are not available during flight on emergency supplies, however they must be selected to OFF to allow the engagement of AUTOSTAB No. 1.

AUTOSTAB No. 1 .... ENGAGE P

Verify AUTOSTAB No. 1 switches (3) are engaged.

ARTIFICIAL FEEL No. 1 .... ENGAGE P

Verify ARTIFICIAL FEEL No. 1 switches (3) are engaged. AUTOSTAB 1 and ARTIFICIAL FEEL 1 will disconnect when main generation is removed. They can then be re-engaged.

F/O INSTRUMENT TRANSFER sws .... ALL LEFT P

Verify the First Officer's instrument transfer switches
at ATT INS 3
COMP 1
DEV 1
NAV INS 1

PLAN TO LAND AT NEAREST SUITABLE AIRFIELD

SPEED .... REDUCE TO SUBSONIC C

Reduce speed to subsonic using normal engine throttling technique during descent at 325 kt and replan for subsonic flight to the nearest suitable airfield.

CAUTION
THE ENGINE RECIRCULATION VALVES MUST NOT BE OPENED UNTIL AFTER MAIN GENERATION IS RESTORED.

IF TANKS 6 AND/OR 8 CONTAIN MORE THAN 1000 KG
~~INTER-CON VALVES (5-8) AND/OR (6-7)~~ .... OPEN E

Set the INTERCON VALVE switch (6-7) and/or (5-8) to OPEN to allow interflow of fuel between associated tanks This is to enable tank 6 and tank 8 contents to be transferred to collector tanks via the pumps in tank 5.

contd.

ELECTRICAL

and 7 powered by the essential busbars 8 x and 7 x.

IF FUEL IN TANK 11

TANK 11 PUMPS BLUE AND GREEN ....ON E

The trim transfer auto system and tank 11 electric pumps are inoperative.

IF FUEL REQUIRED IN TANK 9

CAUTION

ONCE FUEL IS IN TANK 9 THE ONLY METHOD OF TRANSFER OUT IS GRAVITY FEED.

Using gravity feed, fuel is transferred out of tank 9 by selecting the inlet valves open and maintaining a nose up attitude.

TANK 9 INLET VALVE O/RIDE sels .... OPEN E

The MAIN selector is inoperative and the INLET VALVE MIs remain crosshatched.
Tank 9 contents should be observed increasing.
The rate of CG movement can be controlled using the tank 11 PUMP BLUE and PUMP GREEN.

WHEN TANK 9 FUEL AS REQUIRED.

The tank 9 contents should be the amount required for the planned landing weight.

TANK 9 INLET VALVE O/RIDE sels .... SHUT E

TANK 5 & 7 INLET VALVE O/RIDE sels .... OPEN E

The MAIN selector is inoperative and the INLET VALVE MIs remain crosshatched.

IF FUEL IN TANKS 5 & 7

CROSSFEED rty sels .... ALL INLINE E

TANK 5 & 7 PUMPS sels .... EMERG E

At EMERG the associated pumps are powered from essential busbars and the first standby engine feed pumps of engines 2 and 4 are inhibited.
The engines are now being fed by two pumps only, the first standby engine feed pumps of collector tanks 1 and 3.

PRIOR TO APPROACH CHECKLIST

TANK 5 & 7 PUMPS sels ....OFF E

The engines are now fed by the first standby engine feed pumps of collector tanks 1, 2, 3, 4.

contd.

ELECTRICAL

LOWER VISOR/NOSE USING STANDBY LOWERING
AT SPEED FOR NOSE DOWN

LOWER LANDING GEAR USING STANDBY LOWERING

SET BRAKES TO EMERG BEFORE LANDING

END//

NOTE

ON EMERGENCY ELECTRICS

<u>The following are AVAILABLE</u>

Normal pressurisation control
Fuel TOTAL CONTENTS indications and FQIs
FASTEN SEAT BELTS and NO SMOKING signs
Standby horizon
Captain's ADF/RMI
First Officer's VOR/RMI
Voice recorder
Public address
TRK/HDG unit
Marker
Interphone audio selector panels (4)
No. 1 ADC, INS, ADI, Compass Coupler & HSI.
No. 1 ADF, VOR, DME, ILS & Radio Altimeter
No. 1 ATC Transponder, VHF & HF

The engine operating schedule will be MID with HI selected and gear up:
it will be LO with any other selection

<u>The following are NOT AVAILABLE</u>

Autopilot
Autothrottle
Normal landing gear operation
Normal visor/nose operation
Visor/nose position indicator

Reverse thrust
Nosewheel steering
Landing lights
Reheat
Normal brakes

FAILURE OF THREE MAIN GENERATORS

WING & INTAKE ANTI-ICING .... OFF E

Verify WING AND INTAKE ANTI-ICING rotary selectors at OFF.

With three main generators off-line wing and intake anti-icing would overload the single remaining generator.

NOTE
Avoid icing conditions as anti-icing is inoperable during flight on emergency electrical power except for the left hand W/S de-ice which is operable at low only, and heating for the standby pitot/static probe and ADC 1 sensors.

GALLEYS .... SHED E

Set GALLEYS, gen 1&3, GEN 2&4 switches to SHED.

With three main generators off-line, galley loads may overload the single remaining generator.

EMERG GEN .... MANUAL -CHECK VOLTS & FREQUENCY E

Unguard and set the EMERG GEN selector to MANUAL and observe the SELECTED light (blue) on. Set the AC FREQ/VOLTS rotary selector to EMERG PWR and observe the frequency and volts are normal.

The EMERG GEN selector is set to MANUAL when a.c. essential busbar changeover to emergency power is impending, thereby reducing duration of power interrupt at essential busbars.

Systems data (emergency generator)

Maximum load	30 KVA (25 KW)
AC frequency	390 to 410 Hz
AC voltage	110 to 118 volts

F/O ASI AND ALTIMETER .... STANDBY MODE P

Rotate First Officer's ASI and Altimeter mode selectors to

ELECTRICAL

S (Standby) in preparation for the loss of ADC No. 2.

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

F/O INSTRUMENT TRANSFER sws .... ALL LEFT P

Verify the First Officer's instrument transfer switches at ATT INS 3
COMP 1
DEV 1
NAV INS 1

ADC 2 .... OFF P

ADC No.2 will be lost with loss of main electrical supply. To prevent the nuisance of spurious overspeed warnings due to circuit design ADC No.2 can be switched off.

SERVO CONTROLS YELLOW rty sel .... YELLOW GREEN C

Pull and rotate SERVO CONTROLS yellow rotary selector to YELLOW GREEN position to ensure the maximum green hydraulic power is available for the emergency generator.

AC ESS BUS sws .... ALL EMERG E

Set AC ESS BUS, NORM EMERG switches (4) to EMERG

This confirms that the emergency generator is on and the a.c. essential busbars are locked on to it therefore even if main generation is re-instated, the a.c. essential busbars cannot revert to a.c. main busbars as a power source.

AC essential busbar NORM EMERG switch must only be set to EMERG if the emergency generator is serviceable.

No.2 AC ESS BUS switch sheds the avionics A busbar 10X and the 26 V a.c. main A busbar 12X.
No.3 AC ESS BUS switch, sheds the avionics B busbar 11X and the 26V a.c. main·busbar 13X.

No. 1 & 2 ANTI-STALL .... OFF P

Set No.1 and No.2 ANTI-STALL switches to OFF.

The anti-stall systems are powered from main busbars and are not available during flight on emergency supplies; however they must be selected to OFF to allow the engagement of AUTOSTAB No. 1 system.

With failure of three main generators the ANTI-STALL switches are set to OFF as a precautionary measure because if the fourth generator goes unserviceable, the Autostab would be automatically lost, until ANTI-STALL is switched OFF.

ELECTRICAL

AUTOSTAB No. 1 .... ENGAGE P

Verify No. 1 AUTOSTAB switches (3) are engaged.

AUTOSTAB No. 1 is powered from essential busbars.
An interrupt of the essential busbars may cause the AUTOSTAB No.1 to disengage.

ARTIFICIAL FEEL No. 1 .... ENGAGE P

Verify ARTIFICIAL FEEL No. 1 switches (3) are engaged.

ARTIFICIAL FEEL No. 1 is powered from essential busbars.
An interrupt of the essential busbars may cause the ARTIFICIAL FEEL No.1 to disengage.

RADAR .... SYSTEM 2 P

Rotate weather radar selector to SYSTEM 2 because the SYSTEM 1 was lost when the No.2 AC ESS BUS, NORM EMERG switch was set to EMERG.

NOTE

Before an attempt is made to recover failed generators, the emergency generator must power the essential busbars. With only one generator operative it is possible that the attempted recovery of additional main generators could lose all main generation because of faults.

GENERATORS .... RECOVER E

For each failed generator in turn

Set the generator selector to TEST, the AC FREQ/VOLTS rotary selector to the relevant GEN number and observe the frequency and volts are normal.
Set the generator selector to ON, observe the GEN light is off and the GCB MI shows inline.

Systems data

AC frequency	396 to 404 Hz
AC voltage	110 to 118 volts

<u>IF THREE GENERATORS REMAIN OFF-LINE</u>

KW/KVAR .... MONITOR E

Monitor the KW/KVAR indication to ensure electrical load remains below 54 KW (36 KVAR)

END//

NOTE

WING AND INTAKE ANTI-ICING may be used if necessary but should be kept to a minimum.

The following major services are NOT AVAILABLE with

No.2 AC ESS BUS switch at EMERG	No.3 AC ESS BUS switch at EMERG
No.1 - AFCS - Autothrottle - Electric trim - Safety Flight Control - Radar Blue & Green hydraulic contents gauges Nosewheel Steering No.2 Compass standby supply	No.2 - AFCS - Autothrottle - Electric trim - Autostabs - Artificial Feel - Safety Flight Control - ADC, ADI & HSI - ILS, VOR, DME & ADF - Captains VOR/RMI - Co-pilots ADF/RMI - Radio Altimeter Yellow Hydraulic contents gauge No. 2 Compass normal supply.

NOTE

No.2 Compass will only be inoperative if both No.2 and No.3 switches are at EMERG.

LANDING GEAR

LANDING WITH ABNORMAL LANDING GEAR CONFIGURATION

This procedure is not expanded.

See Emergency Drill Vol. 2B. 07.07.01

RAPID DEPRESSURIZATION

AUDIO .... CANCEL E

Press to cancel audio warning.

OXYGEN .... ON 100% ALL

All crew members don masks and verify N-100% switch at 100%

CREW COMMUNICATION .... ESTABLISH ALL

On the audio selector panel
Rotate the boom/mask rotary selector to MASK

CABIN ALTITUDE .... CONFIRM WARNING E

Observe CABIN ALT indicator shows more than 10,000 ft

The cabin altitude is limited to 11,000 ft by a cabin altitude limiter on each discharge valve.
The cabin altitude is limited to 15,000 ft by the discharge valve geometry when four air conditioning groups are operating

PASSENGER OXYGEN .... CONFIRM ON. E

Verify passenger oxygen on.

Passenger oxygen masks should deploy automatically if a cabin altitude of 14,000 ft is exceeded.
If necessary unguard and set PASSENGER SYSTEM EMERG MANUAL O/RIDE to ON
Further override facilities are provided at the oxygen control panels in the rear cabin for use in the event of non deployment.

DISCHARGE VALVES .... IF OPEN, SELECT THE OTHER SYSTEM AND CLOSE MANUALLY IF NECESSARY E

GROUND PRESSURE RELIEF VALVE .... SHUT E

Set the GROUND PRESSURE RELIEF VALVE selector to SHUT 1 and observe the GROUND PRESSURE RELIEF VALVE MI reads SHUT

<u>IF CABIN ALTITUDE CANNOT BE CONTROLLED</u>
APPLY PROCEDURE: EMERGENCY DESCENT

EMERGENCY DESCENT

REFER ALSO TO PROCEDURES & TECHNIQUES - EMERGENCY DESCENT

THROTTLES .... IDLE C

With the engines at flight idle it is possible to experience a small pop surge at speeds above M = 1.60, this can be ignored.

Announce over the PA system an emergency descent is being initiated.

FUEL FWD TRANS sw .... O/RIDE C

At the same time as the power reduction, the FUEL FWD TRANS switch is set to O/RIDE position until such time as the Flight Engineer can take over control of the fuel transfer.
It is important to begin forward transfer as soon as possible to keep the aircraft in the CG corridor and avoid the REAR CG limit.

TANKS 9 &10 PUMPS sels .... VERIFY OFF E
PRESSURISATION .... MAX RATE OF DESCENT E

On system 1 and system 2 altitude selectors set the rotary selectors R (2) fully clockwise to allow maximum rate of change of cabin altitude

CABIN ALTITUDE sel .... ZERO E

Set the rotary selectors A (2) to obtain required cabin altitude of 0.

ATC TRANSPONDER .... A 7700 C

Rotate the ATC Transponder code selector knobs to obtain A7700 on digital code display

SAFETY HEIGHT .... CHECK P

Obtain safety height from flight log and inform captain

(Unchanged)

TANK 9 INLET VALVES MAIN sel ....AUTO E

Verify tank 9 INLET VALVE MAIN selectors at AUTO to ensure they are under control of the FUEL FWD TRANS switch or the TRIM TRANS AUTO MASTER selector.

AIR CONDITIONING

TANK 11 PUMPS .... ALL AUTO

Verify tank 11 PUMP GREEN, PUMP BLUE and PUMPS selectors (4) at AUTO to ensure they are under control of the FUEL FWD TRANS switch or the TRIM TRANS AUTO MASTER selector. The four pumps are required during forward transfer whilst in emergency descent to maintain aircraft within the MACH/CG corridor.

TANKS 9 AND 10 LLC .... 8000 KG

Set tank 9 and 10 load limit control to 8000 kg plus the FQI reading of tank 10 in readiness for auto transfer control.

TANK 11 LLC .... ZERO

Set tank 11 load limit control to zero in readiness for auto transfer control.

TRIM TRANS AUTO MASTER sel .... FORWARD

Set the TRIM TRANS AUTO MASTER selector to FORWARD in readiness for auto transfer control.

FUEL FWD TRANS sw .... GUARD

Set the FUEL FWD TRANS switch to its guarded position to place the forward transfer under control of the TRIM TRANS AUTO MASTER and tank 9 and 10 load limit control.

FWD EMERGY RELIEF sw .... OPEN

Set the FWD EMERGY RELIEF switch to OPEN as insurance against loss of extraction flow should the emergency descent have been initiated by pressurisation or associated problems.

FWD EXTRACT FANS .... ALL ON ..

Set the FWD EXTRACT FANS to ALL ON as insurance against loss of extraction flow should the emergency descent have been initiated by pressurisation or associated problems.

(Deletion)

IF OXYGEN HAS BEEN IN USE
~~WHEN CABIN ALTITUDE DESCENDS~~ TO 15,000 FT OR BELOW

NO SMOKING SIGNS .... ON

Set the NO SMKG switch to ON as a precaution against accidental ignition of oxygen discharging from masks by passengers.

AIR CONDITIONING

CREW OXYGEN .... SELECT N ALL
USE AS REQD

PASSENGER OXYGEN SHOULD RETURN TO NORMAL FLOW AUTOMATICALLY BUT IF MANUAL OVERRIDES HAVE BEEN USED THEY SHOULD BE RESET

IF NORMAL CABIN PRESSURE CANNOT BE RESTORED

CABIN & FLIGHT DECK
TEMPERATURE SELECTORS .... COOLEST AUTO SETTING E

Set the CABIN and FLIGHT DECK TEMPERATURE SELECTORS TO 0 COOL AUTO

END//

(Unchanged)

SMOKE ON THE FLIGHT DECK

GENERAL

Whenever smoke appears on the Flight Deck take the following precautions BEFORE calling for one of the drills to be carried out:-

(1) Assume that the smoke will get worse.

(2) At least one Pilot and the Flight Engineer should use oxygen masks and smoke goggles immediately.

(3) Engage the autopilot as quickly as possible - if on final approach a go-around should be considered.

(4) Select storm lighting.

(5) Identify the smoke source - this may not be easy, and may take time. Electrical fires usually have a distinctive smell and may be accompanied by tripped circuit breakers. Air conditioning smoke can sometimes be seen coming from the ducts or louvres.

(6) Notify cabin crew - smoke may enter the cabin whilst clearance is under way.

(Unchanged)

AIR CONDITIONING SMOKE

OXYGEN (IF REQ'D) .... ON 100% ALL

If required, all crew members don oxygen masks.
Verify N-100% switch at 100%

CREW COMMUNICATION .... ESTABLISH ALL

On the audio select panel
Rotate the boom/mask rotary selector to MASK

SMOKE GOGGLES (IF REQ'D) .... ON ALL

COND VALVE ....OFF E

Set the COND VALVE selector of the affected group to OFF to confirm the automatic shut down of the affected air conditioning system.

AIR GENERATION SMOKE rty sel .... INHIB E

Set AIR GENERATION SMOKE rotary selector to INHIB to allow restart of the affected group

NOTE

With the AIR GENERATION SMOKE rotary selector at INHIB, if any COND VALVE is switched to OFF then to ON the smoke detection auto shutdown function on that group is inhibited. The AIR GENERATION, SMOKE warning lights on the Flight Engineers right bottom panel and the MWS SMOKE warnings are operative.

<u>WAIT 5 MINUTES</u>
This is to allow smoke to dissipate

<u>THEN</u>
COND VALVE .... ON E

Set the COND VALVE switch of the affected group to ON.

<u>IF SMOKE IS DETECTED</u>
COND VALVE .... OFF E

Set the COND VALVE selector of the affected group to OFF

AIR GENERATION SMOKE rty sel .... NORM E

Set the AIR GENERATION SMOKE rotary selector to NORM to reset the MWS.

APPLY PROCEDURE : SHUT DOWN OF AIR CONDITIONING GROUPS

ELECTRICAL SMOKE OR FIRE

OXYGEN (IF REQ'D) .... ON 100% ALL

If required, all crew members don oxygen masks
Verify N-100% switch at 100%

CREW COMMUNICATION .... ESTABLISH ALL

On the audio select panel
Rotate the boom/mask rotary selector to MASK

SMOKE GOGGLES (IF REQ'D) ....ON ALL

IF SMOKE ORIGIN LOCATED AND CAN BE SAFELY ISOLATED,
OR IF SYSTEM MALFUNCTION OBSERVED
REMOVE RELEVANT POWER SUPPLY

END//

IF SMOKE ORIGIN NOT LOCATED AND FLIGHT DECK OR CABIN
VISIBILITY REDUCED
EMERG GEN .... MANUAL
CHECK VOLTS
AND FREQUENCY E

Set the EMERG GEN selector to MANUAL and observe the SELECTED light (blue) on, the AC FREQ/VOLTS rotary selector to EMERG PWR and observe the frequency and volts are normal.

Systems data (emergency generator)

Maximum load	30 KVA (25 KW)
AC frequency	390 to 410 Hz
AC voltage	110 to 118 volts

ENGINE FEED PUMPS .... ALL ON E

Verify all ENGINE FEED PUMPS are selected on since some pumps will be lost when the generators are switched off.

ENGINE RECIRCULATION VALVES .... ALL SHUT E

This ensures maximum fuel flow to the engines while only one fuel pump is operating.

CAUTION
THE ENGINE RECIRCULATION VALVES MUST NOT BE OPENED UNTIL AFTER MAIN GENERATION IS RESTORED.

SERVO CONTROLS YELLOW rty sel .... YELLOW GREEN C

This ensures maximum green hydraulic power availability for the emergency generator.

REAR EXTRACT STANDBY FAN .... ON E

The rear extract standby fan is powered from essential busbars.

F/O ASI AND ALTIMETER .... STANDBY MODE P

Rotate First Officer's ASI and Altimeter mode selectors to S (Standby) in preparation for the loss of ADC No.2

When at S (Standby) the ASI and Altimeter receive information from the nose pitot probe.

ADC 2 .... OFF P

ADC No.2 will be lost with main electrical supply. To prevent the nuisance of spurious over-speed warnings due to circuit design ADC No.2 can be switched off.

AC ESS BUS sws .... ALL EMERG E

Set AC ESS BUS, NORM EMERG switches (4) to EMERG

This confirms that the emergency generator is on and the a.c. essential busbars are locked on to it therefore even if main generation is re-instated, the a.c. essential busbars cannot revert to a.c. main busbars as a power source.

AC essential busbar NORM EMERG switch must only be set to EMERG if the emergency generator is serviceable.

No.2 AC ESS BUS switch, sheds the avionics A busbar 10X and the 26 V a.c. main A busbar 12X
No.3 AC ESS BUS switch, sheds the avionics B busbar 11X and the 26 V a.c. main B busbar 13X.

AIR INTAKE LANE rty sel .... 1 & 3 TO A
2 & 4 TO B E

With the AIR INTAKE LANE rotary selector for intakes No.1 and No.3 at the non-auto A position and intakes No.2 and No.4 at the non-auto B position, the A control lanes of intakes No.1 and No.3 and the B control lanes of intakes No.2 and No.4 are powered from the a.c. essential busbars.

AIR INTAKE HYD sel .... 1 TO GREEN
3 TO BLUE
2 & 4 TO YELLOW E

(Unchanged)

Selecting the INTAKES HYD selectors to GREEN, BLUE or YELLOW selects the appropriate hydraulic system since loss of the d.c. busbars loses the ability to select the standby hydraulic system to intakes 1 & 3 and the main hydraulic system to intakes 2 & 4.

ENGINE CONTROL SCHEDULE .... ABOVE 220 KT HI
BELOW 220 KT LO E

The aircraft speed should be observed and if greater than 220 kt set the ENGINE CONTROL SCHEDULE selector to HI
If aircraft speed less than 220 kt set the ENGINE CONTROL SCHEDULE selector to LO.

CAUTION

INS NO.2 AND NO.3 WILL AUTOMATICALLY REVERT TO BATTERY POWER. THEIR LIFE IN NAV MODE IS 15 MINUTES.

GENERATORS ....ALL OFF E

NOTE

Forward rack extract fans are not powered in this condition. Maintain cabin differential above 1 PSI as long as possible.

BATTERY sels .... ESS MAIN SPLIT E

This ensures that the battery is connected to its associated d.c. essential busbar which stays disconnected from the d.c. main busbar.

Subsequent restoration of main generation power will not cause reconnection of d.c. essential busbar to d.c. main busbar.

(Deletion)

THROTTLE MASTERS .... MAIN E

The THROTTLE MASTERS are set to MAIN since all MAIN throttle control lanes are supplied from the a.c. essential busbar.

WING & INTAKE ANTI-ICING .... OFF E

While on emergency generation supply only, the wing and intake anti-icing is not powered but if a main generator is subsequently regained with wing and intake anti-icing selected on, the heavy anti-icing load may put the main generator at risk.

NOTE

Avoid icing conditions as anti-icing is inoperable during flight on emergency electrical power except for the left hand W/S de-ice which is operable at low only and heating for the standby pitot/static probe and ADS 1 sensor.

No.1 & 2 ANTI-STALL .... OFF P

The anti-stall systems are powered from main busbars and are not available during flight on emergency supplies; however they must be selected to OFF to allow the engagement of No.1 AUTOSTAB system.

AUTOSTAB No.1 .... ENGAGE P

Verify AUTOSTAB No.1 switches (3) are engaged

ARTIFICIAL FEEL No.1 .... ENGAGE P

Verify ARTIFICIAL FEEL No.1 switches (3) are engaged. AUTOSTAB No.1 and ARTIFICIAL FEEL No.1 will disconnect when main generation is removed. They can then be re-engaged.

SSB sw .... OPEN E

BTB sels (4) .... TRIP E

WHEN SMOKE, CABIN & FREIGHT HOLD LTS ARE OFF AND/OR SMOKE CLEARED.

RESET MAIN GENERATORS IN TURN TO IDENTIFY THE BUSBAR SUPPLYING THE DEFECTIVE EQUIPMENT. ALLOW APPROXIMATELY 1 MINUTE BETWEEN EACH SELECTION.

WHEN THE DEFECTIVE SUPPLY IS IDENTIFIED

AFFECTED GENERATOR .... OFF E

CAUTION

LEAVE ASSOCIATED BTB TRIPPED.
LEAVE ASSOCIATED AC ESS BUS SWITCH AT EMERG.

SERVICEABLE CHANNELS .... MANUAL PARALLEL E

Apply procedure MANUAL PARALLEL to serviceable channels.

SSB sw ....CLOSE E

AC ESS BUS sw(s)
(SERVICEABLE CHANNELS) .... NORM E

On each serviceable channel set the a.c. essential busbar NORM EMERG switch to NORM.

Some equipment may trip. Reset as required.

IF NO.3 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 2 TO B
3 TO A E

With the AIR INTAKE LANE rotary selector for intake No.3 at the non-auto A position and intake No.2 at the non-auto B position, the A control lanes of intake No.3 and the B control lanes of intake No.2 are powered from the a.c. essential busbars.

IF NO.4 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 1 TO A
4 TO B E

With the AIR INTAKE LANE rotary selector for intake No.1 at the non-auto A position and intake No.4 at the non-auto B position, the A control lanes of intake No.1 and the B control lanes of intake No.4 are powered from the a.c. essential busbars.

BATTERY sels ....BATT ON E

CAUTION
EMERGENCY GENERATOR MUST BE LEFT ON LINE WITH ONE OR MORE A.C. ESSENTIAL BUSBAR NORM EMERG SWITCHES AT EMERG.

Restore all systems to normal status where possible.

(Deletion)

Monitor all systems for correct operation and remove relevant power supply if malfunction observed.

IF EMERGENCY GENERATOR NOT REQUIRED
EMERG GEN .... AUTO E

Set the EMERG GEN selector to AUTO

EMERG GEN NORM/ISOL sw .... ISOL
THEN NORM E

Set the emergency generator NORM/ISOL switch to ISOL for five seconds to switch off the emergency generator then return switch to NORM, observe SELECTED light off.

END//

ON EMERGENCY ELECTRICS

The following are AVAILABLE

Normal pressurisation control
Fuel TOTAL CONTENTS indications and FQIs
FASTEN SEAT BELTS and NO SMOKING signs
Standby horizon
Captain's ADF/RMI
First Officer's VOR/RMI
Voice recorder
Public address
TRK/HDG unit
Marker
Interphone audio selector panels (4)
No. 1 ADC, INS, ADI, Compass Coupler & HSI
No. 1 ADF, VOR, DME, ILS & Radio Altimeter
No. 1 ATC Transponder, VHF & HF

The engine operating schedule will be MID with HI selected and gear up:
it will be LO with any other selection

The following are NOT AVAILABLE

Autopilot
Autothrottle
Normal landing gear operation
Normal visor/nose operation
Visor/nose position indicator
Reverse thrust
Nosewheel steering
Landing lights
Reheat
Normal brakes

EMERGENCY LANDING

ATC TRANSPONDER .... A 7700 P

Rotate the ATC Transponder code selector knob to obtain A7700 on the digital code display.

DISTRESS MESSAGE ....TRANSMIT P

Transmit MAYDAY and advise position, disposition of crew and passengers, intentions on landing, location and description of any dangerous cargo, disposition and quantity of fuel.

CABIN CREW AND PASSENGERS .... BRIEF C

Instruct cabin crew and passengers to prepare for emergency landing and evacuation.

FUEL JETTISON .... AS REQUIRED CE

On Captain's command the Flight Engineer will jettison fuel down to the required quantity. Stop jettisoning before commencing final approach unless performance considerations require maximum weight reduction, in which case set the TANK JETTISON VALVES SWS to SHUT and JETTISON MASTER VALVES sels to OFF by 800 feet above threshold.

HARNESS ....SECURE ALL

CABIN .... DEPRESSURISE BELOW 10,000 FT E

Below 10,000 feet when the cabin altitude and aircraft altitude are approximately the same, set the EMERGENCY DEPRESSURISATION selector to EMERGY DEPRESS.

APPROACH CHECKLIST

EMERGENCY LANDING BRIEFING .... UPDATED C

The Captain will brief on his intentions and requirements for approach, landing and after landing.

F/D DOOR sw .... OPEN E

SEAT BELT SIGNS .... ON E

NO SMOKING SIGNS ....ON E

EMERGENCY LIGHTS	ARM	E
DRAIN MAST HTRS	OFF	E

This ensures that if a drain mast is damaged at impact there is no possibility of the heater circuit acting as a fire ignition source.

ALTIMETERS	SET/CROSS CHECKED	ALL
RADIO ALTIMETERS	DH SET	ALL
ENG RATING MODE	TAKE-OFF	E
RAD/INS sws	RAD	ALL
VISOR	DOWN 5° LT OFF	EP
NOSE	5°	EP
FUEL/WEIGHT/CG	CHECKED	E
TARGET THRESHOLD SPEED	BUGGED	ALL
ENGINE FEED PUMPS	ALL ON	E
FUEL CROSSFEED VALVES	SHUT	E
ENGINE RECIRCULATION VALVES	SHUT	E
APPROACH CHECKLIST	COMPLETED	E

LANDING CHECKLIST

LANDING GEAR	DOWN 4 GREENS	ALL
NOSE	DOWN, GREEN	EP
VISOR STBY CONTROL	VISOR LOWER	P

Setting the STBY control switch to VISOR DOWN will remove the hydraulic pressure from the droop nose jacks and allow the nose to be forced upwards on impact with the runway.

BRAKES	CHECKED/NORM	P
ANTI-SKID	CHECKED	P
SECONDARY AIR DOORS	SHUT	E

BRAKE FANS	ON	E
RADAR	STANDBY	E
YELLOW PUMPS	ON/PRESSURE NORMAL	E
AUX INLET MIs	OPEN/CROSS-HATCHED	E
SEATS	LOCKED /PWR OFF	ALL
LANDING CHECKLIST	COMPLETED	E

<u>AT 1,000 FT</u> - CALL ON PA
"TAKE UP EMERGENCY POSITION" .... P

<u>AT 200 FT</u> - CALL ON PA
"BRACE BRACE" .... P

If PA is unserviceable flash the cabin signs

END//

(Unchanged)

PASSENGER EVACUATION ON LANDING

ADVISE CABIN CREW AND PASSENGERS OF INTENTION TO EVACUATE C

Advise cabin crew and passengers to prepare for evacuation.

NOTIFY CABIN CREW OF ANY CONDITIONS THAT MAY AFFECT EVACUATION C

Notify cabin crew of any existing conditions such as high winds, irregular ground conditions and/or structural damage, areas that could affect deployment or alter status of the escape slides.

TOWER/GROUND CREW .... NOTIFY P

Notify tower and/or ground crew of abnormal airplane condition and of intention to evacuate.

BRAKES LEVER .... PARK C

The brakes are applied with pressure from the brake accumulator.

ENGINE SHUT DOWN HANDLES ....PULL CE

On Captain's command, the Flight Engineer will pull all 4 engine shut down handles and confirm all engines are shut down.

CONTROL COLUMN .... PUSH FULLY FWD AND RELEASE C

Pushing the control column fully forward decays the hydraulic pressure and sets the elevons at the required position for rear slide deployment.

<u>SEVEN SECONDS AFTER PULLING ENGINE SHUT DOWN HANDLES</u>

2 SHOT .... PRESS E

The 2 SHOT extinguishant circuit has greater integrity in a crash situation than the 1 SHOT circuit.

PASSENGER EVACUATION .... INITIATE C

The Captain will direct the cabin crew and passengers to commence evacuation and state which exit doors are to be used.
The EMERG EVAC system may be used in lieu of, or in addition to the PA announcement

MISCELLANEOUS

BATTERY sels ....BATT OFF E

Set the BATTERY selectors to BATT OFF when electrical power is no longer required.

CAUTION
AT LEAST 10 SECONDS MUST ELAPSE BETWEEN PULLING THE ENGINE SHUT DOWN HANDLES AND SWITCHING OFF THE BATTERIES TO ALLOW THE LP FUEL VALVES TO SHUT.

EVACUATION .... EVACUATE AIRCRAFT
ASSIST CABIN
CREW ALL

Leave the aircraft via the forward slides and control, passenger movement away from the aircraft vicinity, unless conditions in the cabin dictate their carrying out the duties of any of the cabin crew.

END//

NOTE
If neither of the forward slides are available at least one flight crew member is to use the forward vestibule escape rope and align any retrievable slides.

(Deletion)

DITCHING

ATC TRANSPONDER .... A 7700 P

Rotate the ATC Transponder Code selector knob to obtain A7700 on the digital code display.

DISTRESS MESSAGE ....TRANSMIT P

Transmit MAYDAY and advise positions, disposition of crew and passengers, intentions on landing, location and description of any dangerous cargo, disposition and quantity of fuel.

CABIN CREW AND PASSENGERS .... BRIEF P

Instruct cabin crew and passengers to prepare for ditching and evacuation.
All crew, don life jackets, uninflated, at the earliest opportunity.

FUEL JETTISON .... AS REQUIRED CE

On Captain's command the Flight Engineer will jettison fuel down to the required quantity. Stop jettisoning before commencing final approach unless performance considerations require maximum weight reduction, in which case set the TANK JETTISON VALVES sws to SHUT and JETTISON MASTER VALVES sels to OFF by 800 ft above sea level.

GPW C/B .... TRIP E
L/GEAR WARN C/B .... TRIP E

CIRCUIT BREAKER	PANEL	GRID REF
GROUND PROXIMITY WARN AC SUP	13-215	G4
AUDIO WARN SYS SUP 1	1-213	M21

AT 180 KNOTS

AUDIO .... CANCEL E

NOTE

With the GPW circuit breaker tripped all modes of operation of the ground proximity system will be inhibited.

With the L/GEAR WARN circuit breaker tripped the audio will operate at 180 knots.

HARNESS	SECURE	ALL
DISCHARGE VALVES sws (2)	NORMAL	E
CABIN	DEPRESSURISE BELOW 10,000 FT	E

Below 10,000 ft, when the cabin altitude and aircraft altitude are approximately the same, set the emergency depressurisation selector to EMERGY DEPRESS.

APPROACH CHECKLIST

DITCHING BRIEFING	UPDATED	C

The Captain will brief on his intentions and requirements for approach, ditching and after ditching

F/D DOOR sw	OPEN	E
SEAT BELT SIGNS	ON	E
NO SMOKING SIGNS	ON	E
EMERGENCY LIGHTS	ARM	E
ALTIMETERS	SET/CROSS CHECKED	ALL
RADIO ALTIMETERS	DH SET	ALL
ENG RATING MODE	TAKE-OFF	E
RAD/INS sws	RAD	ALL
CG	53.5%	E

Control fuel disposition to maintain authorised maximum rearward CG (53.5% Co)

TARGET THRESHOLD SPEED	BUGGED	ALL
ENGINE FEED PUMPS	ALL ON	E

FUEL CROSSFEED VALVES	SHUT	E
ENGINE RECIRCULATION VALVES	SHUT	E
APPROACH CHECKLIST	COMPLETED	E

LANDING CHECKLIST

LANDING GEAR	UP	ALL
NOSE	UP	ALL
VISOR	UP	ALL
RAMP/SPILL MASTERS	MAN	E
RAMPS	0%	E
BLEED VALVES	SHUT	E
DITCHING VALVES	SHUT	E
SEATS	LOCKED /PWR OFF	ALL
LANDING CHECKLIST	COMPLETED	E

<u>AT 1,000 FT</u> - CALL ON PA
"TAKE UP DITCHING POSITION" .... P

<u>APPROACH FOR TOUCHDOWN</u>

ON LEAVING 1,000 FT ALTITUDE

AUTOPILOT	ENGAGED	C
AUTOTHROTTLE	ENGAGED	C
APPROACH SPEED	VREF	C
RATE OF DESCENT...	300 FT/MIN	C

Hold speed and glide slope using autothrottle and autopilot.

<u>AT 200 FT</u> - CALL ON PA
"BRACE BRACE" .... P

If PA is unserviceable flash the cabin signs.

AT 50 FT

AUTOTHROTTLE .... DISENGAGE MAINTAIN EXISTING POWER SETTINGS C

REDUCE RATE OF DESCENT FOR TOUCHDOWN AT A PITCH ATTITUDE OF APPROXIMATELY 15°

ON TOUCHDOWN

~~ENGINE SHUTDOWN~~ HANDLES ....PULL CE

On Captain's command, the Flight Engineer will pull all (4) engine shut down handles and confirm all engines are shut down.

HOLD PITCH ATTITUDE AS LONG AS POSSIBLE

PASSENGER EVACUATION ....INITIATE C

The Captain will direct the cabin crew and passengers to commence evacuation and state which exit doors are to be used.
The EMERG EVAC system may be used in lieu of, or in addition to the PA announcement.

EVACUATION ....EVACUATE AIRCRAFT ASSIST CABIN CREW ALL

Leave the aircraft via the most convenient door, joining with the cabin crew to ensure at least one crew member per raft or slide raft.

END//

NOTE

If flight crew access to forward doors is impeded, the escape rope stowed in the side console is to be used for evacuation via the sliding window.

NOTE

Disconnection of autopilot during the approach for touchdown is left to the discretion of the pilot.

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(Unchanged)

GROUND PROXIMITY PULL-UP WARNING

CALL	"PULL-UP WARNING"	P
AUTOPILOT	DISCONNECT	C
FULL POWER	APPLY	E

Immediately apply full dry power, together with reheat and contingency as required.

ATTITUDE	ADJUST	C

<u>Departure</u>
Check and adjust pitch attitude to achieve a minimum speed of V_2+40 kts in level flight before initiating a climb. Level the wings where possible.

<u>En-route and Arrival</u>
Check and adjust pitch attitude to a minimum of 15° and climb away at not less than VREF + 50 kts. Level the wings where possible.

CAUTION.

In either case:

1. DO NOT DISREGARD SHORT DURATION WARNING - TAKE IMMEDIATE ACTION.

2. AFTER WARNING CEASES
   - **(a) CHECK AIRCRAFT POSITION**
   - **(b) CHECK RADIO AND PRESSURE ALTIMETERS**
   - **(c) CHECK ALTIMETER SETTINGS**
   - **(d) DETERMINE MINIMUM SAFE ALTITUDE**

END//

TYPES OF CRASH LANDING

GENERAL

Emergencies develop in two forms:-

UNPREMEDITATED:- Those that take place without warning e.g. take-off or landing.

PREMEDITATED:- Those where there is ample warning to preplan the evacuations.

When an accident occurs, the most vital factor is TIME. Consequently crews must know their drills and equipment thoroughly so no time is lost.

Any landing involving fire risks or tearing of the a/c structure should necessitate immediate evacuation of passengers after coming to rest. Cabin crew will always be alerted as soon as possible. The nature of the emergency drill determines the actions required.

It is possible, in certain emergencies due to undercarriage failure, for the aircraft to rest on a wingtip, to tip up on its tail or nose - extreme caution should be exercised to ensure that slides reach the ground and are safe for passenger evacuation.

Cabin lighting should be dimmed for night landing to allow the passengers eyes to adjust to night conditions.

UNPREMEDITATED

This is the most critical case, and its success will depend entirely on the competency of the crew.

The Captain will order, over the P.A. or through the Senior Cabin Crew Member, an immediate evacuation, indicating, if conditions so require, the doors or side of aircraft that should be used.

PREMEDITATED

Action will be initiated by Captain calling "Prepare for Crash Landing".

Passengers should remain in their seats and take up their bracing attitudes on command of "Brace, Brace" or flashing of cabin signs.

Supernumerary crew members should take up passenger seats where available, otherwise their normal take-off and landing stations

Co-pilot will call take up crash landing position on the P.A. at 1000 ft. At approx. 200 ft., the Co-pilot will call "Brace, Brace" on public address system, or flash the cabin signs. Doors must not be operated until the aircraft has come to rest.

The Captain will order, over the P.A. or through the Senior Cabin Crew member immediate evacuation, indicating, if conditions so require, the doors or side of aircraft to be used.

DUTIES BEFORE CRASH LANDING

AIR CABIN CREW WILL:-

Acknowledge the order "Prepare for Crash Landing".

The Senior Cabin Crew member will ensure:-

Cabin crew fully briefed on their duties,
Precautions listed in the emergency announcement carried out, including full passenger briefing with maximum cabin lighting.

The cabin crew will:-

Secure all loose hand-baggage and equipment.

Secure galley equipment and switch off galley electrics.

Distribute blankets and pillows.

Re-position passengers and seat able-bodied people next to:-

Invalids
Unstable people
Children
Old people

Check that:-

Seats are in the upright position.

High-heeled shoes are removed.

Seat belts are secured.

Ties and collars are loosened.

Spectacles and dentures are removed.

All sharp objects are removed from person
(i.e. pens, pencils)

The bracing Position is understood.

Cabin lighting to DIM.

The Senior Cabin Crew member will report to the Captain

"CABIN PREPARATION COMPLETE"

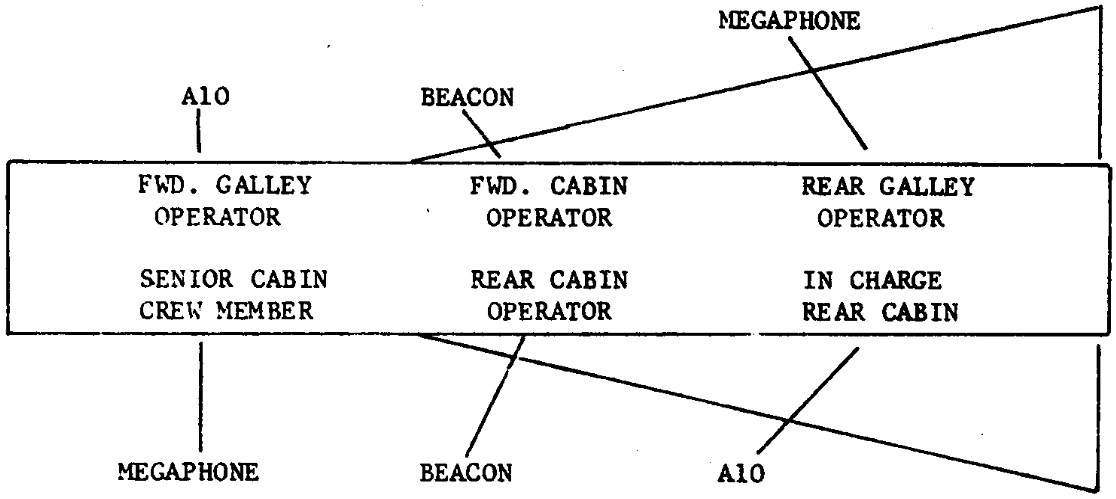
Cabin crew will take up crash-landing positions.

Doors must not be operated until after the aircraft has come to rest.

DUTIES AFTER CRASH LANDING

1. Operate only doors not affected by fire or other hazard.
2. Direct passengers through available doors, by standing to the side of the doorway so that none of the available exit area is blocked. Make physical and/or verbal contact with the approaching passengers, as far back in the vestibule area as possible. Use whatever physical force is necessary to keep the passengers moving.
3. At the Slide:-
   - (a) Call "JUMP - JUMP - JUMP"; except at centre and rear doors which have ramps therefore instruct passengers to "WALK TO SLIDE AND JUMP".
   - (b) When assisting passengers through the doorways, all physical contact should be kept below shoulder level, preferable in the small of the back or even lower. If passengers sit down, do not bend down to them but use your foot or knee in their backs to tip them on to the slide. Passengers can, if necessary, be pushed out in any position.
   - (c) Order four able bodied passengers to wait at the bottom of the slide, to help passengers to their feet, and away from the aircraft.
4. Check your cabin area is clear of passengers, then leave via the nearest available door. When on the ground, assist with the marshalling of passengers away from the aircraft.

CRASH LANDING POSITIONS AND EQUIPMENT RESPONSIBILITIES



CRASH LANDING DRILL

SENIOR CABIN CREW MEMBER

FWD LH door

1. Acknowledge.
2. Full Cabin Lighting.
3. Brief Cabin Crew.
4. Brief Passengers and Supervise Cabin Preparation.
5. Galley Equipment 'OFF'.
6. Cabin Dividers 'OPEN'.
7. Doorways Clear.
8. Passenger and Cabin Preparation Complete.
9. Lighting controls to 'DIM'.
10. Check Emergency Lights 'ON'.
11. Report to Captain "All preparations complete".
12. Adopt landing position.

AFTER LANDING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR USABLE

1. Check emergency lights 'ON'
2. Operate door.
3. Evacuate passengers.
4. Check cabin area clear.
5. Leave by anv door.
6. Direct passengers away from aircraft.

DOOR NOT IN USE

1. Check emergency lights 'ON'
2. Guard door.
3. Direct passengers to nearest useable exit.
4. Check cabin area clear.
5. Leave by any door.
6. Direct passengers away from aircraft.

CRASH LANDING DRILL

CREW MEMBERS

ALL OTHER DOORS

1. Acknowledge
2. Secure cabin area and passengers.
3. Cabin Dividers "OPEN"
4. Doorways Clear
5. Report to SENIOR CABIN CREW MEMBER "All preparations complete".
6. Adopt landing position

AFTER LANDING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR USABLE

1. Operate door.
2. Evacuate passengers.
3. Check cabin area clear.
4. Leave by any door.
5. Direct passengers away from aircraft.

DOOR NOT IN USE

1. Guard door.
2. Direct passengers to nearest useable exit.
3. Check cabin area clear.
4. Leave by any door.
5. Direct passengers away from aircraft.

REASON FOR ISSUE:

To amend the Forward LH Door Logic to include reference to Manual Unlocking Straps on a particular batch of Forward LH Door Slidepacks.

The following information is applicable to the Forward LH Door only and is supplementary to the drill opposite.

There is a remote possibility that a particular batch of Forward LH door Slidepacks may exhibit the following fault:-

Upon opening the door in the "Armed" condition the slide pack will release from the door, but the slide container may not open, thus inhibiting the automatic deployment/inflation sequence.

Until these slidepacks can be modified they are each fitted with two Manual Unlocking Straps. Pulling the Straps will open the container and permit normal deployment/inflation to continue.

Therefore, in the event of a Forward LH Door Slide failing in the manner described above:-

1. Locate the two red Manual Unlocking Straps.

2. Before pulling these straps be aware that a successful manual release will be indicated by the front cover of the slide container moving rapidly upwards and outwards, therefore take up an appropriate position.

3. Pull each Manual Unlocking Strap sharply in turn.

   NOTE: (a) The strap movement will be small - one to two inches.

   (b) the slide may well deploy after pulling the first strap.

4. Following successful manual release of the slide container revert to standard drills and Procedures.

DOOR LOGIC

EXPANDED DRILLS

FWD LH door & FWD RH door
Centre LH door & Centre RH door

PASSENGER EVACUATION AFTER EMERGENCY LANDING
OR GROUND EMERGENCY

ESCAPE SLIDE LEVER - CHECK IN FWD. ARM POSITION.

DOOR - FWD DOORS - CHECK THROUGH VIEWING WINDOW.
CENTRE DOORS - CHECK THROUGH ADJACENT WINDOW THAT ESCAPE ROUTE CLEAR

<u>IF ESCAPE ROUTE CHECK UNSATISFACTORY</u>

\- DO NOT USE

<u>IF ESCAPE ROUTE CHECK SATISFACTORY</u>

DOOR - OPEN - SLIDE DEPLOYS AND INFLATES AUTOMATICALLY.

<u>IF SLIDE DOES NOT DEPLOY</u>

MANUAL SLIDE PACK RELEASE LEVER - OPERATE.

<u>IF SLIDE STILL DOES NOT DEPLOY</u>

DO NOT USE EXIT

<u>IF SLIDE DEPLOYS BUT DOES NOT INFLATE</u>

RED MANUAL INFLATION HANDLE - PULL

<u>IF SLIDE STILL DOES NOT INFLATE.</u>

DO NOT USE EXIT

<u>WHEN SLIDE DEPLOYS AND INFLATES CORRECTLY</u>

PASSENGERS AND CREW - EVACUATE

DOOR LOGIC

EXPANDED DRILLS

Rear LH door & Rear RH door

PASSENGER EVACUATION AFTER EMERGENCY LANDING OR GROUND EMERGENCY

ESCAPE SLIDE LEVER - CHECK IN FWD. ARM POSITION.

DOOR - PARTIALLY OPEN AND CHECK ESCAPE ROUTE SAFE.

- <u>IF ESCAPE ROUTE CHECK UNSATISFACTORY</u>
  SHUT DOOR - DO NOT USE.

<u>IF ESCAPE ROUTE CHECK SATISFACTORY</u>

DOOR - OPEN - SLIDE DEPLOYS AND INFLATES AUTOMATICALLY.

- <u>IF PACK DOES NOT DEPLOY</u>
  DO NOT USE EXIT
- <u>IF WALKWAY DEPLOYS BUT DOES NOT INFLATE.</u>
  RED MANUAL INFLATION HANDLE - PULL
  - <u>IF WALKWAY STILL DOES NOT INFLATE.</u>
    DO NOT USE EXIT
- <u>IF OFFWING SLIDE DEPLOYS BUT DOES NOT INFLATE.</u>
  SECOND RED MANUAL INFLATION HANDLE - PULL
  - <u>IF OFFWING SLIDE DOES NOT INFLATE</u>
    DO NOT USE EXIT

WHEN SLIDE DEPLOYS AND INFLATES CORRECTLY

PASSENGERS AND CREW - EVACUATE

CRASH LANDING DRILL

SPECIAL FLIGHTS (E.G. TRAINING/DELIVERY)
Forward Cabin in use only. Maximum number on board 16 - Senior Cabin Crew Member Fwd. LH door.

1. Acknowledge.
2. Full Cabin Lighting.
3. Brief Passengers and Prepare Cabin
4. Galley Equipment 'OFF'.
5. Cabin Dividers 'OPEN'.
6. Doorways Clear.
7. Passenger and Cabin Preparation Complete.
8. Lighting controls to 'DIM'.
9. Check Emergency Lights 'ON'.
10. Report to Captain "All preparations complete".
11. Adopt landing position.

AFTER LANDING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR USABLE

1. Check emergency lights 'ON'.
2. Operate door.
3. Evacuate passengers.
4. Check cabin area clear.
5. Leave by any door.
6. Direct passengers away from aircraft.

DOOR NOT IN USE

1. Check emergency lights 'ON'.
2. Guard door.
3. Direct passengers to nearest useable exit.
4. Check cabin area clear.
5. Leave by any door.
6. Direct passengers away from aircraft.

TYPES OF DITCHING

GENERAL

Emergencies develop in two forms.

UNPREMEDITATED:- Those that take place without warning e.g. take-off or landing.

PREMEDITATED:- Those where there is ample warning to pre-plan the evacuation.

When an accident occurs, the most vital factor is TIME. Consequently crews must know their drills and equipment so that no time is lost.

Check door is in the armed position. The doors must not be operated until the aircraft has come to rest.

Cabin lighting should be dimmed for night landing to allow the passengers eyes to adjust to night conditions.

UNPREMEDITATED

This is a most critical case and is only likely to occur at airfields close to water e.g. Hong Kong.

The Captain will order over the P.A. or through the Purser that lifejackets be put on, liferaft and sliderafts launched and an immediate evacuation commenced, indicating, if conditions so require, the doors or side of aircraft to be used.

PREMEDITATED

Action will be initiated by the Captain calling "Prepare for ditching"

Passengers should put on their lifejackets, fasten their seat belts and be prepared to take up their bracing attitudes on command of "Brace, Brace", or flashing of cabin signs.

Supernumerary crew members should take up passenger seats where available, otherwise their normal take-off and landing stations.

Co-Pilot will call "Take up ditching position" on the P.A. at 1000 ft. At approximately 200 ft, the co-pilot will call "Brace, Brace" on public address system, or flash the cabin signs. Doors must not be operated until the aircraft has come to rest.

The captain will order evacuation to commence, indicating, if conditions so require, the doors or side of aircraft to be used.

DITCHING DUTIES

ALL CABIN CREW WILL

Acknowledge the order, "PREPARE FOR DITCHING".

The Senior Cabin Crew member will ensure:-

- Cabin crew fully briefed on their duties.
- Precautions listed in the emergency announcement carried out.
- Full passenger briefing with maximum cabin lighting.

Cabin Crew will:-

- Secure all loose hand-baggage and equipment.
- Secure galley equipment and switch off galley electrics.
- Fit lifejackets to small children.
- Distribute blankets and pillows.

Reposition passengers and seat able-bodied people next to:-

- Invalids
- Unstable people
- Children
- Old people

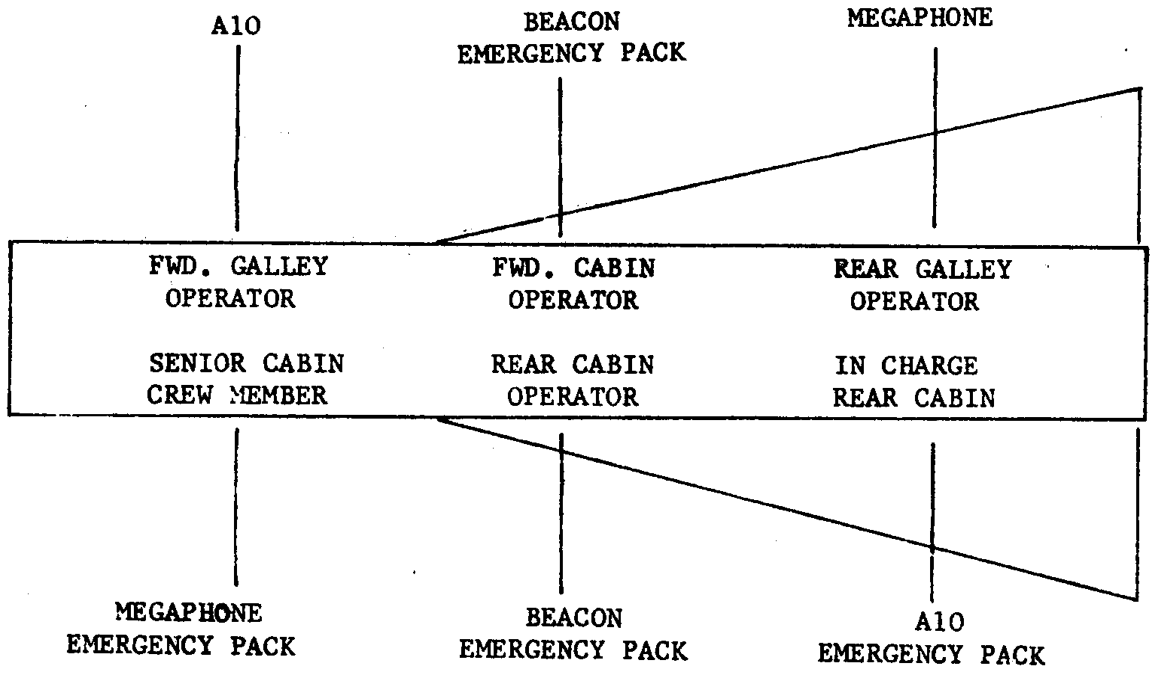
Check that:-

- Lifejackets fit correctly.
- Seats are in the upright position.
- High-heeled shoes are removed.
- Seat belts are secured.
- Ties and collars are loosened.
- Spectacles and dentures are removed.
- All sharp objects are removed from person (i.e. pens, pencils).
- The Bracing Position is understood.
- Cabin lighting to DIM.

The Senior Cabin Crew member will report to the Captain "CABIN PREPARATION IS COMPLETE".

Cabin crew will take up ditching stations.

DITCHING POSITIONS AND EQUIPMENT RESPONSIBILITIES



DITCHING DRILL

SENIOR CABIN CREW MEMBER

FWD LH door

1. Acknowledge.
2. Full cabin lighting.
3. Brief Cabin Crew.
4. Brief passengers and supervise cabin preparation
5. Loosen Tie and Collar
6. Fit Lifejacket
7. Galley Equipment Off
8. Select and brief passengers to assist
9. Cabin Dividers 'OPEN'
10. Doorways Clear
11. Passenger and Cabin Preparation Complete
12. Lighting Controls to 'DIM'.
13. Check Emergency Lights 'ON'
14. Report to Captain "All preparations complete"
15. Adopt landing position.

AFTER DITCHING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR USABLE

1. Check emergency lights 'ON
2. Open door.
3. Attach mooring line.
4. Convert slide to raft.
5. Launch raft by detach handle.
6. Control Evacuation.
7. Check cabin area clear.
8. Command a liferaft.

DOOR NOT IN USE

1. Check emergency lights 'ON'
2. Guard door.
3. Direct passengers to centre doorways.
4. Detach raft from door and reposition to centre doorways.
5. Attach and launch raft.
6. Control evacuation.
7. Check cabin clear.
8. Leave by any door.
9. Command a liferaft.

DITCHING DRILL

FWD RH Door

1. Acknowledge
2. Cabin Dividers "OPEN"
3. Loosen tie and collar
4. Fit lifejacket
5. Assist with cabin preparation
6. Adopt landing position

AFTER DITCHING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

Assist as required

DITCHING DRILL

Centre LH door & Centre RH door

1. Acknowledge
2. Full Cabin Lighting
3. Cabin Dividers 'OPEN'
4. Doorways Clear
5. Loosen tie and collar.
6. Fit Lifejacket.
7. Select and Brief passengers to assist.
8. Secure cabin area and passengers.
9. Lighting Controls to 'DIM'.
10. Report to SENIOR CABIN CREW MEMBER "All preparations complete".
11. Adopt landing position.

AFTER DITCHING
CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR USABLE

1. Open door.
2. Attach mooring line.
3. Convert slide to raft.
4. Launch raft by detach handle.
5. Control Evacuation.
6. Check cabin area clear.
7. Command a liferatt.

DOOR NOT IN USE

1. Guard door.
2. Direct passengers to nearest useable door.
3. Check cabin area clear.
4. Leave by any door.
5. Command a liferaft.

DITCHING DRILL

Rear LH Door

1. Acknowledge
2. Full Cabin Lighting
3. Cabin dividers 'OPEN'
4. Doorways Clear
5. Loosen tie and collar
6. Fit lifejacket.
7. Select and brief passengers to assist.
8. Secure cabin area and passengers.
9. Lighting controls to 'DIM'.
10. Report to SENIOR CABIN CREW MEMBER "All preparations complete".
11. Adopt landing position.

AFTER DITCHING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOWNWIND

DOOR IN USE

1. Open door.
2. If slide deploys
3. Drag raft to exit.
4. Attach mooring line
5. Remove walkway curtain.
6. Throw out raft.
7. Pull mooring line to inflate.
8. Control evacuation.
9. Check cabin area clear.
10. Command a liferaft.

2. If slide does not deploy open door to full extent.
3. Drag Raft to Exit
4. Attach Mooring Line
5. Throw out Raft
6. Pull Mooring Line to Inflate
7. Control Evacuation
8. Check Cabin Area Cler
9. Command a Liferaft

DOOR NOT IN USE

1. Guard door
2. Direct passengers to nearest useable exit.
3. Check cabin area clear
4. Leave by any door
5. Command a liferaft

DITCHING DRILL

Rear RH Door

1. Acknowledge
2. Cabin Dividers "OPEN"
3. Loosen tie and collar
4. Fit Lifejacket
5. Assist with cabin preparation
6. Adopt landing position

AFTER DITCHING

Assist as required.

If a slide/raft is unserviceable and a second 36 seater raft is carried.

AFTER DITCHING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR IN USE

1. Open door
2. If slide deploys
3. Drag raft to exit
4. Attach mooring line
5. Remove walkway curtain
6. Throw out raft
7. Pull mooring line to inflate
8. Control evacuation
9. Check cabin area clear
10. Command a liferaft

2. If slide does not deploy open door to full extent
3. Drag raft to exit
4. Attach mooring line
5. Throw out raft
6. Pull mooring line to inflate
7. Control evacuation
8. Check cabin area ckear
9. Command a liferaft.

DOOR NOT IN USE

1. Guard door
2. Direct passengers to nearest useable exit
3. Check cabin area clear
4. Leave by any door
5. Command a liferaft

DOOR LOGIC

EXPANDED DRILLS

Rear LH door

PASSENGER EVACUATION AFTER DITCHING

DOWNWIND SIDE DOOR

ESCAPE SLIDE LEVER - CHECK IN FWD 'ARM' POSITION

DOOR OPEN SLIDE DEPLOYS AND INFLATES AUTOMATICALLY.

IF SLIDE DOES NOT DEPLOY

TO ENSURE SUFFICIENT CLEARANCE TO LAUNCH LIFERAFT, PUSH YELLOW LEVER TO OPEN DOOR TO FULL EXTENT.

DOOR LOGIC

EXPANDED DRILLS

FWD LH door

PASSENGER EVACUATION AFTER DITCHING

ESCAPE SLIDE LEVER - CHECK IN FWD. ARM POSITION

DOOR - CHECK THROUGH VIEWING WINDOW THAT ESCAPE ROUTE CLEAR.

<u>IF ESCAPE ROUTE CHECK UNSATISFACTORY</u>

- DO NOT USE BUT RAFT CAN BE MANUALLY LAUNCHED THROUGH EITHER OF THE CENTRE DOORWAYS.

<u>IF ESCAPE ROUTE CHECK SATISFACTORY</u>

DOOR - OPEN SLIDE/RAFT DEPLOYS AND INFLATES AUTOMATICALLY.

<u>IF DOOR FAILS TO OPEN</u>

RAFT CAN BE MANUALLY LAUNCHED THROUGH CENTRE DOORWAYS.

<u>IF SLIDE/RAFT DOES NOT DEPLOY</u>

MANUAL SLIDE/RAFT PACK RELEASE LEVER - OPERATE

<u>IF SLIDE/RAFT STILL DOES NOT DEPLOY</u>

DO NOT USE EXIT.

<u>IF SLIDE/RAFT DEPLOYS BUT DOES NOT INFLATE</u>

RED MANUAL INFLATION HANDLE - PULL

<u>IF SLIDE/RAFT STILL DOES NOT INFLATE</u>

DO NOT USE EXIT.

TEMPORARY REVISION
Insert facing 02-14 page 70

REASON FOR ISSUE:

To amend the Forward LH Door Logic to include reference to Manual Unlocking Straps on a particular batch of Forward LH Door Slidepacks.

The following information is applicable to the Forward LH Door only and is supplementary to the drill opposite.

There is a remote possibility that a particular batch of Forward LH door Slidepacks may exhibit the following fault:-

Upon opening the door in the "Armed" condition the slide pack will release from the door, but the slide container may not open, thus inhibiting the automatic deployment/inflation sequence.

Until these slidepacks can be modified they are each fitted with two Manual Unlocking Straps. Pulling the Straps will open the container and permit normal deployment/inflation to continue.

Therefore, in the event of a Forward LH Door Slide failing in the manner described above:-

1. Locate the two red Manual Unlocking Straps.

2. Before pulling these straps be aware that a successful manual release will be indicated by the front cover of the slide container moving rapidly upwards and outwards, therefore take up an appropriate position.

3. Pull each Manual Unlocking Strap sharply in turn.

   NOTE: (a) The strap movement will be small - one to two inches.

   (b) the slide may well deploy after pulling the first strap.

4. Following successful manual release of the slide container revert to standard drills and Procedures.

DOOR LOGIC

EXPANDED DRILLS

Centre LH door & Centre RH door

<u>PASSENGER EVACUATION AFTER DITCHING</u>

ESCAPE SLIDE LEVER - CHECK IN FWD. ARM POSITION
DOOR - CHECK THROUGH ADJACENT WINDOW THAT ESCAPE ROUTE CLEAR

<u>IF ESCAPE ROUTE CHECK UNSATISFACTORY</u>

DO NOT USE.

<u>IF ESCAPE ROUTE CHECK SATISFACTORY</u>

DOOR - OPEN SLIDE/RAFT DEPLOYS AND INFLATES AUTOMATICALLY.

<u>IF SLIDE/RAFT DOES NOT DEPLOY</u>

MANUAL SLIDE/RAFT PACK RELEASE LEVER - OPERATE

<u>IF SLIDE/RAFT STILL DOES NOT DEPLOY</u>

DO NOT USE EXIT.

<u>IF SLIDE/RAFT DEPLOYS BUT DOES NOT INFLATE</u>

RED MANUAL INFLATION HANDLE - PULL

<u>IF SLIDE STILL DOES NOT INFLATE</u>

DO NOT USE EXIT.

DITCHING DRILL

SPECIAL FLIGHTS (E.G. TRAINING/DELIVERY)
Forward Cabin in use only. Maximum number on board - 16. Senior Cabin Crew Member Fwd. LH door.

1. Acknowledge.
2. Full cabin lighting.
3. Brief passengers and prepare cabin
4. Loosen Tie and Collar
5. Fit Lifejacket
6. Galley Equipment Off
7. Select and brief passengers to assist
8. Cabin Dividers 'OPEN'
9. Doorways Clear
10. Passenger and Cabin Preparation Complete
11. Lighting Controls to 'DIM'.
12. Check Emergency Lights 'ON'
13. Report to Captain "All preparations complete"
14. Adopt landing postion.

AFTER DITCHING

CHECK AVENUE OF ESCAPE IS SATISFACTORY

DOOR USABLE

1. Check emergency lights 'ON'.
2. Open door.
3. Attach mooring line.
4. Convert slide to raft.
5. Launch raft by detach handle.
6. Control Evacuation.
7. Check cabin area clear.
8. Command a liferaft.

DOOR NOT IN USE

1. Check emergency lights 'ON'.
2. Guard door.
3. Direct passengers to centre doorways.
4. Open door.
5. Attach mooring line.
6. Convert slide to raft.
7. Launch raft by detach handle.
8. Control evacuation.
9. Check cabin clear.
10. Leave by any door.
11. Command a liferaft.

LIST OF CONTENTS

ABNORMAL PROCEDURES

POWER PLANT

(Unchanged)

LIST OF CONTENTS

"ABNORMAL PROCEDURES"

FUEL SYSTEM

FLIGHT CONTROLS

HYDRAULIC POWER

NAVIGATION SYSTEM

LIST OF CONTENTS

ABNORMAL PROCEDURES

LIST OF CONTENTS

ABNORMAL PROCEDURES

AIR CONDITIONG

OXYGEN

ICE AND RAIN PROTECTION

FIRE PROTECTION

MISCELLANEOUS

(Unchanged)

POWER PLANT

PRECAUTIONARY ENGINE SHUT DOWN

Engine shut down in flight required

AUTO THROTTLE MASTER .... OFF E

Verify AUTO THROTTLE MASTER switch of affected engine off.

The AUTO THROTTLE MASTER switch is set to OFF isolating the associated engine from the auto throttle system thereby preventing total auto throttle system disconnect when the throttle lever of the engine to be shut down is retarded.

THROTTLE .... IDLE C

HP VALVE ....SHUT E

As the engine is shut down it will cause the following warnings:
HYDRAULIC LOW PRESS light (amber) on accompanied by a master warning system HYD LIGHT (amber) on and an audio (gong), when the aircraft speed is subsonic.
GEN light (amber) on accompanied by a master warning system ELEC light (amber) on and an audio (gong), when the aircraft speed is less than M = 1.10.
The N1 SIG light (amber) on accompanied by a master warning system INT light (amber) on and audio (gong) may come on when aircraft speed is subsonic.

ADJACENT ENGINE THROTTLE MASTER ....MAIN E

Verify the adjacent engine THROTTLE MASTER selector is at MAIN since the T1 probe of an engine supplies temperature information to the MAIN throttle control system of its own engine and the ALTERN throttle control system of the adjacent engine. Therefore to ensure following an engine shut down, that the adjacent engine throttle control system is receiving correct temperature information, the MAIN system should be selected.

GENERATOR ....OFF E

Set the associated generator selector to OFF to prevent slight power interrupts. Normally when an engine is shut down under subsonic or ground conditions the respective generator will trip on underspeed and no power interrupt occurs on the aircraft supply. Following engine shut down at supersonic speeds the engine windmill speeds are sufficient to maintain the generator on line. As the aircraft speed is reduced a condition occurs at approximately M = 1.10 when the input speed to the CSD is below that which will maintain correct load sharing under parallel operating conditions but above the underspeed trip threshold. In this condition the respective BTB is tripped by the real load deficit protection and its load is now supplied by the windmilling engine generator, without assistance from the parallel system. The generator is tripped in this condition due to underspeed but since the system has been un-paralleled a busbar power interrupt occurs before the dead busbar is connected to the parallel system.

REHEAT .... OFF E

Verify the reheat selectors OFF.

SPEED ....SUBSONIC C

Reduce aircraft speed to subsonic using normal engine throttling technique during descent at 325 kt.

SYSTEM FAILURE PROCEDURES ....APPLY E

Apply Procedures to deal with system failures.

When an engine is shut down due to vibration a subsonic speed should be chosen that will meet the overriding objective of the aircraft reaching its destination or diversion airfield, provide as low a front vibration level on the engine as possible and provide as low a windmilling speed as possible.

END//

THROT LIGHT ON

CAUTION
WITH REVERSE THRUST SELECTED DO NOT CANCEL REVERSE UNTIL THE THROT LIGHT IS OFF OR THE ENGINE HAS BEEN SHUT DOWN.

With reverse thrust selected, do not attempt to cancel reverse until the THROT light (red) has been extinguished or the engine has been shut down. This is to prevent secondary nozzle bucket movement with uncontrollable high engine power.

THROTTLE MASTER ....OTHER LANE E

Setting the THROTTLE MASTER selector to the opposite selection MAIN or ALTERN will extinguish the THROT light if the selected system is serviceable.

IF THROT LT REMAINS ON
APPLY PROCEDURE:PRECAUTIONARY ENGINE SHUT DOWN

If the THROT light is not extinguished by moving the THROTTLE MASTER selector to the opposite selection during use of reverse thrust, set HP VALVE switch to SHUT and during use of forward thrust APPLY PROCEDURE PRECAUTIONARY ENGINE SHUTDOWN.

With both electrical throttle control systems failed, the engine is shut down to prevent engine surge due to uncontrolled primary nozzle movements.

ENGINE FLAME OUT

An engine flame out is indicated by a large fall in EGT followed by a reduction of N2 and N1.

The auto ignition system should relight the engine without any crew action. Should the N2 fall below 75% the engine must be regarded as flamed out.

● ▶ IF HP VALVE MI READS SHUT
APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUTDOWN

The HP VALVE MI reading SHUT with the HP VALVE switch at OPEN may indicate that the LP shaft failure device has operated. Once the engine has shut itself down by this means it cannot be restarted.

● ▶ IF HP VALVE MI READS OPEN

THROTTLE MASTER ....OTHER LANE .... E
Select throttle master to the other lane.

Electrical power interruptions may cause malfunction of a Throttle Control Unit without causing an automatic lane change or illumination of the THROT light. This malfunction can result in an engine run down or possible flame-out.

APPLY PROCEDURE: ENGINE IN-FLIGHT START

(Unchanged)

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AUTO IGNITION RELIGHT

When a flame out is detected by the engine control system with auto ignition selected on, an immediate relight attempt will take place. Operation of the auto ignition system is indicated by the LH IGN, RH IGN and START PUMP lights being on.
During relight attempt monitor the EGT and N2 until power is restored to throttle lever position then check START PUMP light is off

IF START PUMP LT ON
START PUMP C/B .... TRIP E

CIRCUIT BREAKER	PANEL	GRID REF.
ENG 1 START PUMP SUP	1-213	J6
ENG 2 START PUMP SUP	1-213	K6
ENG 3 START PUMP SUP	1-213	L6
ENG 4 START PUMP SUP	1-213	M6

CAUTION
WITH AN INOPERATIVE START PUMP, AUTO AND MANUAL RELIGHT WILL NOT BE POSSIBLE.

It is permitted to leave the start pump running but an inspection of the HP and LP turbines must be made on landing.

DURING RELIGHT

IF N2 FALLS BELOW 75% OR EGT RISES WITH A STEADY OR FALLING N2

HP VALVE .... SHUT E
AUTO IGNITION sw .... OFF E

Set the associated AUTO IGNITION switch to OFF to prevent interaction between auto relight system and manual relight attempts.

APPLY PROCEDURE : ENGINE IN FLIGHT START

ENGINE IN FLIGHT START

THROTTLE .... IDLE C

The throttle is retarded since the manual relight system is inhibited with it away from idle.

HP VALVE .... SHUT E

Set the HP VALVE to SHUT to prevent flooding the engine with fuel.

AUTO IGNITION .... OFF E

Set the AUTO IGNITION switch to OFF to prevent interaction between auto ignition system and attempt at manual relighting.

ENGINE FEED PUMPS .... ON E

Verify ENGINE FEED PUMPS of engines to be started are switched ON and scan FUEL MANAGEMENT PANEL to ensure correct engine fuel feed.

START RELIGHT sel .... RELIGHT E

Set the START RELIGHT selectors to RELIGHT in preparation for relight of engines.

30 SEC AFTER CLOSURE OF HP VALVE

30 secs is the minimum time to allow for drainage of fuel from engine.

HP VALVE .... OPEN E

Set the HP VALVE switch to OPEN to initiate the relight, this being indicated by a rising EGT. The rise in EGT should take place within 20 secs of opening the HP VALVE.

IF THE ENGINE FAILS TO RELIGHT IN 20 SEC

HP VALVE .... SHUT E

Set HP VALVE switch to SHUT to stop the engine from flooding with fuel.

Allow engine to drain and continue with relight attempts.

30 secs is the minimum drainage time required after HP VALVE closure for the first relight attempt.
If circumstances permit and further relight attempts are required allow a drainage time of 1 minute between each attempt.

contd.

POWER PLANT

ATTEMPT FURTHER RELIGHT AT LOWER
ALTITUDE OR HIGHER SPEED
(SEE RELIGHT ENVELOPE)

WHEN THE ENGINE IS STABILISED
START RELIGHT sel .... OFF E

When the N2 stabilises at the prevailing idle, set the START RELIGHT selector to OFF.

START PUMP LT .... OFF E

Setting the START RELIGHT selector to OFF switches off the start pump and ignition, this being indicated by the START PUMP light and IGN light being OFF.
If the START PUMP light is on trip associated circuit breaker.

CIRCUIT BREAKER	PANEL	GRID REF
ENG 1 START PUMP SUP	1-213	J6
ENG 2 START PUMP SUP	1-213	K6
ENG 3 START PUMP SUP	1-213	L6
ENG 4 START PUMP SUP	1-213	M6

CAUTION
WITH AN INOPERATIVE START PUMP, AUTO AND NORMAL RELIGHTS WILL NOT BE POSSIBLE.

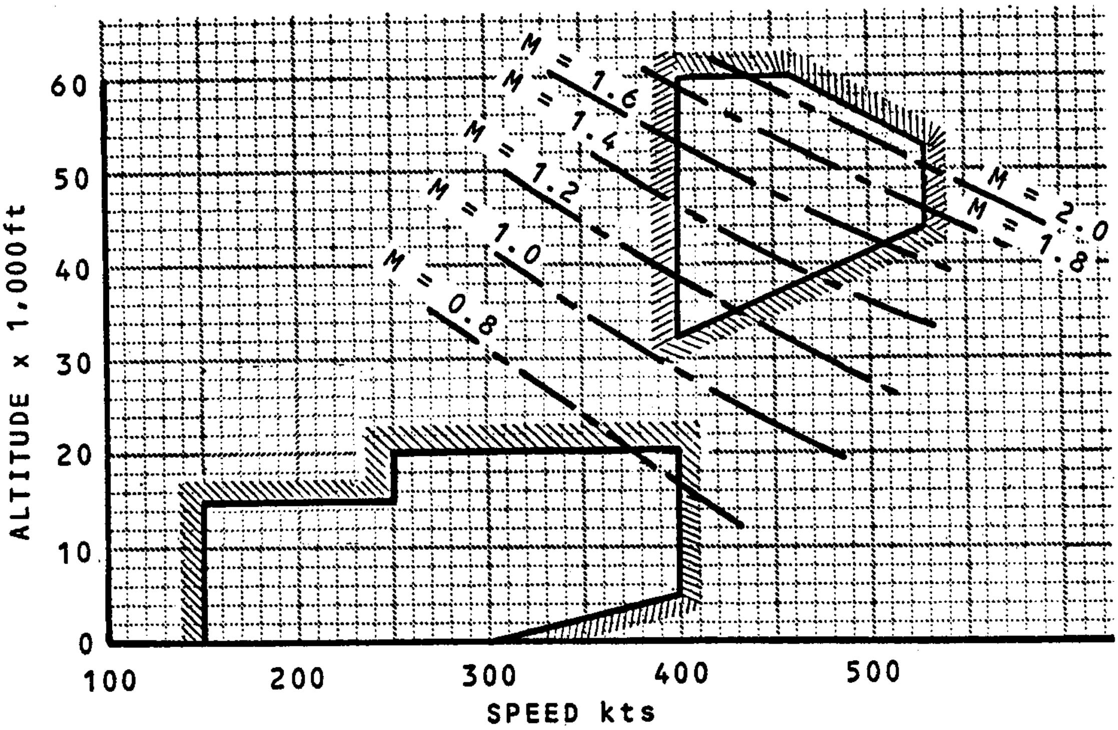
It is permitted to leave the start pump running but an inspection of the HP and LP turbines must be made on landing.

SYSTEMS .... RE-ESTABLISH E

Re-establish the status of systems affected by relight.

END//

POWER PLANT



RELIGHT ENVELOPE

NOTE: Relights may be attempted outside the envelope but may not be successful

The best area for relight attempts outside the envelope is within 375-400 kt at altitudes below 45000 ft.

ENGINE HIGH OIL TEMP LIGHT ON

Observe the fuel temperature on the FUEL TEMP instrument of the secondary instrument panel.
It is a characteristic of engine oil and fuel system design that excessive temperature within one system can interact on the other.

WITH FUEL TEMPERATURE LESS THAN 70°C
ENGINE RECIRCULATION VALVE .... OPEN E

Set the ENGINE RECIRCULATION VALVE switch to OPEN to increase the fuel flow across the oil cooler.

If the high fuel temperature was caused by a malfunction other than a fuel heater failure, the opening of the recirculation valve is the only direct means of attempting to keep the temperature within limits, however if this is done at High Mach numbers, the characteristics of the aircraft fuel system are such that the benefits of opening the valve are only effective for a limited period of time. To minimise the possibility of arriving at an engine shut down situation therefore, it is preferable to initiate the deceleration/descent at the same time as the valve is opened.

During the deceleration/descent the associated engine RECIRCULATION VALVE will normally be selected OPEN. If other system failures require the valves to be selected shut, the SHUT selection is to have priority.

SPEED .... SUBSONIC C

Reduce speed using normal descent technique.

OIL TEMP .... MONITOR E

Monitor oil temperature.

IF OIL TEMPERATURE STABILIZING AT LESS THAN 190°C
SPEED .... SUBSONIC C

Continue operation at subsonic speed

END//

contd.

IF OIL TEMPERATURE GREATER THAN 195°C OR REMAINS ABOVE 190°C FOR 5 MINS

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUTDOWN

WITH FUEL TEMPERATURE GREATER THAN 70°C

FUEL HEATER .... OFF E

Set associated engine FUEL HEATERS switch OFF

Inadvertent operation of the FUEL HEATERS will cause an increase in oil and fuel temperature, possibly to the extent of causing excessive temperature warnings. The response rate of oil temperature to corrective action is relatively slow. With the high oil temperature warning set at 180°C and the maximum continuous limit 190°C a short period of time can elapse after switching off the fuel heater to observe tendency in oil temperature before maximum limit is reached.

OIL TEMP .... MONITOR E

Monitor oil temperature.

IF OIL TEMPERATURE STABILIZING AT LESS THAN 190°C

CONTINUE WITH NORMAL FLIGHT

END//

IF OIL TEMPERATURE RISING TOWARDS LIMITING VALUES

ENGINE RECIRCULATION VALVE .... OPEN E

Set the associated ENGINE RECIRCULATION VALVE switch to OPEN to increase the fuel flow across the oil cooler.

If the high fuel temperature was caused by a malfunction other than a fuel heater failure, the opening of the recirculation valve is the only direct means of attempting to keep the temperature within limits, however if this is done at High Mach numbers, the characteristics of the aircraft fuel system are such that the benefits of opening the valve are only effective for a limited period of time. To minimise the possibility of arriving at an engine shut down situation therefore, it is preferable to initiate the deceleration/descent at the same time as the valve is opened.

(Deletion)

During the deceleration/descent the associated engine RECIRCULATION VALVE will normally be selected OPEN. If other system failures require the valves to be selected shut, the shut selection is to be priority.

SPEED ....SUBSONIC C

Reduce speed using normal descent technique

OIL TEMP ....MONITOR E

Monitor oil temperature

IF OIL TEMPERATURE STABILIZING AT LESS THAN 190°C

SPEED .... **SUBSONIC** **C**

Continue operation at subsonic speed

END//

IF OIL TEMPERATURE GREATER THAN 195°C OR REMAINS ABOVE 190°C FOR 5 MINS

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUTDOWN

(Deletion)

REHEAT LIGHT ON

(Reheat not in use)

Observe the FUEL flow instrument flag.

WITH FUEL FLOW FLAG SHOWING FE

The FUEL flow flag showing FE indicates the fuel flow to the reheat system (reheat not in use) is at an acceptable level.

CONTINUE WITH NORMAL FLIGHT

END//

WITH FUEL FLOW FLAG SHOWING FT

The FUEL flow flag showing FT indicates the fuel flow to the the reheat system (reheat not in use) is above an acceptable level.

AUTO THROTTLE MASTER .... OFF E

The AUTO THROTTLE MASTER switch is set to off isolating the associated engine from the auto throttle system thereby preventing total auto throttle system disconnect when the throttle lever of the engine to be shut down is retarded.

THROTTLE .... IDLE C

HP VALVE .... SHUT E

As the engine is shut down it will cause the following warnings:
HYDRAULIC LOW PRESS light (amber) on accompanied by an MWS HYD (amber), when the aircraft speed is subsonic.
GEN light (amber) on accompanied by an MWS ELEC (amber), when the aircraft speed is less than M = 1.10.
The N1 SIG light (amber) on accompanied by an MWS INT (amber) may come on when aircraft speed is subsonic.

ADJACENT ENGINE THROTTLE MASTER .... MAIN E

Verify the adjacent engine THROTTLE MASTER selector is at MAIN since the T1 probe of an engine, supplies temperature information to the MAIN throttle control system of its own engine and the ALTERN throttle control syster of the adjacent engine. Therefore to ensure following an engine shut down, that the adjacent engine throttle control system is receiving correct temperature information, the MAIN system should be selected.

GENERATOR .... OFF E

Set the associated generator selector to OFF to prevent slight power interrupts. Normally when an engine is shut down under subsonic or ground conditions the respective generator will trip on underspeed and no power interrupt occurs on the aircraft supply. Following engine shut down at supersonic speeds the engine windmill speeds are sufficient to maintain the generator on line. As the aircraft speed is reduced a condition occurs at approximately M = 1.05 when the input speed to the CSD is below that which will maintain correct load sharing under parallel operating conditions but above the underspeed trip threshold. In this condition the respective BTB is tripped by the real load deficit protection and its load is now supplied by the windmilling engine generator, without assistance from the parallel system. The generator is tripped in this condition due to underspeed but since the system has been un-paralleled a busbar power interrupt occurs before the dead busbar is connected to the parallel system.

LP VALVE ....SHUT E

Set LP VALVE selector for engine shut down to SHUT to stop fuel flow to reheat system.

The engine FUEL FLOW instrument flag showing FT indicates fuel is still being supplied to the reheat system because reheat fuel supply is not affected by HP VALVE closure.

CSD .... DISC E

Unguard and set CSD switch to DISC to prevent over-heating of the CSD oil due to loss of cooling fuel flow across CSD oil cooler.

Reset of the CSD is only possible on the ground with the engine stopped.

COND VALVE ....OFF E

Set associated COND VALVE selector to OFF.

Do not use the air conditioning group of the engine with LP VALVE shut since closure of the LP VALVE prevents cooling fuel flow across heat exchanger of associated air conditioning group.

SPEED .... SUBSONIC C

Reduce speed using normal descent technique.

SYSTEM FAILURE PROCEDURES .... APPLY E

POWER PLANT

Apply Procedures to deal with system failures.

The REHEAT light on (reheat not in use) procedure is intended to cover the case where a fault has developed allowing a fuel flow above an acceptable level in the reheat system.

END//

REHEAT FAILS TO CANCEL

This procedure is intended to cover the failure of reheat to cancel immediately after use and should not be confused with REHEAT LIGHT ON procedure.

IF FUEL FLOW DOES NOT REDUCE

A reduction of FUEL flow and AREA is an indication of reheat cancellation.

REHEAT SYSTEM AC C/Bs .... TRIP E

AC CIRCUIT BREAKERS

CIRCUIT BREAKER	PANEL	GRID REF
ENG 1 REHEAT AMP SUP	14-215	C12
ENG 2 REHEAT AMP SUP	13-215	B14
ENG 3 REHEAT AMP SUP	13-216	B 7
ENG 4 REHEAT AMP SUP	14-216	D 7

Two reheats are the minimum required for transonic acceleration: however due note must be taken of additional fuel usage with one or two reheats failed.

END//

(Unchanged)

EGT INSTRUMENT LIGHT ON

THROTTLE MASTER ....OTHER LANE E

Set the THROTTLE MASTER selector to the other selection, MAIN or ALTERN observing the EGT light goes OFF, to enable the selected engine control rating to be temperature limited because EGT information is supplied directly to the selected throttle control system.

IF THE EGT INSTRUMENT LT REMAINS ON

EGT and N2 ....MAINTAIN WITHIN LIMITS E

Continued engine operation is permitted but the N2 and EGT must be monitored and if necessary the engine manually controlled to observe the limitations. The engine handling ability may be impaired and careful handling is recommended.

With the EGT instrument light on the manual N2 limiter datums of the affected engine control system are automatically depressed 0.5%. This should prevent infringement of the EGT lmitations.

CAUTION
IF THE EGT INSTRUMENT LIGHT IS ON AND THE EGT INDICATION HAS FAILED AND N2 FALLS BELOW 70% RETARD THROTTLE LEVER TO IDLE AND LEAVE AT IDLE.

DO NOT USE REVERSE THRUST ON ASSOCIATED ENGINE

ENGINE RELIGHT ATTEMPTS WITH THE EGT INSTRUMENT LIGHT ON ARE ONLY PERMITTED IF THE ASSOCIATED EGT INDICATOR IS WORKING SATISFACTORILY.

END//

INTAKE HYD LIGHT ON

AFFECTED INTAKE .... YELLOW E

Set the HYD selector for the affected intake to YELLOW to confirm the automatic changeover of hydraulic supplies and observe the HYD light is OFF.

IF INTAKE HYD LT REMAINS ON

The intake HYD light remaining on after YELLOW selection indicates operation of yellow tank second low level switch which cuts off hydraulic supplies to the spill system, except when the RAMP/SPILL MASTERS is at MAN.

Before the RAMP/SPILL master switch is selected to MAN, the ramps remain operative with a restricted range for slow throttle movements.

RAMP/SPILL MASTER .... MAN E

Setting the RAMP/SPILL MASTER switch to MAN enables the intake surfaces to be inched and removes all warnings from the intake panel except the INTAKE light.

APPLY PROCEDURE: INTAKE LIGHT ON

(Unchanged)

INTAKE LIGHT ON

AIR INTAKE LANE rty sel .... A E

Rotate affected intake LANE rotary selector to non-auto A position, observe the INTAKE light is off.

IF INTAKE LT REMAINS ON
AIR INTAKE LANE rty sel .... B E

Rotate affected intake LANE rotary selector to non-auto B position, observe the INTAKE light is off.

The initial LANE reselection must not be attempted more than once per incident.

IF INTAKE LT REMAINS ON
RAMP SPILL MASTER .... MAN E

Setting the RAMP SPILL MASTER switch to MAN enables the intake surfaces to be inched.

Setting the RAMP SPILL MASTER switch to MAN removes all warnings from the intake panel except the INTAKE light.

IF NO ASSOCIATED MAIN SYSTEM LOW PRESSURE AND/OR LOW LEVEL WARNING

Check the serviceability of the main blue or green hydraulic system associated with intake with INTAKE light on.

AFFECTED INTAKE .... BLUE GREEN E

Set the HYD selector of affected intake to BLUE or GREEN to enable inching of intake surfaces.

REHEAT .... ALL OFF E

Verify the reheat selectors of all engines at OFF

IF SPEED GREATER THAN M = 1.50

SPEED ....REDUCE TO M = 1.50 C

Reduce aircraft speed to M = 1.50 by retarding throttle lever (s) for unaffected intake/engine(s) using normal throttling technique, and handling throttle lever(s) for affected intake/engine(s) to maintain INTAKE PRESSURE RATIO ERROR between the amber bands.

contd.

POWER PLANT

AFFECTED INTAKE/ENGINES .... MAINTAIN POINTER BETWEEN AMBER BANDS E

Following an intake control failure if the INTAKE PRESSURE RATIO ERROR instrument pointer lies in the left amber band the throttle lever must be retarded. If the pointer lies in the right amber band the throttle lever must be advanced. Correct intake-engine matching is indicated when pointer is between amber bands.

NOTE

Between M = 1.95 and M = 1.8, pointer movement with change in Mach number may be rapid, particular care should therefore be taken in making the necessary throttle adjustments in this region.

<u>IF SPEED IS AT OR LESS THAN M = 1.50</u>
AFFECTED INTAKE/ENGINE .... IDLE C

Retard throttle lever of affected intake/engine to idle.

SPEED .... SUBSONIC C

<u>AT M = 1.30</u>
RAMP .... 0% E

Inch the ramp for the affected intake to 0%

SPILL .... 0% E

Inch spill door for affected intake to 0%

<u>IF RAMP & SPILL DOORS AT 0%</u>
CONTINUE WITH NORMAL DESCENT

END//

<u>IF RAMP & SPILL DOORS NOT AT 0%</u>
AFFECTED INTAKE/ENGINE .... IDLE C

Leave the throttle lever of affected intake/engine at idle since high power settings with ramp and spill not at 0% may induce engine surge.

CAUTION

DO NOT USE REVERSE THRUST IN FLIGHT ON AFFECTED INTAKE/ENGINE.

AT M = 0.60
RAMP POSITION FOR AFFECTED
INTAKE/ENGINE .... OBSERVE E

IF RAMP POSITION GREATER THAN 50%
CONTINUE WITH NORMAL DESCENT
BUT KEEP AFFECTED INTAKE/ENGINE AT IDLE

END//

IF RAMP POSITION LESS THAN 50%
ENGINE CONTROL SCHEDULE .... LO E

Set ENGINE CONTROL SCHEDULE selector to LO observing the
ENGINE CONTROL SCHEDULE LO lights are ON

IF LO NOT OBTAINED
CONTINUE WITH NORMAL DESCENT BUT KEEP
AFFECTED INTAKE/ENGINE AT IDLE

END//

IF LO OBTAINED

AFFECTED INTAKE/ENGINE .... MOVE THROTTLE SLOWLY C

END//

CAUTION
ON LANDING IF RAMP POSITION GREATER THAN
20% LIMIT REVERSE THRUST TO REVERSE IDLE
ON AFFECTED INTAKE/ENGINE. IF RAMP POSITION
WITHIN RANGE 0 - 20% NORMAL REVERSE THRUST
MAY BE USED.

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POWER PLANT

AUX INLET MI FAILS TO READ OPEN

● ▶ SPEED IS GREATER THAN 200 KT
CONTINUE NORMAL FLIGHT

CONTINUE//

● ▶ SPEED IS LESS THAN 200 KT

N2 .... REDUCE TO LESS THAN 85% C

Set the affected engine throttle lever to 85% N2 and use only the remaining throttles for thrust changes until reverse is selected after landing

At aircraft speeds of less than 200 kt the airflow to the engine will be affected should maximum power be selected with the intake auxiliary inlet shut.

The above N2% rpm limit is applicable to forward thrust configuration only.

END //

INTAKE INCIDENCE SIGNAL FAILURE LIGHT ON

INTAKE ....IDENTIFY E

Identify affected intake(s) by reference to MWS INT lights.

As the alpha light may be on for failure of the incidence signal to any intake, the Master Warning System INT light(s) (amber) is/are the only positive indication of the affected intake(s).

LANE ....OTHER AUTO POSITION E

Rotate the LANE rotary selector of the affected intakes to the other AUTO position
Observe the α light

IF α FAILURE LIGHT REMAINS ON

MAINTAIN 1g INCIDENCE WHEN SPEED IS GREATER THAN M = 1.80 WHEREVER POSSIBLE

END//

POWER PLANT

INTAKE N1 SIG AND/OR LANE LIGHT ON

LANE ....NON AUTO POSITION TO AGREE WITH LANE IN USE LT E

Rotate the LANE rotary selector of the affected intake to the non-auto position that agrees with the lane in use light (green) that is on.

The N1 SIG light is always accompanied by a LANE light.

IF N1 SIG LT REMAINS ON

MAINTAIN FIXED THROTTLE LEVER ANGLE ON AFFECTED ENGINE WHEN SPEED IS GREATER THAN M = 1.80 WHEREVER POSSIBLE.

END//

IF LANE AND N1 SIG LTS OFF

LANE ....AUTO POSITION TO AGREE WITH LANE IN USE LT E

Rotate the LANE rotary selector of the affected intake to auto position which agrees with the lane in use light (green) so that in the event of a subsequent more serious lane failure the first lane will be automatically re-selected.

If both the minor failures Alpha and N1 signal occur on the same intake the lane with the Alpha failure should be selected since it is the least limiting of the failures.

END//

N1 REDUCE LIGHT ON

N1 Reduce light on continuously

THROTTLE MASTER .... OTHER LANE E

Set THROTTLE MASTER selector of associated engine to opposite selection, MAIN or ALTERN.

IF N1 REDUCE LT REMAINS ON
INTAKE .... OTHER AUTO POSITION E

Rotate the associated AIR INTAKE LANE rotary selector to the other AUTO position

IF N1 REDUCE LT REMAINS ON
SPEED .... DO NOT EXCEED M = 1.95 C

Do not exceed M = 1.95 with the N1 Reduce light on since the affected intake is operating supercritically and the propulsion unit is not operating at optimum efficiency.

END//

POWER PLANT

FUEL FILTER LIGHT ON

CAUTION
WITH THE FUEL FILTER LIGHT ON A LOSS OF ENGINE POWER MAY OCCUR.

ENGINE RECIRCULATION VALVE ....SHUT E

Verify associated ENGINE RECIRCULATION VALVE switch at SHUT to ensure that the possibly restricted flow across the fuel filter is available for engine use.

ENGINE FUEL TEMPERATURE ....OBSERVE E

Observe the FUEL TEMP instrument reading of affected engine on secondary instrument panel.

<u>IF ENGINE FUEL TEMPERATURE ABOVE +70° C</u>
CONTINUE WITH NORMAL FLIGHT

END//

<u>IF ENGINE FUEL TEMPERATURE BELOW +70°C</u>
FUEL HEATER ....ON E

Set the FUEL HEATER selector to ON since with a fuel temperature of less than plus 70°C in the burner manifold a fuel temperature of less than plus 5°C may exist at the fuel filter. At this temperature ice crystals may form in the fuel, causing clogging of the filter giving rise to high differential pressure.

<u>WHEN ENGINE FUEL TEMPERATURE ABOVE +70°C</u>
FUEL HEATER ....OFF E
ENGINE FUEL TEMPERATURE .... MONITOR E

END//

ENGINE INLET LOW PRESS LIGHT ON

ENGINE FEED PUMPS ....ON E

Verify affected ENGINE FEED PUMPS switches at ON

ENGINE RECIRCULATION VALVE ....SHUT E

Verify affected ENGINE RECIRCULATION VALVES switch at SHUT observing the engine LOW PRESS light goes off.

Shutting the ENGINE RECIRCULATION VALVE ensures that the maximum available flow from the engine feed pumps is directed to the engine.

<u>IF ENGINE INLET LOW PRESS LT ON</u>

No further action unless accompanied by another warning

END//

HIGH FUEL TEMP LIGHT ON

ENGINE FUEL HEATER .... OFF E

Set associated FUEL HEATERS selector to OFF, since in the event of the high temperature in the fuel system being caused by an inadvertent operation of the fuel heater, Setting the FUEL HEATERS selectors to OFF should reduce the fuel temperature immediately.

ENGINE FUEL TEMPERATURE .... OBSERVE E

Monitor FUEL TEMP instrument reading on secondary instrument panel

IF ENGINE FUEL TEMPERATURE REDUCING

CONTINUE WITH NORMAL FLIGHT

END//

IF ENGINE FUEL TEMPERATURE INCREASING

ENGINE RECIRCULATION VALVE ....OPEN E

If the high fuel temperature is caused by a malfunction other than a fuel heater failure, the opening of the recirculation valve is the only direct means of attempting to keep the temperature within limits. However, if this is done at high Mach number the characteristics of the aircraft fuel system are such that the benefits of opening the valve are only effective for a limited period of time.

To minimise the possibility of arriving at an engine shut down situation therefore it is preferrable to initiate the deceleration/descent at the same time as the valve is opened.

During deceleration/descent the ENGINE RECIRCULATION VALVES will normally be selected OPEN, if any other system failure requires the valve to be selected SHUT the shut selection is to take priority.

SPEED .... SUBSONIC C

Reduce aircraft speed to subsonic using normal engine throttling technique during descent at 325 kt.

ENGINE FUEL TEMPERATURE .... MONITOR E

Monitor FUEL TEMP instrument reading on secondary instrument panel.

IF ENGINE FUEL TEMPERATURE LESS THAN 150° C

SPEED .... REMAIN SUBSONIC C

END//

IF ENGINE FUEL TEMPERATURE GREATER THAN 150°C FOR 2 MIN OR EXCEEEDS 170°C

APPLY PROCEDURE PRECAUTIONARY ENGINE SHUT DOWN

END//

ENGINE ANTI-ICING MALFUNCTION

IGV PRESS LT ON WITH ENGINE ANTI-ICING OFF

ENGINE ANTI-ICING sw ....CYCLE ON/OFF E

Set the ENGINE ANTI-ICING switch to ON then OFF in attempt to close the anti-icing air supply valve as the light on with switch at OFF indicates air pressure in the anti-icing supply duct.

IF IGV PRESS LT REMAINS ON

UNRESTRICTED ENGINE OPERATION PERMITTED BUT WITH TOTAL TEMPERATURE GREATER THAN 80°C and N2 GREATER THAN 96% DAMAGE MAY OCCUR TO THE No. 1 BEARING VIBRATION PICKUP CABLE.

END//

IGV PRESS LT OFF WITH ENGINE ANTI-ICING ON

IF THROTTLE AT IDLE

N2 ....INCREASE BY 10% E

Advance throttle lever of associated engine to increase N2 by approxiamtely 10% and check the IGV light comes on.

If the light comes on return throttle to idle as the system is functioning but at the idle setting there is insufficient pressure to put the light on.

IF IGV PRESS LT OFF WITH THROTTLE ABOVE IDLE

LEAVE ICING CONDITIONS

If the aircraft is on the ground consult MEL.

END//

NOZZLE LIGHT ON NOT ASSOCIATED WITH ADC FAILURE

(ENGINE CONTROL SCHEDULE rty sel AT NORMAL ABOVE M = 1.0)

The ENGINE CONTROL SCHEDULE lights are to be observed to establish correct schedule operation.

The correct ENGINE CONTROL SCHEDULE light indications are:

LO lights (green) on with the ENGINE CONTROL SCHEDULE rotary selector at NORMAL with the aircraft on the ground, or flying at speeds less than 220 kt or during reheat operation with the ENG RATING MODE switch at TAKE-OFF and the ENGINE CONTROL SCHEDULE selector at AUTO

LO lights (green) on with the ENGINE CONTROL SCHEDULE rotary selector at FLYOVER (F/O) with the aircraft on the ground or flying at speeds less than 220 kt or during reheat operation with the ENG RATING MODE switch at TAKE-OFF and the ENGINE CONTROL SCHEDULE selector at AUTO

MID lights (white) on with the ENGINE CONTROL SCHEDULE rotary selector at NORMAL with the aircraft speed greater than 220 kt, the ENG FLIGHT RATING switch at CLIMB or CRUISE the ENG RATING MODE switch at FLIGHT, reheat operating and the ENGINE CONTROL SCHEDULE selector at AUTO

MID lights (white) on with the ENGINE CONTROL SCHEDULE rotary selector at APPROACH (MID) and the ENGINE CONTROL SCHEDULE selector at AUTO

HI lights (white) on with the ENGINE CONTROL SCHEDULE rotary selector at NORMAL with the aircraft speed greater than 220 kt, reheat cancelled and the ENGINE CONTROL SCHEDULE selector at AUTO

HI lights (white) on with the ENGINE CONTROL SCHEDULE rotary selector at FLYOVER (F/O) with the aircraft speed greater than M = 1.0, reheat cancelled and the ENGINE CONTROL SCHEDULE selector at AUTO

F/O lights (white) on with the ENGINE CONTROL SCHEDULE rotary selector at FLYOVER (F/O) with the aircraft speed greater than 220 kt but less than M = 1.0, reheat cancelled and the ENGINE CONTROL SCHEDULE selector at AUTO

WITH ALL ENGINE CONTROL SCHEDULE LTS INDICATING CORRECT SCHEDULE OPERATION

N2,N1 AND EGT .... MONITOR DURING SUPERSONIC CRUISE E

During the use of cruise rating with the static temperature colder than -51 °C with the throttle levers fully advanced monitor the N2, N1 and EGT. Should it appear likely that the cruise rating limitations will be exceeded set the THROTTLE MASTER selector of the associated engine to the opposite selection, MAIN or ALTERN.

IF A SYMMETRIC PAIR OF ENGINES EXCEED OPERATING CRUISE RATINGS AT STATIC TEMPERATURES COLDER THAN -51°C

THROTTLE MASTERS .... OTHER LANE E

Set THROTTLE MASTER selector for affected engines to opposite selection, MAIN or ALTERN

A function failure of NASU automatically transfers control of the secondary nozzle buckets and high engine control schedule together with ASOV closure signal to the other NASU. The FLYOVER and approach schedules and the static temperature signal are still available from the NASU with the function failure.
A power supply failure to a NASU causes nozzle buckets, high schedule and ASOV signal to transfer but the flyover and approach schedules together with static temperature signal outputs are lost. Setting the throttle master selectors for affected engines to the opposite selection enables the flyover and approach schedules together with the static temperature outputs from the non-failed NASU to be utilized

END//

WITH A SYMMETRIC PAIR OF ENGINE CONTROL SCHEDULE LIGHTS INDICATING INCORRECT SCHEDULE OPERATION

THROTTLE MASTERS .... OTHER LANE E

Set THROTTLE MASTER selector for affected engines to opposite selection, MAIN or ALTERN

END//

(Unchanged)

WITH ALL ENGINE CONTROL SCHEDULE LIGHTS INDICATING INCORRECT SCHEDULE OPERATION

ENGINE CONTROL SCHEDULE ....ABOVE 220 KT HI
BELOW 220 KT LO E

The aircraft speed should be observed and if greater than 220 kt, set the ENGINE CONTROL SCHEDULE selector to HI. If aircraft speed less than 220 kt set the ENGINE CONTROL SCHEDULE selector to LO.

N2, N1 and EGT .... MONITOR DURING SUPERSONIC CRUISE E

A power supply failure to both NASUs loses all output from the NASUs, this causes the secondary nozzle bucket to drive to the fully open position and all engines to operate in the LO engine control schedule.

The loss of the static temperature signal to the ECU loses the static temperature correction of cruise rating limitations. Therefore, during the use of cruise rating or static temperatures colder than -51 C with throttle levers fully advanced, monitor N1, N2 and EGT. If it appears likely that they will exceed their cruise rating limitations retard the throttle levers of the associated engine(s).

IF ENGINES EXCEED OPERATING CRUISE RATINGS WHEN CRUISING AT STATIC TEMPERATURES COLDER THAN -51 C

THROTTLES ....RETARD TO OBSERVE CRUISE RATINGS E

END//

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ENGLISH VIBRATION AMBER WARNING LIGHT ON

For affected engines observe vibration levels with FRONT then REAR selected.

FRONT VIBRATION WARNINGS

Observe the engine instruments and general aircraft vibration in an attempt to establish validity of the warning.

IF ENGINE MALFUNCTION OR GENERAL AIRCRAFT VIBRATION OBSERVED

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUTDOWN

IF NO EVIDENCE OF ENGINE MALFUNCTION

N2 .... REDUCE BY 10% E

Retard the associated engine throttle lever to reduce N2 by at least 10%.
Observe the FRONT vibration level to see if retarding the throttle lever has reduced the vibration level.

IF INDICATED VIBRATION LEVEL DOES NOT REDUCE WITH N2

RETURN TO NORMAL ENGINE HANDLING .... E

If the indicated vibration level does not reduce as the N2 is reduced, or the vibration level is fluctuating erratically, and there is no other evidence of vibration, the warning may be considered false.

END//

IF INDICATED VIBRATION LEVEL REDUCES WITH N2

N2 .... ADJUST UNTIL VIBRATION BELOW 5 E

Adjust throttle lever of the affected engine until indicated vibration level, with FRONT selected is less than 5 ins/sec, then cancel the warning.
The engine may be operated manually so as not to exceed a vibration level of 5 ins/sec.

(Completely Revised)

POWER PLANT

IF INDICATED VIBRATION GREATER THAN 5 INS/SEC WITH THROTTLE AT IDLE

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUTDOWN

NOTE
All vibration warnings greater than 10 INS/SEC should be logged.

REAR VIBRATION LEVEL GREATER THAN 4 INS/SEC

NOTE
Do not action rear vibration warnings during take-off, but the warnings should be logged.

REHEAT .... OFF E

Verify affected engine RHT selector at OFF.

Two reheats are the minimum requirement for transonic acceleration, however, due note must be taken of additional fuel usage with one or two reheats failed.

With reheat on, a shock wave pattern within the jet pipe will be the cause of the vibration.

REAR vibration levels greater than 4 INS/SEC when reheat is not in use should be reported.

VIBRATION WARNING .... RESET E

END//

(Completely Revised)

CONTINUOUS ENGINE SURGE ABOVE M = 1.3

CAUTION
IF AT ANY TIME DURING SURGE AN UNUSUALLY RAPID RISE IN EGT OCCURS IMMEDIATELY SHUT DOWN THE ENGINE.

ATTITUDE MAINTAIN

If the auto-pilot or flight director is in use, engage PITCH HOLD mode immediately before throttling to prevent large pitch changes occuring when the throttles are retarded

THROTTLES .... IDLE C

The throttle levers should be retarded to idle consistent with passenger comfort and the need to reduce power very quickly.

During the throttling of the engine to idle at speeds greater than M = 1.60 the action of throttling may induce a mild 'pop' surge, this slight surge may be disregarded providing they are not accompanied by unusual engine instrument readings or engine failure indications.

THROTTLE MASTERS .... ALL OTHER LANE E

Set all THROTTLE MASTER selectors to the opposite selection MAIN or ALTERN.

FWD FUEL TRANS sw .... O/RIDE C

Unguard and set the FUEL FWD TRANS switch to O/RIDE.

The forward transfer of fuel is a precautionary measure linked to the reduction in engine power and thereby speed. Careful monitoring of the transfer operation is required and it should be terminated at any time the circumstances demand.

AIR INTAKES .... ALL OTHER LANE E

Rotate all AIR INTAKE LANE rotary selectors to the other AUTO position.

INTAKE HYDRAULICS .... ALL YELLOW E

Set all intake HYD selectors to YELLOW.

Selecting the opposite AUTO selections on the Intake lanes and Hydraulics, together with the throttles, is an attempt to stop the surge, which, may have been induced by an undetected fault in one of the selections.

REHEAT .... ALL OFF E

Verify all the reheat selectors at OFF.

The retarding of the throttles will have cancelled reheat, putting the selectors to OFF ensures that reheat will not be inadvertently re-activated when the throttle lever is advanced.
Putting the selectors of the non-surging engines to OFF ensures reheat fuel is not used until surge situation is resolved.

IF SURGING CONTINUES
ENGINE CONTROL SCHEDULE .... LO E

Set the associated ENGINE CONTROL SCHEDULE selector to LO to reduce the engines demand for air.

ENGINES .... IDENTIFY E

Identify the surging engine(s) by reference to the PRESSURE RATIO ERROR instrument and the EGT instrument.

At high supersonic speeds, an engine surge will induce a surge of the other engine in the same nacelle, therefore positive identification is difficult, the fluctuating ENGINE PRESSURE RATIO and/or rising EGT will assist in identification, but should there be doubt apply corrective action to both engines.

RAMP .... INCH TO 70% E

Set the RAMP/SPILL MASTER switch(es) to MAN and inch the ramp(s) to 70%.

SPILL .... INCH TO 50% E

Inch the spill door(s) to 50%

A ramp position of 70% and a spill door position of 50% is the best intake configuration at high supersonic speeds with the throttle at idle.

IF SURGING CONTINUES

HP VALVE ....SHUT E

As the engine is shut down it will cause the following warnings:
HYDRAULIC LOW PRESS light (amber) on accompanied by a MWS HYD when the aircraft speed is subsonic.
GEN light (amber) on accompanied by a MWS ELEC (amber), when the aircraft speed is less than M = 1.10.
The N1 SIG light (amber) on accompanied by a MWS INT (amber). may come on when aircraft speed is subsonic.

(Unchanged)

POWER PLANT

ADJACENT ENGINE THROTTLE MASTER .... MAIN E

Verify the adjacent engine THROTTLE MASTER selector is at MAIN since the T1 probe of an engine supplies temperature information to the MAIN throttle control system of its own engine and the ALTERN throttle control system of the adjacent engine. Therefore to ensure following an engine shut down, that the adjacent engine throttle control system is receiving correct temperature information, the MAIN system should be selected.

AUTO THROTTLE MASTER .... OFF E

Verify AUTO THROTTLE MASTER switch of affected engine off.

The AUTO THROTTLE MASTER switch is set to OFF isolating the associated engine from the auto throttle system.

RAMP ....INCH TO 100% E

Inch the ramp to 100%

SPILL .... INCH TO 100% E

Inch the spill door to 100%

The ramp at 100% and the spill door at 100% is the best intake configuration at supersonic speeds for the shut down engine.

END//

IF SURGE STOPS AFTER INITIAL ACTIONS

ADVANCE THROTTLES SINGLY. IF NO SURGE OCCURS RETURN TO FLIGHT PLAN.

SHOULD SURGE OCCCUR DURING THROTTLE ADVANCE, RETURN THROTTLE TO IDLE, REDUCE SPEED TO SUBSONIC. WHEN SPEED LESS THAN M = 1.30 ADVANCE THROTTLE. IF SURGE OCCURS VERIFY RAMP AT 0%, SPILL AT 0%. USE HIGHEST SURGE FREE POWER AVAILABLE.
END//

IF SURGE STOPS AFTER 70% RAMP AND 50% SPILL OBTAINED

REDUCE SPEED TO SUBSONIC. WHEN SPEED LESS THAN M = 1.30 INCH RAMP TO 0% AND SPILL TO 0%. RETURN ENGINE CONTROL SCHEDULE SELECTOR BACK TO AUTO. CONTINUE FLIGHT AT SUBSONIC SPEED USING THROTTLE AS REQUIRED.

END//

IF ENGINE SHUT DOWN

REDUCE SPEED TO SUBSONIC. WHEN SPEED M = 1.30 INCH RAMP TO 0% AND SPILL TO 0% RETURN ENGINE CONTROL SCHEDULE SELECTOR TO AUTO. RELIGHT ENGINE.
IF SURGE OCCURS WHEN ADVANCING THROTTLE AFTER ENGINE RELIGHT USE HIGHEST SURGE FREE POWER AVAILABLE.

END//

CONTINUOUS ENGINE SURGE AT OR BELOW M = 1.3

CAUTION
IF AT ANY TIME DURING SURGE AN UNUSUALLY RAPID RISE IN EGT OCCURS IMMEDIATELY SHUT DOWN THE ENGINE.

ENGINE .... IDENTIFY E

A rising EGT may assist in the identification of the surging engine

THROTTLE .... IDLE C

If safety considerations permit retard the throttle of surging engine to idle

THROTTLE MASTER .... OTHER LANE E

Set THROTTLE MASTER selector of surging engine to the opposite selection, MAIN or ALTERN.

AIR INTAKE .... OTHER LANE E

Set AIR INTAKE LANE rotary selector of surging engine/intake to other AUTO position.

INTAKE HYDRAULIC .... YELLOW E

Set the intake HYD selector of surging engine/intake to YELLOW

Selecting the other selections on the INTAKE lanes and Hydraulics, together with the throttles,is an attempt to stop the surge, which,may have been induced by an undetected fault in one of the selections.

REHEAT .... ALL OFF E

Verify all the reheat selectors at OFF.

The retarding of the throttle lever on the surging engine will have cancelled reheat, putting its selector to OFF ensures reheat will not be inadvertently re-activated when throttle lever is advanced.
Putting the selectors of the non-surging engines to OFF ensures reheat fuel is not used until surge situation is resolved.

IF SURGE CONTINUES
RAMP ....INCH TO 0% E

Inch the ramp of surging engine to 0%

SPILL .... INCH TO 0% E

Inch the spill door of surging engine to 0%

The ramp and spill position of 0% is the intake configuration for high power setting at speeds below M = 1.30.

IF SURGE CONTINUES
RAMP/SPILL MASTER .... AUTO E

The engine still surging when ramp and spill are set to 0% indicates the surging is not being maintained by intake geometry, therefore setting the RAMP/SPILL MASTER switch to AUTO enables the intake surfaces to be automatically positioned when engine is shut down.

APPLY PROCEDURE ; PRECAUTIONARY ENGINE SHUTDOWN

END//

IF SURGE OCCURS DURING THROTTLE ADVANCE AFTER CORRECTIVE ACTIONS, VERIFY RAMP AT 0%, SPILL AT 0%, USE HIGHEST SURGE FREE POWER AVAILABLE.

END//

ENGINE MALFUNCTION NOT ASSOCIATED WITH THROT LIGHT ON

This procedure is for use in the event of such failures as inadvertent increase or decrease of thrust, unstable running, primary nozzle malfunction, inadvertent operation of wind down system or auto ignition system.

THROTTLE MASTER .... OTHER LANE E

Set associated THROTTLE MASTER selector to the opposite selection, MAIN or ALTERN.

NOTE

If malfunction consisted of incorrect primary nozzle operation, and normal operation of nozzle was restored by lane change, monitor engine in case malfunction recurs.

If condition persists subsequent actions are dependent on the failure mode and are as follows:

● Inadvertent change of thrust or unstable running

THROTTLE .... IDLE C

Retard associated throttle lever to idle

IF engine stabilises at idle

Continued operation at idle is permitted, provided all other indications are normal.

END//

IF condition persists (inadvertent change of thrust or unstable running with throttle at idle)

Apply procedure:PRECAUTIONARY ENGINE SHUT DOWN

CAUTION

IN THE EVENT OF INADVERTENT INCREASE IN THRUST WITH REVERSE THRUST SELECTED, REVERSE THRUST SHOULD NOT BE CANCELLED UNTIL ENGINE SPEED HAS BEEN REDUCED TO IDLE OR THE ENGINE HAS BEEN SHUT DOWN.

contd.

Primary nozzle Malfunction

IF AREA indicates nozzle jammed at greater than 15% or has inadvertently moved to 84% or greater:

NOTE

Inadvertent movement to 84% or greater is defined as an inadvertent increase in primary nozzle area not associated with a selected change in engine operating condition.

In subcruise with AT and F/O it is particularly important to ensure that engines are reasonably synchronised when comparing A_J, as a significant difference in A_J can result from a 1% difference in N_2.

Apply procedure: PRECAUTIONARY ENGINE SHUT DOWN

IF AREA indicates nozzle jammed at 15% or less

SPEED.. SUBSONIC C

Reduce speed to subsonic using the normal deceleration/descent technique.

Normal engine operation is permitted except that the use of reheat or reverse thrust is prohibited on the affected engine.
At maximum power setting the N2 may be depressed by up to 5%.

END//

If IGN lights and start pump light on

AUTO IGNITION .... OFF E

Set associated AUTO IGNITION switch to OFF

END//

(Completely Revised)

contd

WIND DOWN light on, not accompanied by bucket movement

THROTTLE .... IDLE C

Retard associated throttle lever to idle

WIND DOWN C/Bs .... TRIP E

Trip the associated wind down circuit breakers

CIRCUIT BREAKER	PANEL	GRID REF
ENG 1 WIND DOWN CONT SUP 1 ENG 1 WIND DOWN CONT SUP 2	5-213 1-213	B1 C7
ENG 2 WIND DOWN CONT SUP 1 ENG 2 WIND DOWN CONT SUP 2	1-213 5-213	F4 C1
ENG 3 WIND DOWN CONT SUP 1 ENG 3 WIND DOWN CONT SUP 2	1-213 5-213	F5 C2
ENG 4 WIND DOWN CONT SUP 1 ENG 4 WIND DOWN CONT SUP 2	5-213 1-213	B2 C8

THROTTLE .... AS REQUIRED C

The wind down system is normally inoperative with the throttle lever at idle.

END//

(Unchanged)

CON LIGHT ON

CON light (amber) on during take-off at speed less than 60 kt

REHEAT .... RESELECT E

Set the associated reheat selector to OFF then RHT
Only one reselection is permitted.

A CON light (amber) is on to indicate a failure to detect reheat light up.

END//

CON light (amber) on during take-off at speed between 60 and 100 kt

IF THREE REHEATS ONLY REQUIRED FOR TAKE-OFF

Take-Off may be continued providing the RTOW data has been prepared in anticipation of a reheat failure.

END//

IF FOUR REHEATS REQUIRED FOR TAKE-OFF

THROTTLES .... IDLE C

Retard throttle levers (4) to idle and abandon the take-off

END//

CON light (amber) on during take-off between 100 kt and V_1

N2 .... OBSERVE E

Observe N2 instrument of affected engine

IF N2 is stable

Continue with the take-off

END//

IF decreasing N2 indicates loss of engine power

THROTTLES .... IDLE C

Retard throttle levers (4) to idle and abandon the take-off

END//

CON light (amber) on during transonic acceleration (reheat selected)

FUEL FLOW & AREA .... COMPARE WITH OTHER ENGINES — E

IF FUEL FLOW and AREA indications sensibly in line

Continue normal operations
The FUEL FLOW and AREA sensibly in line with other engines indicates correct reheat operation.

END//

IF FUEL FLOW and AREA indications not sensibly in line

REHEAT .... OFF THEN RHT — E

Set the affected engine RHT selector to OFF then RHT in attempt to obtain reheat operation

If the CON light is accompanied by a REHEAT light, attempts to obtain reheat operation are unlikely to be successful

At least two reheat systems are required for transonic acceleration. If one or more reheat systems is lost, see Cruise Control Manual section 5 for en-route Fuel penalty.

END//

CON light (amber) on during use of reverse thrust

AREA .... OBSERVE — E

Observe the primary nozzle area on the affected engine AREA indicator.

IF AREA is less than 15%

Continued use of reverse thrust permitted

END//

IF AREA is greater than 15%

IN FLIGHT .... CANCEL REVERSE THRUST — C

Cancel reverse thrust on associated engine.

POWER PLANT

With the primary nozzle area greater than 15% overheating of the secondary nozzle could occur, even with the power at idle, because of the length of time use of reverse thrust is permitted in flight.

ON THE GROUND .... RESTRICT USE TO REVERSE IDLE C

Leave the affected engine throttle lever at reverse idle during use of reverse thrust

END//

ENGINE FAILURE AT OR AFTER V1 IN THE TAKE-OFF PHASE OF FLIGHT

If decrease in N2 indicates loss of engine thrust

REHEAT .... ALL CTY E

Set the reheat selectors to CTY by use of ganging bar, observing N2 and EGT of engines not affected by thrust loss attain, but do not exceed, their contingency rating, T/O light off, CTY light on.

With the T/O MONITOR button pressed and REHEAT selected, should the N2 of any engine reduce to 58%, contingency rating will be selected automatically on all engines.

Automatic selection of contingency rating is indicated by the CTY light (yellow) flashing. Should the CTY light flash, select contingency rating by use of ganging bars immediately, in which case the CTY light remains on steady.

The contingency rating is selected by depressing the latch on the upper ganging bar and using the upper and lower ganging bars to move the reheat selectors (4) to the CTY position. The selection of contingency rating on the unsound engine at this time is an acceptable procedure.

IF CONTINGENCY RATING N2 OR EGT LIMITS EXCEEDED

N2, EGT .... MAINTAIN WITHIN LIMITS E

Retard associated throttle lever to obtain contingency rating

Verify reheat selectors at CTY

WHEN 3 MIN FROM START OF TAKE-OFF ROLL

T/O MONITOR .... PULL P

Pull to disarm T/O MONITOR button

REHEAT .... ALL RHT E

Set the reheat selectors to RHT using ganging bar, observing N2 and EGT reduce to the take-off rating limits, CTY light off, T/O light ON.

Always use the upper ganging bar, which will latch at the RHT position, to move the reheat selectors from CTY to RHT, as it is possible to select the OFF position from CTY by individual selector selections.

contd.

IF N2 AND EGT DO NOT REDUCE TO T/O RATING LIMITS
THROTTLE MASTER .... OTHER LANE E

Set associated THROTTLE MASTER selector to other selection, MAIN or ALTERN.

WHEN 7.5 MIN FROM START OF TAKE-OFF ROLL
ENG RATING MODE .... FLIGHT E

Set the ENG RATING MODE switches to FLIGHT, observing N2 and EGT attain, but do not exceed, their reheated climb rating limits, CLB light on, T/O light off, MID light on, LO light off.

IF N2 AND EGT DO NOT REDUCE TO THE REHEATED CLIMB RATING
THROTTLE MASTER .... OTHER LANE E

Set associated THROTTLE MASTER selector to other selection, MAIN or ALTERN.

ENGINE CONTROL SCHEDULE .... NORMAL E

Verify ENGINE CONTROL SCHEDULE rotary selector at NORMAL

With the engine control schedule rotary selector at NORMAL the engine control schedule is prevented from alternating between F/O and HI should the throttle lever be adjusted around 95% of the open position when reheat is cancelled.

WHEN 22.5 MIN FROM START OF TAKE-OFF ROLL
REHEAT .... ALL OFF E

Set the reheat selectors to OFF, observing all RHT selected lights off, ENGINE CONTROL SCHEDULE, HI lights on.

Setting the reheat selectors to OFF is not possible by use of ganging bar. Individual selectors must be used.

IF ENGINE CONTROL SCHEDULE, HI LT(S) OFF
THROTTLE MASTER .... OTHER LANE E

Set the THROTTLE MASTER selector to other selection, MAIN or ALTERN.

All use of contingency rating must be logged.

END//

ENGINE OVERSPEED

N1 or N2 overspeed

THROTTLE .... IDLE C

Retard throttle lever of affected engine to idle

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

INCORRECT SECONDARY NOZZLE POSITION (WITHIN NORMAL FORWARD THRUST RANGE)

DURING TAXI CHECKS

If during the taxi checks one secondary nozzle is not within the range 18° - 24° but is between 10° and 27°, take-off is permitted providing full account is taken of the performance effects. The performance effects are obtained by referring to the Performance Manual Section 5, and the Cruise Control Manual Section 5.

LIMITATION

With one secondary nozzle bucket system inoperative, aircraft operation is permitted providing there is no brake failure on the same side.

Before take-off

Observe the position of the failed bucket.

Trip the bucket control c/b.

CIRCUIT BREAKER	PANEL	GRID REF
ENG 1 BUCKET CONT UNIT SUP	14-215	E12
ENG 2 BUCKET CONT UNIT SUP	13-215	G14
ENG 3 BUCKET CONT UNIT SUP	13-216	C 6
ENG 4 BUCKET CONT UNIT SUP	14-216	C 6

Reset the BCU C/B after take-off, before transonic acceleration.

NOTE

Tripping the Bucket unit circuit breaker enables the CLEAR TO GO light for affected engine to function irrespective of bucket position.

With the Bucket unit circuit breaker tripped the secondary nozzle position indicator will be off scale 0° end.

Use of reverse thrust

Reverse is inoperable on the affected engine, the use of reverse on the other engines should be as given in PROCEDURES AND TECHNIQUES "Engine Failures".

CONTINUE//

IN FLIGHT

IF SECONDARY NOZZLE IS WITHIN THE RANGE 5° to 15°

No flight restrictions but see Cruise Control Manual section 5 for fuel penalty.

IF SECONDARY NOZZLE IS WITHIN THE RANGE 16° to 27°

Unrestricted subsonic operation is permitted. Supersonic flight is permitted but during transonic acceleration reheat must not be used on the associated engine. See Cruise Control Manual Section 5 for combined fuel penalty due one reheat inoperative and secondary nozzle not at optimum.

END//

POWER PLANT

SECONDARY AIR DOORS FAIL TO OPEN AFTER TAKE-OFF

SECONDARY AIR DOOR sel .... OPEN E

Set the SECONDARY AIR DOORS selector to OPEN observing the SECONDARY AIR DOORS MI reads OPEN.

IF SECONDARY AIR DOORS MI STILL FAILS TO READ OPEN

SPEED .... SUBSONIC C

Replan flight at subsonic speed

END//

CAUTION

IF THE SECONDARY AIR DOORS ARE NOT OPEN AT SPEEDS GREATER THAN M = 0.95 NACELLE OVER-HEATING WILL OCCUR.

IF THE SECONDARY AIR DOORS ARE SHUT AT SPEEDS GREATER THAN M = 0.90/300 KT,AND AN ATTEMPT IS MADE TO OPEN THEM, AIR LOADING ON THE DOORS MAY CAUSE THE MOTOR DRIVE C/BS TO TRIP. IF THE C/BS SHOULD TRIP LEAVE THEM TRIPPED FOR A MINIMUM TIME OF 2 MINS TO ALLOW MOTOR COOLING, REDUCE SPEED TO LESS THAN M = 0.90/300 KT AND ATTEMPT DOOR OPENING.

HIGH OIL CONT LIGHT ON

OIL CONT .... OBSERVE E

Observe OIL CONT instrument indicates engine oil tank contents greater than 14.0 U.S. quarts.

Overfull warnings occasionally occur prior to engine starting, due to the characteristics of the engine oil system, but the warning should disappear by the time that the engine has attained idling conditions.

If the indicated oil contents exceeds 14.0 U.S. quarts then the level is likely to fluctuate between 14.0 and 17.0 U.S. quarts.

The increase in contents of the engine oil tank may be caused by fuel leaking into the engine oil system from the fuel cooled oil cooler, continued engine operation is permitted but incident must be reported.

END//

FALSE START

The FALSE START procedure may only be applied after 2 min has elapsed since previous operation of air turbine starter.

COND VALVE .... OFF E

Verify COND VALVE selector at OFF and observe COND VALVE MI shows crossline.

HP VALVE .... SHUT E

Verify HP VALVE switch at SHUT to prevent flooding the engine with fuel.

IGNITION rty sel .... BOTH E

Verify IGNITION rotary selector at BOTH

ENGINE DEBOW sw .... DEBOW E

Set ENGINE DEBOW switch to DEBOW and observe DEBOW switch light on.

START/RELIGHT sel .... START E

Set START/RELIGHT selector to START

Start clock

Observe START/RELIGHT selector is latched at START, START VALVE MI reads OPEN, ENGINE DEBOW switch light off, START PUMP light (yellow) on, N2 rises.

During the dry motoring cycle the air supply to the ram air turbine starter must be controlled to maintain N2 below 16% and duct pressure below 35 psig to prevent air turbine starter limitations being exceeded.

20 SEC AFTER SETTING START/RELIGHT SEL TO START

HP VALVE .... OPEN E

Set HP VALVE switch to OPEN and observe RH IGN and LH IGN lights (green) on, EGT rising.

IF EGT NOT RISING WITHIN 8 SEC OF OPENING HP VALVE

HP VALVE .... SHUT E
START/RELIGHT sel .... OFF E
ENGINE DEBOW sw .... NORMAL E

contd.

Set HP VALVE switch to SHUT, START/RELIGHT selector to OFF and ENGINE DEBOW switch to NORMAL.

END//

<u>IF EGT RISING</u>
Continue as for normal engine start.

END//

POWER PLANT

The following drills are not published in expanded form.

Inadvertent Reverse Thrust - refer to abnormal drill 07.01.10
Inadvertent Forward Thrust - refer to abnormal drill 07.01.10
Aux Inlet MI Fails to Read Shut - refer to abnormal drill 07.01.15

FUEL JETTISON

CAUTION
WHERE POSSIBLE AVOID STORMY WEATHER CONDITIONS.
DO NOT ENTER A ZONE WHERE FUEL HAS RECENTLY BEEN JETTISONED.

SPEED .... NOT ABOVE M = 0.93 C

The maximum demonstrated speed for fuel jettisoning is M = 0.93.

REHEAT .... ALL OFF E

Verify all reheat selectors are OFF because the engine feed pumps cannot support reheated engine demand while fuel jettisoning from collector tanks.

TRIM TRANS AUTO MASTER .... OFF E

Verify the TRIM TRANS AUTO MASTER selector is at OFF to prevent interaction between trim transfer system and fuel jettisoning operation.

TANK 11 DE-AIR sw .... OFF E

Verify the TANK 11 DE-AIR switch is at OFF to prevent interaction between de-aeration and fuel jettisoning operation.

AFT TRIM sw .... NORM E

Verify the AFT TRIM switch is at NORM to ensure tanks 1 & 4 are returned to nominal values should fuel be transferred prior to jettisoning

TANK 9 CONTENTS .... LANDING QUANTITY E

Determine the landing quantity required in tank 9.

CAUTION
DURING JETTISON THE ONLY TRUE INDICATION OF FUEL QUANTITY ON BOARD IS THE TOTAL CONTENTS.
THE TOTAL FUEL REMAINING AND A/C WEIGHT INDICATORS DEPEND ON SIGNALS FROM THE ENGINE FLOWMETERS AND JETTISONED FUEL DOES NOT PASS THROUGH THEM.

NOTE
During jettison the aircraft weight will decrease at approximately 2000 kg per min.

JETTISON AS REQUIRED MAINTAINING CG WITHIN LIMITS.
WHERE POSSIBLE TRIM TANK FUEL SHOULD BE JETTISONED BEFORE MAIN TANK FUEL.

TO JETTISON FROM TRIM TANKS

JETTISON MASTER VALVES .... OPEN E

Set the JETTISON MASTER VALVE selectors to OPEN.

TRIM TRANSFER PUMPS .... ON AS REQ'D E

Set the appropriate tank 9, 10, or 11 pumps to ON as required for jettison purposes and monitor contents of tank being jettisoned.

WHEN TANK 9 CONTENTS EQUAL LANDING QUANTITY

TANK 9 PUMPS .... AUTO E

Setting TANK 9 PUMP selectors to AUTO with the TRIM TRANS AUTO MASTER selector at OFF switches off the pumps.

WHEN TANK 10 & 11 CONTENTS AS REQUIRED

TANK 10 & 11 PUMPS .... AUTO E

Setting TANK 10 or TANK 11 PUMPS selectors to AUTO with the TRIM TRANS AUTO MASTER selector at OFF switches off the pumps.

TO JETTISON FROM MAIN TANKS

ENGINE FEED PUMPS .... ALL ON E

Verify all ENGINE FEED PUMP switches are at ON to ensure engine fuel feed is maintained during jettisoning.

MAIN TRANSFER TANK PUMPS .... ALL ON E

Set main transfer tanks 5, 7, 6 and 8 PUMP switches and selectors to ON if the associated tank contains at least 100 kg of fuel.

The auxiliary tanks 5A and 7A PUMP switches should also be set to on if these tanks contain fuel.

TRANS VALVES 5A-5, 7A-7 .... OPEN E

contd.

FUEL SYSTEM

Set the TRANS VALVES 5A-5, 7A-7 switches to OPEN to allow transfer of fuel if their associated tanks contain fuel.

COLLECTOR TANK JETTISON VALVES .... OPEN E

Set tanks 1, 2, 3 and 4 jettison valve switches to OPEN.

JETTISON MASTER VALVES .... OPEN E

Set the JETTISON MASTER VALVE selectors to OPEN and monitor tank contents and TOTAL CONTENTS indicator.

WHEN TOTAL CONTENTS INDICATOR SHOWS THE REQUIRED QUANTITY

COLLECTOR TANK JETTISON VALVES .... SHUT E

Set tanks 1, 2, 3 and 4 jettison valve switches to SHUT.

JETTISON MASTER VALVES .... SHUT E

Set JETTISON MASTER VALVE selectors to SHUT to close the jettison master valves.

JETTISON MASTER VALVES MIs .... CROSSLINE E

Observe the JETTISON MASTER VALVES MIs show crossline indicating the jettison master valves are shut.

JETTISON MASTER VALVES .... OFF E

Set the JETTISON MASTER VALVES selectors to OFF to remove electrical power from the jettison master valves.

TOTAL FUEL REMAINING .... RESET TO AGREE WITH TOTAL CONTENTS E

Since the fuel jettisoned is not automatically subtracted from the TOTAL FUEL REMAINING indicator it must be reset using the TOTAL CONTENTS indicator for reference.

A scan of the fuel panel should be carried out to ensure all pumps and valves are set appropriate to the phase of flight condition.

END//

FUEL SYSTEM

TANK PRESS LIGHT ON

WHEN AIRCRAFT IN CLIMB AND TANK PRESSURE INDICATION IN THE POSITIVE AMBER ARC

O/FULL LTS .... OBSERVE E

The TANK PRESS light may be on due to fuel entering the vent line from a tank that is being overfilled, observation of the O/FULL lights and SCAVENGE PUMP MI should confirm this.

IF O/FULL LTS ON
APPLY PROCEDURE: O/FULL LIGHT ON

IF O/FULL LTS OFF
REDUCE RATE OF CLIMB TO MAINTAIN TANK PRESSURE INDICATION WITHIN THE POSITIVE YELLOW OR GREEN ARC CE

At a high rate of climb the venting system may not reduce tank pressure fast enough, reducing the aircraft rate of climb should reduce tank to atmosphere differential pressure thereby putting off the TANK PRESS light.

END//

WHEN AIRCRAFT IN CRUISE ABOVE 40,000 ft AND TANK PRESSURE INDICATION APPROXIMATELY ZERO

ENGINE FEED PUMPS .... ALL ON E

Verify all ENGINE FEED PUMP switches at ON and observe the ENGINE FEED PUMP LOW PRESS lights.

IF ONE PUMP LOW PRESS LT ON
ENGINE RECIRCULATION VALVE .... SHUT UNTIL THROTTLE IDLE E

Verify the ENGINE RECIRCULATION VALVE switch of associated engine is at SHUT, the switch must remain at SHUT until the throttle lever is retarded to idle during deceleration.

IF TWO PUMPS LOW PRESS LTS ON (IN ONE TANK)
ENGINE RECIRCULATION VALVE .... SHUT E

Verify the ENGINE RECIRCULATION VALVE switch of associated engine is at SHUT. The switch must remain at SHUT for the remainder of the flight.

ENGINE INLET LOW PRESS LTS .... MONITOR E

IF TWO OR MORE INLET LOW PRESS LTS ON
FLIGHT LEVEL .... 450 OR BELOW C

Atmospheric pressure at 45,000 ft is sufficient to

contd.

FUEL SYSTEM

maintain normal engine feed.

IF LESS THAN TWO INLET LOW PRESS LTS ON

TANKS 1 & 4 .... 1500 KG MINIMUM E
TANKS 2 & 3 .... 2500 KG MINIMUM E

Maintaining 1500 KG in tanks 1 & 4 and 2500 KG in tanks 2 & 3 ensures sufficient head of fuel above the engine feed pumps to compensate for lack of tank pressure. However continued flight above 45,000 ft without pressurisation may result in the loss of up to 700 KG of the reserve fuel due to boiling.

IF QUANTITIES CANNOT BE MAINTAINED

FLIGHT LEVEL .... 450 OR BELOW C

If the 1500 kg in tanks 1 & 4 or the 2500 kg in tanks 2 & 3 cannot be maintained continue flight at 45,000 ft or below.

END//

WHEN AIRCRAFT IN DESCENT AND TANK PRESSURE INDICATION IN THE NEGATIVE AMBER ARC

REDUCE RATE OF DESCENT TO MAINTAIN TANK PRESSURE INDICATION IN NEGATIVE YELLOW OR AMBER ARC .... CE

Negative tank pressure is the result of the venting system being unable to cope with the aircraft rate of descent. Reducing the descent rate should reduce the tank to atmosphere differential pressure.

END//

FUEL SYSTEM

MANAGEMENT WITH ABNORMALLY LOW FUEL QUANTITY

This procedure is intended for use when the fuel on the aircraft has been reduced to 6000 kg plus fuel for ballast and assumes the collector tanks contain equal quantities after forward transfer and tank 9 contains correct ballast fuel.
For maximum benefit this procedure should be initiated as early as possible in the descent. Five minutes after commencing the procedure and thereafter, the total useable fuel should be determined by addition of collector tank contents.

CROSSFEED rty sels .... INLINE E

Set all CROSSFEED valve rotary selectors inline to ensure all engines are being supplied by fuel remaining on aircraft, and observe CROSSFEED MIs inline.

MAIN TRANSFER PUMPS .... ALL ON E

Set tanks 5,6,7 and 8 pump switches and selectors to ON to scavenge any fuel remaining in these tanks.

TRANS VALVES 5A-5 & 7A-7 .... OPEN E

Set the TRANS-VALVE switch 5A-5 and 7A-7 to OPEN to enable any fuel in tanks 5A and 7A to be transfered.

TANKS 5A & 7A PUMPS ....ON E

Set tanks 5A and 7A pump switches to ON to scavenge any fuel remaining in these tanks.

The amount of fuel scavenged from tanks 5,5A,6,7,7A & 8 is approximately 300 kg.

WHEN LOW PRESS LTS ON.

TANK 5 & 6 LEFT HAND PUMPS .... OFF E
TANK 7 & 8 RIGHT HAND PUMPS .... OFF E

When all the main transfer pumps LOW PRESS lights are ON. Set tanks 5 & 6 left hand pumps and tanks 7 & 8 right hand pumps OFF, the remaining pump in each tank is left running to continue scavenge of tank.

CAUTION
BALLAST FUEL SHOULD BE USED ONLY IF THE SAFETY OF THE AIRCRAFT WOULD OTHERWISE BE PREJUDICED.

<u>IF TRIM TANK FUEL IS TO BE USED</u>

TANK 5 & 7 INLET VALVES .... OPEN E

Set tanks 5 & 7 INLET VALVES to OPEN to enable fuel to be transfered to these tanks.

TRIM TRANSFER PUMPS .... ALL ON E

Set the TRIM TRANSFER PUMPS in tanks containing fuel to ON.

TANK 6 & 8 STANDBY INLET VALVES ....OPEN E

Set TANK 6 & 8 STANDBY INLET VALVES to OPEN to enable fuel to be transfered into these tanks.

WHEN TANK 9 LOW PRESS LTS ON

TRIM PIPE DRAIN .... OPEN E

When the pump LOW PRESS lights for tank 9 come ON, set the TRIM PIPE DRAIN switch to OPEN. This will automatically set the scavenge pump running thereby draining the trim pipe of its fuel.

WHEN TANK 10 & 11 LOW PRESS LTS ON

TANK 9 & 11 INLET VALVES .... OPEN E

Set TANK 9 & 11 INLET VALVES to OPEN.

END//

NOTE
The total usable fuel should be determined by addition of the collector tank CONTENTS indication.

(Deletion)

CAUTION
ALL PUMPS AND VALVES SHOULD REMAIN AS SELECTED UNTIL AFTER LANDING.

FAILURE OF TANK 1&4 NORM MODE

Failure of tank(s) 1 and/or 4 to return to normal mode will be shown by TANKS 1 & 4 MI not reading NORM or their respective contents remaining at low level.

CROSSFEED .... TO USE FUEL FROM 2 AND/OR 3 E

Rotate the CROSSFEED selectors to supply engines 1 and 2 from tank 2, and/or engines 3 & 4 from tank 3 as appropriate.

STANDBY INLET VALVES ....OPEN E

Set to OPEN the STANDBY INLET VALVES switches of tank(s) affected by failure to return to normal mode.

SAME SIDE TANK 11 PUMP .... ON E

Set to ON the tank 11 PUMP selector(s) to enable fuel to be pumped into tanks 1 and/or 4 as appropriate.

WHEN COLLECTOR TANK(S) ABOVE UNDERFULL LEVEL

When tanks 1 and/or 4 contents greater than its underfull warning level (approximately 3400 kg).

TANK 11 PUMPS .... AUTO E

Set tank 11 PUMP selectors to AUTO

Setting TANK 11 PUMPS selector to AUTO with the TRIM TRANS AUTO MASTER selector at OFF switches off the pumps.

STANDBY INLET VALVES .... SHUT E

Set to SHUT the STANDBY INLET VALVES selectors of tanks 1 and/or 4 as appropriate.

WHEN TRIM TRANSFER IS COMPLETE
AND MAIN TRANSFER TANKS ARE EMPTY

CROSSFEED .... CEASE E

Verify all ENGINE FEED pumps are ON and rotate CROSSFEED rotary selectors crossline.

END//

(Unchanged)

FUEL SYSTEM

FAILURE OF TANK 5 OR 7 PUMPS

BEFORE OR DURING ACCELERATING CLIMB

IF 5-2 OR 7-4 PUMP FAILED
6-2 OR 8-4 PUMP ....OFF E

With a main transfer pump failed an underfull warning will occur in the affected collector tank soon after failure, the underfull warning may be ignored.

Pumps 6-2 and 8-4 will be on for de-aeration, switching them off ensures no inadvertent transfer from 6 or 8 can occur when the affected collector tank quantity falls to where it will demand fuel from tank 6 or 8.

6-1 or 8-3 PUMP .... ON E

Set 6-1 or 8-3 pump on as appropriate for tank de-aeration.

This ensures that the remaining pump in the affected main transfer tank will operate at altitude and is an insurance against the effects, on pumps start up, of a climb without de-aeration.

FAILED PUMP .... OFF E

Set failed pump 5-1 or 7-3 or 6-2 or 8-4 to OFF

IF TRIM TRANSFER IS NOT INTO 5 & 7

WHEN COLLECTOR TANK APPROACHES LOW LEVEL

APPROPRIATE TANK 6 OR 8 PUMP .... ON E

If there is no fuel transfer into tanks 5 & 7, wait until the collector tank affected by the failed transfer pump approaches or attains the LOW LEVEL warning then set the appropriate tank 6 or 8 pumps to ON to raise fuel level in collector tank.

IF TRIM TRANSFER IS INTO 5 & 7
MANAGE TRIM TRANSFER TO TOP UP AFFECTED COLLECTOR TANKS USING 5 & 7 MAIN INLET VALVES AND COLLECTOR TANK STANDBY INLET VALVES.............. E

To top up the affected collector tank during trim transfer set tank 5 or 7 MAIN INLET VALVE selector to SHUT and the affected collector tank STANDBY INLET VALVE switch to OPEN. When the collector tank at the desired level reverse the procedure.

FUEL SYSTEM

WHEN TRIM TRANSFER IS COMPLETE

5 & 7 MAIN INLET VALVES ....AUTO E

COLLECTOR TANK STANDBY
INLET VALVES ....SHUT E

When trim transfer complete set tank 5 & 7 MAIN INLET VALVES selector to AUTO and verify collector tank STANDBY INLET VALVE switches at SHUT in preparation for forward trim transfer.

CROSSFEED .... AS NECESSARY E

NOTE
Re-examine the situation when forward trim transfer is required.

END//

DURING STABILIZED CRUISE, DECELERATION OR DESCENT

FAILED PUMP .... OFF E

Set tank 5 or tank 7 failed pump to OFF.

IF TRIM TRANSFER IS NOT INTO 5 & 7
CROSSFEED ....AS NECESSARY E

IF TRIM TRANSFER IS INTO 5 & 7
MANAGE TRIM TRANSFER TO TOP UP AFFECTED
COLLECTOR TANK USING 5 & 7 MAIN INLET
VALVES AND COLLECTOR TANK STANDBY
INLET VALVES.. E

To top up collector tank during trim transfer set tank 5 or 7 MAIN INLET VALVE selector to SHUT and affected collector tank STANDBY INLET VALVE switch to OPEN. When collector tank at desired level reverse procedure.

WHEN TRIM TRANSFER IS COMPLETE

5 & 7 MAIN INLET VALVES .... AUTO E

COLLECTOR TANK STANDBY
INLET VALVES .... SHUT E

CROSSFEED .... AS NECESSARY E

When trim transfer complete set tank 5 & 7 MAIN INLET VALVES selector to AUTO and verify collector tank STANDBY INLET VALVE switches at SHUT in preparation for forward trim transfer.

During forward trim transfer re-examine the situation.

END//

FAILURE OF TANK 6 OR 8 PUMPS

DURING TAKE OFF OR ACCELERATING CLIMB

IF THE FAILED PUMP IS ON FOR DE-AERATION

REMAINING PUMP .... ON E

Set remaining pump switch in tank 6 or tank 8 to ON for de-aeration

This ensures that the affected pump in the affected main transfer tank will operate at altitude, and is an insurance against the effects, on pump start up, of a climb without de-aeration.

FAILED PUMP .... OFF E

Set tank 6 or tank 8 failed pump to OFF.

WHEN REHEAT OFF AND ENG RATING MODE sw AT FLIGHT

CROSSFEED .... AS NECESSARY E

Crossfeeding is not to be used during take off, the switching off of reheat and setting the ENG RATING MODE switch to FLIGHT is considered to be the end of the take off phase of flight enabling crossfeeding.

If the take off was with full tanks crossfeeding will not be necessary until transfer from tanks 6 and 8.

END//

DURING STABILIZED CRUISE, DECELERATION OR DESCENT

FAILED PUMP .... OFF E

Set tank 6 or tank 8 failed pump to off.

CROSSFEED ....AS NECESSARY E

NOTE
If the forward trim transfer has not taken place re-examine the situation when it is required.

END//

FUEL SYSTEM

FAILURE OF TANK 9 PUMP

PUMPS AND VALVES IN
TRIM TRANSFER TANKS .... AUTO E

The actions contained in this drill are based on the pumps and valves in the trim transfer tanks being initially set to the AUTO position.

REARWARD TRIM TRANSFER IN PROGRESS

IF TANK 10 CONTENTS GREATER THAN TANK 9
TANK 9 FAILED PUMP .... OFF E

Automatic transfer will proceed with the remaining tank 9 pump and tank 10 pump.

END//

IF TANK 10 CONTENTS LESS THAN TANK 9
TANK 9 FAILED PUMP .... OFF E
SAME SIDE TANK 10 PUMP .... OFF E

Automatic transfer will proceed with the single tank 9 pump only.

Tank 9 and 11 QUANTITIES .... MONITOR E

WHEN TANK 11 QUANTITY REACHES TANK 11 LLC

SAME SIDE TANK 10 PUMP .... AUTO E

Setting tank 10 pump selector to AUTO brings the pump on-line.

TANK 9 AND 10 QUANTITIES .... MONITOR E

IF TANK 10 EMPTIES BEFORE TANK 9 AND THE
LEFT HAND TANK 9 PUMP HAS FAILED
OPERATING TANK 9 PUMP .... OFF E

Setting tank 9 PUMP selector to OFF stops the rearward transfer.

INTER-CON VALVE (5-8) .... OPEN E

Set INTER-CON VALVE (5-8) switch to OPEN and observe INTER-CON VALVE (5-8) MI reads OPEN.

ALLOW TANK 5 QUANTITY TO INCREASE BY HALF
THAT REMAINING IN TANK 9

WHEN QUANTITY IN TANK 5 IS AS REQUIRED

contd.

INTER-CON VALVE (5-8) .... SHUT E

Set INTER-CON VALVE (5-8) switch to SHUT and observe INTER CON VALVE (5-8) MI reads SHUT.

TANK 8 STANDBY INLET VALVE .... OPEN E
TANK 7 INLET VALVE MAIN sel .... SHUT E

Observe tank 7 INLET VALVE, MAIN MI shows crossline.

TANK 9 RIGHT HAND PUMP .... AUTO E

The preceding three actions enable the serviceable pump in tank 9 to transfer fuel from 9 to 8 only.

WHEN TANK 8 CONTENTS ARE RESTORED TO ORIGINAL

TANK 8 STANDBY INLET VALVE .... SHUT E
TANK 7 INLET VALVE MAIN sel .... AUTO E

Observe tank 7 INLET VALVE MI shows inline.

END//

<u>IF TANK 10 EMPTIES BEFORE TANK 9 AND THE</u>
<u>RIGHT HAND TANK 9 PUMP HAS FAILED</u>
OPERATING TANK 9 PUMP .... OFF E

Setting tank 9 PUMP selector to OFF stops the rearward transfer.

INTER-CON VALVE (6-7) .... OPEN E

Set INTER-CON VALVE (6-7) switch to OPEN
Observe INTER-CON VALVE (6-7) MI reads OPEN

ALLOW TANK 7 QUANTITY TO INCREASE BY HALF
THAT REMAINING IN TANK 9

WHEN QUANTITY IN TANK 7 IS AS REQUIRED

INTER-CON VALVE (6-7) .... SHUT E

Set INTER-CON VALVE (6-7) sw to SHUT
Observe INTER-CON VALVE (6-7) MI reads SHUT

TANK 6 STANDBY INLET VALVE .... OPEN E
TANK 5 INLET VALVE MAIN sel .... SHUT E

Observe tank 5 INLET VALVE, MAIN MI shows crossline.

TANK 9 LEFT HAND PUMP .... AUTO E

The preceding three actions enable the serviceable pump in tank 9 to transfer fuel from 9 to 6 only.

WHEN TANK 6 CONTENTS ARE RESTORED TO ORIGINAL

contd.

TANK 6 STANDBY INLET VALVE .... SHUT E
TANK 5 INLET VALVE MAIN sel .... AUTO E

Observe tank 5 INLET VALVE MI shows inline

END//

IF TANK 9 EMPTIES BEFORE TANK 10
RETURN TO NORMAL PROCEDURES

NOTE
Re-examine the situation when trim transfer fuel is required for topping up the collector tanks after a subsequent forward transfer.

END//

FUEL JETTISON IN PROGRESS

PROCEED WITH JETTISON USING THE REMAINING PUMP

END//

ABNORMAL CG POSITION

AFT LIMIT

MACH NO .... INCREASE IF POSSIBLE C

Increase the Mach number if possible since the Mach number is too low for CG position.

FUEL FWD TRANS sw .... O/RIDE C

Set the FUEL FWD TRANS switch to O/RIDE since the CG position is too far aft for Mach number

Monitor the CG position.

TRIM TRANSFER PUMPS
AND VALVES .... AUTO E

Verification of the auto control of the trim tank transfer pumps and valves is necessary to ensure that the FUEL FWD TRANS sw at O/RIDE will operate correctly.

TRIM TRANS AUTO MASTER .... OFF E

Setting the TRIM TRANS AUTO MASTER sel to OFF ensures that the transfer of fuel is solely under the control of the FUEL FWD TRANS sw.

WHEN NORMAL CG POSITION ACHIEVED
RETURN TO NORMAL TRANSFER CONTROL

When the normal CG position achieved set the FUEL FWD TRANS switch to its guarded position. Check tank 9 and tank 11 LLC preselected quantities and adjust if necessary before returning to normal transfer control.
END//

FORWARD LIMIT

MACH NO .... DECREASE IF POSSIBLE C

Decreasing the Mach number will prevent any further rearward movement of the centre of pressure. Once any problem with the fuel transfer is overcome regain the flight plan speed as soon as possible to minimize the use of contingency fuel.

FUEL FWD TRANS sw .... OFF & GUARDED C

Verify the FUEL FWD TRANS switch is off and guarded, monitor the CG position.

TRIM TRANS AUTO MASTER .... OFF E

The trim transfer is stopped until the system status is checked, in particular, check that the fuel transfer from the main and auxiliary transfer tanks into the collector tanks is in accordance with normal procedures

IF TANK 9 or 10 CONTAINS FUEL

TRIM TRANSFER PUMPS .... AUTO E

Verify tanks 9 and 10 PUMP selectors and tank 11 INLET VALVES selectors at AUTO to ensure they are under control of the TRIM TRANS AUTO MASTER selector.

TANKS 9 & 11 LLC .... ADJUST E

Check the tanks 9 and 11 LLC preselected quantities and adjust if necessary.

TRIM TRANS AUTO MASTER .... REARWARD E

Set the TRIM TRANS AUTO MASTER selector to REARWARD since the CG position is too far forward for Mach number

WHEN NORMAL CG POSITION ACHIEVED
RETURN TO NORMAL TRANSFER CONTROL

When the normal CG position achieved set the TRIM TRANS AUTO MASTER selector to OFF and return to normal transfer control.

END//

IF TANKS 9 AND 10 EMPTY

TANK 11 INLET VALVES .... OPEN E

Set tank 11 INLET VALVES selectors to OPEN and verify tanks 5,7,6,8,9 and 10 INLET VALVES are shut.

TANK 2 & 3 JETTISON VALVES .... OPEN E

Set tanks 2 and 3 JETTISON valves to OPEN thereby transferring fuel into tank 11. Monitor increase in tank 11 contents to ensure correct transfer operation and movement of CG position.

FUEL SYSTEM

WHEN NORMAL CG POSITION ACHIEVED

TANK 11 INLET VALVES .... AUTO E
TANK 2 & 3 JETTISON VALVES .... SHUT E

Set tank 11 INLET VALVES selectors to AUTO and tank 2 and 3 JETTISON valves selectors to SHUT to stop transfer to tank 11.

RETURN TO NORMAL TRANSFER CONTROL

END//

FAILURE OF TANK 5A OR 7A PUMP

FAILED PUMP .... OFF E

Set each pump switch to OFF in turn observing the PUMPS LOW PRESS light.
The failed pump will be identified when its switch is at OFF and the light is OFF.
The imbalance of fuel during transfer by the failure of one pump is insignificant, ensure non-failed pump switch at ON.

END//

FAILURE OF TANK 10 PUMP

FAILED PUMP ....OFF E

Set tank 10 failed pump selector to OFF.

OPPOSITE SIDE TANK 9 INLET VALVE .... OPEN E

Set the tank 9 INLET VALVE selector on the opposite side of failed tank 10 pump to OPEN to allow transfer of fuel to tank 9.

FAILED SIDE TANK 9 PUMP .... ON E

Set the tank 9 PUMPS selector on the same side as the failed tank 10 pump to ON to deliver fuel to the failed side trim pipe.

CAUTION
REARWARD TRIM TRANSFER IS AT HALF RATE
MONITOR CG CLOSELY.

WHEN TANK 11 LOAD LIMIT IS REACHED

TANK 5 AND TANK 7
INLET VALVES ....AUTO/SHUT AS REQUIRED E

(Deletion)

When tank 11 LLC preset value achieved monitor transfer into tanks 5 and 7. Should imbalance occur, set the INLET VALVE of tank with higher content to SHUT until content equal.

WHEN TANK 10 BECOMES EMPTY

When tank 10 is empty its remaining pump will be switched OFF by the auto trim control.

WHEN TANK 9 BECOMES EMPTY

TANK 9 PUMPS AND
INLET VALVES .... AUTO E

TANK 5 & 7 INLET VALVES .... AUTO E

Set tank 9 PUMPS selectors and INLET VALVES selectors to AUTO and tanks 5 and 7 INLET VALVE selectors to AUTO to return pumps and valves to auto trim control.

TRIM TRANS AUTO MASTER .... OFF E

Set TRIM TRANS AUTO MASTER selector to OFF

END//

(Unchanged)

FAILURE OF A TANK 11 PUMP

ELECTRIC PUMP FAILED

FAILED PUMP .... OFF E

Set the failed pump selector to OFF.
If the left hand electric pump fails during de-aeration set the DE-AIR switch to OFF.

GREEN OR BLUE PUMP FAILED

FAILED PUMP .... OFF E

Set the failed PUMPS (GREEN OR BLUE) selector to OFF.

SAME SIDE ELECTRIC PUMP .... AUTO/ON AS REQD E

Set the PUMPS selector on same side as failed GREEN or BLUE pump to AUTO. If transfer under control of TRIM TRANS AUTO MASTER or ON if manual controlling. to ensure transfer rates and correct distribution after trim transfer.

O/FULL LIGHT ON

The overfull condition can be confirmed by the associated tank F.Q.I. indicating above nominal full value.

<u>OVERFULL COLLECTOR TANK DURING MAIN TRANSFER</u>

PUMP OF MAIN TANK
FEEDING COLLECTOR .... OFF E

Set the PUMPS selector/switch of main transfer pump feeding the collector tank with O/FULL warning to OFF.

<u>IF O/FULL ON TANK 2 OR 4 DURING DE-AERATION OF TANKS 6 AND 8</u>

TANK 6 OR 8 RIGHT HAND PUMP .... OFF E

Set tank 6 right hand PUMPS switch to OFF if O/FULL on tank 2 and tank 8 right hand PUMPS switch to OFF if O/FULL on tank 4. This is to rectify the possibility that the O/FULL warning may be due to inadvertent transfer.

TANK 6 OR 8 LEFT HAND PUMP ....ON E

Set the left hand PUMPS switch ON to ensure that the remaining pump in tank 6 or 8 will operate at altitude and is an insurance against the effects, on a pump start up of a climb without de-aeration.

<u>WHEN THE U/FULL light ON</u>

PUMP OF MAIN TANK
FEEDING COLLECTOR ....ON E

Set to ON the PUMPS selector/switch of main transfer tank feeding collector with U/FULL (underfull) warning and use the pump as necessary to keep O/FULL light off.

END//

<u>OVERFULL TANK 5 OR 7 DURING TRANSFER FROM 5A OR 7A</u>

TANK 5A OR 7A PUMPS .... OFF E

Set PUMPS switches (2) to OFF in tank 5A or 7A. The O/FULL light will go off when both pumps are switched off providing the inlet valve and standby inlet valve to the associated tank (5 or 7) are shut.

<u>WHEN TANK 5 OR 7 CONTENTS FALLS</u>

TANK 5A OR 7A PUMPS .... ON E

TEMPORARY REVISION
Insert facing 03.02 page 23

REASON FOR ISSUE:

To reduce possible fuel discharge in event of failure of trim transfer pipes.

When the contents of tank (5 OR 7) drops to enable further transfer to continue, set 5A or 7A pumps. Repeat procedure if O/FULL light comes on again.

END//

OVERFULL TANKS 5,7,9 or 11 DURING TRIM TRANSFER

AFFECTED TANK INLET VALVES .... SHUT E

Set INLET VALVE of tank with O/FULL warning to SHUT, observing valve MI.

IF INLET VALVES MI SHOWS CROSSLINE AND O/FULL LIGHT REMAINS ON
SCAVENGE PUMP .... OBSERVE E

Observe SCAVENGE PUMP MI

IF SCAVENGE PUMP MI READS ON
Apply procedure : SUSPECTED LEAKAGE FROM MAIN TRIM TRANSFER PIPE INTO TANK 11

IF INLET VALVE MI SHOW INLINE
APPROPRIATE TRIM TRANSFER PUMP ....OFF E

Set the trim transfer pump(s) feeding the tank with O/FULL warning to OFF.

WHEN TANK 5,7,9 or 11 CONTENTS FALLS

APPROPRIATE TRIM TRANSFER PUMP......................... ON E

AFFECTED TANK INLET VALVES .... OPEN E

When the contents of tank (5,7,9 or 11) drops to enable further transfer to continue set the trim transfer pump(s) as appropriate to ON and open the affected tank INLET VALVES. Repeat procedure if O/FULL light comes on again.

WHEN TRIM TRANSFER COMPLETE

INLET VALVES sel .... AUTO E

TRIM PUMP sel .... AUTO E

On completion of trim transfer verify tank 5,7,9 and 11 inlet valves at AUTO and tank 9, 10 and 11 pumps at AUTO to return all trim pumps and valves under control the auto trim system.

END//

When the contents of tank (5 OR 7) drops to enable further transfer to continue, set 5A or 7A pumps. Repeat procedure if O/FULL light comes on again.

END//

OVERFULL TANKS 5,7,9 or 11 DURING TRIM TRANSFER

AFFECTED TANK INLET VALVES .... SHUT E

Set INLET VALVE of tank with O/FULL warning to SHUT, observing valve MI.

IF INLET VALVE MI SHOW INLINE
APPROPRIATE TRIM TRANSFER PUMP ....OFF E

Set the trim transfer pump(s) feeding the tank with O/FULL warning to OFF.

WHEN TANK 5,7,9 or 11 CONTENTS FALLS

APPROPRIATE TRIM TRANSFER PUMP .... ON E

AFFECTED TANK INLET VALVES .... OPEN E

When the contents of tank (5,7,9 or 11) drops to enable further transfer to continue set the trim transfer pump(s) as appropriate to ON and open the affected tank INLET VALVES. Repeat procedure if O/FULL light comes on again.

WHEN TRIM TRANSFER COMPLETE

INLET VALVES sel ....AUTO E

TRIM PUMP sel .... AUTO E

On completion of trim transfer verify tank 5,7,9 and 11 inlet valves at AUTO and tank 9,10 and 11 pumps at AUTO to return all trim pumps and valves under control of the auto trim system.

END//

ACC LIGHT ON

●▶ <u>BEFORE TAKE OFF</u>
RETURN TO RAMP .... E

END//

●▶ <u>DURING FLIGHT</u>
ENGINE FEED PUMPS sws ....ALL ON E

Verify all ENGINE FEED PUMP switches (12) set to ON and associated pump LOW PRESS lights off.

FAILURE OF AN ENGINE FEED PUMP

● ▶ **BEFORE TAKE OFF**

Refer to MEL 05-02-14.

● ▶ **AFTER TAKE OFF**

REMAINING PUMPS .... ON E

Verify remaining ENGINE FEED PUMP switches in tank set to ON

FAILED PUMP .... OFF E

END//

PRINTED ... AND

(Unchanged)

FQI/CG ABNORMAL INDICATIONS

CG CHANNEL FAILURES

M light (amber) on
CG Channel .... 1 or 2 E

Set the CG channel rotary selector to 1 or 2 and monitor the indicated CG to ensure correct operation of the selected standby system.

END//

1 or 2 light (amber) on when M is selected

No action - remain selected at M.
If circumstances permit log any FQI with failure or suspect contents indication.

END//

M, 1 and 2 lights (amber) on

Apply procedure TOTAL LOSS OF CG DATA WITH TRIM TANK FQI SERVICEABLE

If circumstances permit log the following data:

Any control panel yellow warning light on. Any tank failure flag visible. ZFW & ZFCG reading. Reading of 1,M,2, CG on digital display. All tank contents and total contents indications together with phase of flight.

END//

COMPARATOR LIGHTS ON A CHANNEL (OR B)

Rotate the FQI test rotary selector to MIN A (or MIN B)
Set the FQI test switch to CANCEL.

IF the A channel light remains on

Rotate the FQI test rotary selector to MAX A (or MAX B)
Set the FQI test switch to CANCEL.

If the A (or B) channel light remains on

9A or 9B Monitor tank 11 to verify auto transfer operating correctly.

(Deletion)

PRINTED IN ENGLAND

FUEL SYSTEM

10A or 10B Monitor end of rearward transfer by tank 10 pump lights.

NOTE
The 9.10.11 Comparator lights are usually accompanied by a CGI or CG2 light.

END//

LLC COMPARATOR LIGHT ON

Verify correct fuel transfer by observation of tank 9,10 and 11 FQIs.

END//

IF 1 AND 4, OR 2 AND 3, OR 5 AND 7, OR 5A AND 7A OR 6 AND 8 COMPARATOR LIGHTS ON

Observe the CG channel lights to identify the faulty tank.

Channel 1 for tanks 1,2,5,5A and 6.
Channel 2 for tanks 3,4,7,7A and 8.

Set the FQI Test Switch to CANCEL.

If the difference in the affected tank contents are within the dead band the lights will go off.

The dead band is
Tanks 1 and 4 750 kg. Tanks 2 and 3 750 kg.
Tanks 5A and 7A 375 kg. Tanks 5 and 7 2000 kg.
Tanks 6 and 8 2700 kg.

END//

contd.

(Deletion)

FUEL SYSTEM

FUEL TANK CONTENTS INDICATOR FAILURE

FAILURE FLAGS (BLACK) ON FQI

If tank 9,10 or 11 affected

Use the instrument pointer for content indication.

END//

FAILURE FLAGS (RED AND BLACK) ON FQI

If tank 1,2,3 or 4 affected

During main transfer operation monitor the affected tank content by reference to the O/FULL,U/FULL and LOW LEVEL lights.

IF tank 5A or 7A, 6 and 8 affected

Assume tank empty when its pump LOW PRESS lights permanently on.

IF tank 5 or 7 affected

Assume tank empty when its pumps LOW PRESS lights permanently on.

During trim transfer use auto control between tanks 9,10,11 and manual control fuel into tanks 6 and 8.

END//

FAILURE FLAG ON TOTAL CONTENTS INDICATOR, FLIGHT ENGINEERS AND/OR PILOTS

If any two collector tanks each with content less than 1000 kgs, the indication is correct.

If all collector tank levels above 1000 kgs, failed contents indication.

END//

Unchanged

TEMPORARY REVISION
Insert facing 03.02. page 28

REASON FOR ISSUE:

To reduce possible fuel discharge in event of failure of trim transfer pipes.

FUEL SYSTEM

SUSPECTED LEAKAGE FROM MAIN TRIM TRANSFER PIPE INTO EQUIPMENT BAY FORWARD OF TANK 11.

TRIM PUMPS ....ALL OFF

Verify the TRIM TRANS AUTO MASTER sw at OFF and guarded.
Verify the PUMPS sels (8) of tanks, 9,10 and 11 at AUTO or OFF.
Verify tank 11 DE AIR sw at OFF.

INLET VALVES ....ALL SHUT

Verify the STANDBY INLET VALVES sws (9) at SHUT
Verify the INLET VALVE MAIN sels(6) of tanks 5,7,9 and 11 at AUTO or SHUT
Verify the INLET VALVE O/RIDE sels (6) of tanks 5,7,9 and 11 at OFF or SHUT

JETTISON VALVES ....ALL SHUT

Verify tanks 1,2,3 and 4 JETTISON VALVES sws (4) at SHUT
Verify JETTISON MASTER VALVES sws at OFF and MI show crossline

LEFT HAND TRIM PIPE ....CHECK

Set the tank 11 PUMP GREEN sel to ON
Monitor the tank 11 CONTENTS for up to 1 minute
Set the tank 11 PUMP GREEN sel to AUTO

<u>IF THE TANK CONTENTS REDUCE BY MORE THAN 200 KG</u>

Make no further use of the left hand trim pipe.

If necessary repeat the CHECK for the right hand trim pipe using tank 11 PUMP BLUE sel.

END//

CAUTION
If a significant leak is detected the total fuel on board should thereafter be determined from TOTAL CONTENTS and not from TOTAL FUEL REMAINING.

CAUTION
If the failure occurs during subsonic climb or before transonic fuel transfer remain subsonic.

TEMPORARY REVISION
(Continued)

FUEL SYSTEM

SUSPECTED LEAKAGE FROM MAIN TRIM TRANSFER PIPE INTO TANK 11.

NOTE

This procedure should only be used when it is firmly established that there is no leak into the equipment bay forward of tank 11.

TRIM PUMPS .... ALL OFF

Verify the TRIM TRANS AUTO MASTER sw at OFF and guarded.
Verify the PUMPS sels (8) of tanks, 9,10 and 11 at AUTO or OFF.
Verify tank 11 DE AIR sw at OFF.

INLET VALVES .... ALL SHUT

Verify the STANDBY INLET VALVES sws (9) at SHUT
Verify the INLET VALVE MAIN sels (6) of tanks 5,7,9 and 11 at AUTO or SHUT
Verify the INLET VALVE O/RIDE sels (6) of tanks 5,7,9, and 11 at OFF or SHUT

JETTISON VALVES .... ALL SHUT

Verify tanks 1,2,3 and 4 JETTISON VALVES sws (4) at SHUT
Verify JETTISON MASTER VALVES sws at OFF and MI show crossline

LEFT HAND TRIM PIPE .... CHECK

Set tank 9 left hand INLET VALVES sel to OPEN
Set the tank 9 or 10 left hand pump sel to ON
Set the tank 9 left hand INLET VALVES sel to AUTO
Monitor the tank 9 or 10 CONTENTS for up to 1 minute
Set the tank 9 or 10 left hand pump sel to OFF

IF THE TANK CONTENTS REDUCE BY MORE THAN 200 KG

Make no further use of the left hand trim pipe.

If necessary repeat the CHECK for the right hand trim pipe using tank 9 or 10 right hand pump.

END//

CAUTION

If a significant leak is detected the total fuel on board should thereafter be determined from TOTAL CONTENTS and not from TOTAL FUEL REMAINING.

CAUTION

If the failure occurs during subsonic climb or before transonic fuel transfer remain subsonic.

NOTE

The equipment bay could contain 4300 Kg of fuel and the cg may be 1.6% Co (0.8% Co at max weight) further aft than indicated.

Once the equipment bay is filled, it will take 25 minutes for the fuel quantity to fall to 2000 Kg and a further 90 minutes to drain completely.

The following drills are not published in expanded form.

Total loss of CG data with trim tank FQI serviceable, refer abnormal drill Vo.II.07.02.10

Total loss of CG data one trim tank FQI unserviceable, refer abnormal drill Vol.II.07.02.13.

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FLIGHT CONTROLS

LOSS OF BOTH ELECTRIC TRIM SYSTEMS

Refer to PROCEDURES AND TECHNIQUES

TOTAL LOSS OF ARTIFICIAL FEEL IN ONE AXIS

Refer to PROCEDURES AND TECHNIQUES

TOTAL LOSS OF AUTOSTABILIZATION IN ONE AXIS

Refer to PROCEDURES AND TECHNIQUES

LOSS OF CONTROL OF ONE INNER ELEVON

Refer to PROCEDURES AND TECHNIQUES

MECH JAM LIGHT ON

This procedure is not expanded
Refer to Abnormal drill Vol.II.07.03.04

FLYING CONTROL INVERTER FAILURE

This procedure is not expanded
Refer to Abnormal drill Vol.II.07.03.05

FLYING CONTROL SIGNALLING MODE CHANGE

Refer to PROCEDURES AND TECHNIQUES

LOSS OF ANTI-STALL SYSTEM(S)

CAUTION
IF TWO ANTI-STALL SYSTEMS ARE LOST THERE IS NO PROTECTION AGAINST HIGH INCIDENCE EXCURSIONS. SPECIAL CARE MUST BE TAKEN IN LOW SPEED FLIGHT.

If the aircraft speed is below 270 knots the loss of an anti-stall system is accompanied by the disengagement of the associated pitch autostabilization, except during an automatic approach with LOC, TRK and GLIDE captured.

If the failure is due to a power supply failure within the anti-stall system the pitch autostabilisation will not disengage.

FAILED ANTI-STALL SYSTEM .... OFF C

IF BOTH ANTI-STALL SYSTEMS ARE FAILED

WHEN THE SPEED IS 270 KTS OR LESS
PITCH AUTOSTAB (No.1 or No.2) .... ENGAGE C

With both ANTI-STALL SYSTEMS sws at OFF either one of the autostabilization pitch axes can be re-engaged below 270 knots.

AT LANDING
MINIMUM SPEED .... VREF + 10 C

NOTE
If the speed is increased from below 270 knots to above 270 knots, both pitch autostabilization axes should be re-engaged.

END//

FLIGHT CONTROLS

LOSS OF ONE AUTOSTABILIZATION SYSTEM

AUTOSTAB PITCH and/or ROLL and/or YAW switches drop to OFF on one system.

If the aircraft speed is less than 270 knots and the PITCH AUTOSTAB fails, the associated ANTI-STALL system will fail.

REVERT TO MANUAL FLIGHT
OTHER AUTOPILOT ....ENGAGE C

The associated autopilot will have disengaged on AUTOSTAB disengagement.

DISENGAGED AUTOSTAB sws .... ENGAGE C

Transient fault signals may cause disengagement of the associated AUTOSTAB system.

<u>IF THE PITCH AUTOSTAB DISENGAGES</u>
APPLY PROCEDURE:LOSS OF ANTI-STALL SYSTEM

END//

LOSS OF ONE ARTIFICIAL FEEL SYSTEM OR ONE ARTIFICIAL FEEL JACK

FAILED SYSTEM .... IDENTIFY C

One ARTIFICIAL FEEL switch dropping to OFF indicates a loss of the associated jack, while all three switches on one system dropping to OFF indicate a loss of hydraulic pressure, an artificial feel computer malfunction or an ADC malfunction.

NOTE

If number 1 channel fails, the changeover to number 2 channel may be felt as a slight bump in the pilot control when the rocking lever swings from one position to the other position and the jack hits the stop.

END//

RELAY JACK BLUE JAM OR GREEN JAM

A relay jack jam will normally be accompanied by the disengagement of its associated autopilot. However if the relay jack jam occurs when both autopilots are engaged in LAND mode, a blue spool valve jam will be accompanied by a changeover of control from autopilot 1 to autopilot 2 and disengagement of autopilot 1, but in the event of a green spool valve jam the autopilot control will not change and both autopilots will remain engaged.

RELAY JACK sel .... TOWARDS JAM LT   C

Pull and set the RELAY JACK selector towards the setting associated with the illuminated JAM light i.e.
BLUE ONLY if GREEN JAM light is on.
GREEN ONLY if BLUE JAM light is on.
This action confirms the automatic depressurization of the failed ram and switches off the JAM light and the MWS PFC light.

<u>IF PRIOR TO THE WARNING BOTH AUTOPILOTS WERE ENGAGED AND THE WARNING WAS A BLUE JAM LT ON</u>

RELAY JACK sel .... NORM   C

If the JAM light remains off this indicates a false warning provoked by No. 1 autopilot disengagement.

<u>IF THE JAM LIGHT COMES ON AGAIN</u>

RELAY JACK sel .... TOWARDS JAM LT   C

<u>WHENEVER NECESSARY</u>

AP LT .... CANCEL   C

Press the autopilot instinctive disconnect button on the control wheel and observe the AP light off.

OTHER AUTOPILOT .... ENGAGE   C

END//

HYDRAULIC TANK LOW LEVEL

LOW LEVEL IN YELLOW TANK ALONE

WHEN YELLOW CONTENTS LESS THAN 1 US GALL

YELLOW PUMPS sw .... MAN E

Providing the yellow pumps selectors are at AUTO unguarding and setting the YELLOW PUMPS switch to MAN offloads yellow pumps, making yellow system pressure reduce to zero.

This action is carried out when there is no simultaneous low level warning in GREEN or BLUE tank.

END//

LOW LEVEL IN BLUE OR GREEN TANK
(with or without yellow low level)

AFFECTED AIR INTAKES HYD sel .... YELLOW E

Set the intake HYD selectors, for the intakes with HYD lights on, to YELLOW to confirm auto-change, and observe the HYD lights.

When an hydraulic tank low level warning is given an automatic onloading of yellow pumps, and a changeover of the affected intakes hydraulic supplies to the yellow system occurs.
If the warning is for the blue tank intakes 3 and 4 supplies change.
If warning is for the green tank intakes 1 and 2 supplies change. The intake HYD lights will be on for the affected intakes.

ALL TANK CONTENTS .... MONITOR E

Monitor the contents of all tanks.

IF YELLOW LEVEL FALLS OR L/LEVEL LT ON
MAXIMUM SPEED .... SUBSONIC C

REDUCE SPEED TO SUBSONIC

IF INTAKE HYD LT ON OR
SPEED SUBSONIC
RAMP SPILL MASTER .... MAN E

Set the RAMP SPILL MASTER switches of intakes being supplied by yellow hydraulic system to MAN.

A low level in blue or green tank followed by a low level in yellow after intake supply changeover indicates the leak of fluid is from an intake system. Setting the RAMP

(Unchanged)

contd.

HYDRAULIC POWER

SPILL MASTER switches to MAN cuts off hydraulic supplies to the associated intake and brings on the INTAKE lights (red).

APPLY PROCEDURE : INTAKE LIGHT ON

IF BLUE OR GREEN LEVEL CONTINUES TO FALL
RELAY JACK sel .... TOWARDS SERVICEABLE SYSTEM C

If the level of green or blue tank falls after changing intake supplies to yellow system, set the RELAY JACK selector to GREEN ONLY if leak is in blue tank and BLUE ONLY if leak is in green tank thereby isolating the blue or green hydraulic supplies from the relay jacks.

A GREEN ONLY selection will disengage No. 1 autopilot
A BLUE ONLY selection will disengage No. 2 autopilot

IF BLUE OR GREEN LEVEL CONTINUES TO FALL
RELAY JACK sel .... NORM C

Set the RELAY JACK selector to NORM thereby restoring availability of autopilots.

SERVO CONTROL YELLOW rty sel .... YELLOW BLUE OR YELLOW GREEN C

If the blue or green level continues to fall pull and rotate the rotary selector toward the appropriate position YELLOW/BLUE if blue level falling YELLOW/GREEN if green level falling.

This isolates the green or blue hydraulic system from flying controls and replaces it by yellow system
Monitor YELLOW tank level.

IF YELLOW LEVEL FALLS
AWAIT FLYING CONTROL SYSTEM ISOLATION

If yellow system level falls after changeover of flying controls hydraulic supplies, wait until the yellow supply is automatically isolated from flying control by yellow tanks first low level warning.

APPLY PROCEDURE : LOW HYDRAULIC PRESSURE AT FLYING CONTROLS

IF BLUE OR GREEN LEVEL CONTINUES TO FALL
HYD PUMPS OF AFFECTED SYSTEM .... OFF E

Set the hydraulic pump selectors of leaking system to OFF.

END//

A complete summary of the effects of loss of hydraulic systems is given in the CHECKLISTS VOL.II.07.04.05/06.

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(Completely Revised)

YELLOW HYD FLUID O/HEAT AND/OR O/PRESS

PRESSURE GREATER THAN 4500 PSI

PUMP sels (2) .... ON E

Set yellow pumps selectors to ON to ensure both pumps are not inadvertently off-loaded during drill.
A pressure greater than 4500 psi may be cause of O/HEAT condition.

YELLOW PUMPS sw .... MAN E

Unguard and set YELLOW PUMPS switch to MAN making the AUTO position of yellow pumps selectors an OFF position

LH PUMP sel .... AUTO E

Set the left hand yellow pump selector to AUTO, this position off-loads the left hand pump, observe the yellow system pressure gauge. If the pressure reduces to normal leave the left hand pump selector at AUTO and continue system operation on single pump.

IF PRESSURE REMAINS GREATER THAN 4500 PSI

LH PUMP sel .... SHUT E

The pressure remaining greater than 4500 psi may be caused by the left hand pump failing to off-load when switched off, or the right hand pump.
Setting the left hand pump selector to SHUT stops all output from the pump if the pressure remains greater than 4500 psi the pump giving the over pressure is the right hand pump

IF PRESSURE REMAINS GREATER THAN 4500 PSI

LH PUMP sel .... ON E

Set the left hand pump selector to ON to onload the pump, and set the guard.

RH PUMP sel ....AUTO E

Set the right hand pump selector to AUTO to off-load the pump, this should reduce system pressure.

IF PRESSURE REMAINS GREATER THAN 4500 PSI

RH PUMP sel .... SHUT E

Set the right hand pump selector to SHUT to stop all output from the pump.

END//

(Unchanged)

CAUTION
IF A PUMP SELECTOR HAS REMAINED AT SHUT FOR LONGER THAN 30 MINUTES DO NOT BRING THIS PUMP BACK INTO USE.

●▶ PRESSURE NORMAL (4000 PSI) OR PRESSURE GAUGE U/S
YELLOW PUMPS sw ....MAN E

Unguard and set YELLOW PUMPS switch to MAN making the AUTO position of yellow pumps selectors an OFF position.

PUMP SELS (2) .... AUTO E

Set both yellow pumps selectors to AUTO, to off-load the yellow pumps and reduce yellow system pressure to zero.

END//

BLUE/GREEN HYD FLUID O/HEAT AND/OR O/PRESS

PRESSURE GREATER THAN 4500 PSI
LH PUMP sel .... OFF E

Set the left hand pump selector of system with overpressure to OFF, observe the associated system pressure gauge, if system pressure reduces to normal, leave the left hand pump selector to OFF and continue system operation on single pump.

IF PRESSURE REMAINS GREATER THAN 4500 PSI
LH PUMP sel ....SHUT E

The pressure remaining greater than 4500 psi may be caused by the left hand pump failing to off-load when switched off or the right hand pump.
Setting the left hand pump selector to SHUT stops all output from the pump, if the pressure remains greater than 4500 psi the pump giving the overpressure is the right hand pump.

IF PRESSURE REMAINS GREATER THAN 4500 PSI
LH PUMP sel .... ON E

Set the left hand pump selector to ON to on load the pump, and set the guard.

RH PUMP sel .... OFF E

Set the right hand pump selector to OFF observe the associated system pressure gauge, if system pressure reduces to normal leave the right hand pump selector at OFF and continue system operation on single pump

IF PRESSURE REMAINS GREATER THAN 4500 PSI
RH PUMP sel ....SHUT E

Set the right hand pump selector to SHUT to stop all output from the pump

END//

CAUTION
IF A PUMP SELECTOR HAS REMAINED AT SHUT FOR LONGER THAN 30 MINUTES DO NOT BRING THIS PUMP BACK INTO USE.

(Unchanged)

HYDRAULIC POWER

<u>PRESSURE NORMAL (4000 PSI) OR PRESSURE GAUGE U/S</u>

HYD SELS FOR AFFECTED INTAKES ....YELLOW E

Set the affected intake HYD selectors to YELLOW, if overheat in green system set intakes 1 and 2 to YELLOW and if overheat is in blue system set intakes 3 and 4 to YELLOW

SERVO CONTROLS YELLOW rty sel ....YELLOW GREEN OR YELLOW BLUE C

Pull and rotate the SERVO CONTROLS YELLOW rotary selector towards the system with O/HEAT warning.
Observe yellow system pressure normal.

PUMP SELS FOR AFFECTED SYSTEM .... OFF E

Set the PUMP selectors for system with O/HEAT warning to OFF.

END//

HYDRAULIC PUMP LOW PRESSURE

BLUE OR GREEN PUMP LOW PRESSURE

FAILED PUMP .... OFF E

Set failed pump selector to OFF

IF FLYING CONTROLS IN GREEN ELECTRIC SIGNALLING MODE
WHEN LANDING GEAR LOWERING REQUIRED.
APPLY PROCEDURE : LANDING GEAR STANDBY LOWERING.

The landing gear is lowered using the standby system to prevent signalling lane change which would occur due to green pressure reduction with gear lowering.

END//

YELLOW PUMP LOW PRESSURE

NON-FAILED PUMP .... ON E

Set non-failed pump selector to ON to prevent inadvertent off-loading.

FAILED PUMP .... AUTO E

Verify the failed pump selector at AUTO.

YELLOW PUMPS sw .... MAN E

Unguard and set the YELLOW PUMPS switch to MAN to off-load the failed pump.

END//

NOTE

With the YELLOW PUMPS switch at MAN the non failed selector is to remain in the ON position to keep system pressurised. This provides for continued operation and auto change to the standby system should a subsequent failure of a main hydraulic system occur.

(unchanged)

ADC FAILURE

If transient failure of an ADC occurs it may be possible to regain it by reset action. At least two seconds must elapse after failure indication before reset is effective.

ASI & ALTIMETER.............................. STANDBY MODE CP

Rotate Captain's or First Officer's ASI and Altimeter mode selector to S (standby).
When at S (standby) the ASI and Altimeter receive information from the nose pitot probe.

FAILED ADC .... OFF P

Set the failed ADC switch to off and monitor the performance of the engaged ADC by comparison with the standby airspeed, altitude and Mach data and general monitoring of other indicators to confirm the validity of the incidence data.

NOTE

If when flying with only one ADC operative, a difference is detected between the standby data and the ADC data, in certain phases of flight (especially at high Mach number) it may be difficult to decide which of the systems is at fault. In these circumstances reference to the air intake fault detection system sensor unit failure lights may assist in determining which system is at fault, since this system monitors the output of the flight instrument pitot/static data sources.

Failed System	Indication
Nose Probe	SU2
ADC 1	SU1
ADC 2	SU3 or SU4

AFFECTED AUTOSTAB.. OFF P

Set associated AUTOSTAB switches (3) to OFF

AFFECTED ANTI-STALL SYSTEM .... OFF P

Set associated ANTI-STALL SYSTEM switch to OFF

NAVIGATION SYSTEM

TRANSPONDER ALT RPTG .... OPERATING ADC P

This ensures that the altitude output of ATC TRANSPONDER is supplied by the serviceable ADC.

<u>IF A SYMMETRIC PAIR OF ENGINES EXCEED OPERATING CRUISE RATING AT STATIC TEMPERATURES COLDER THAN -51 DEG.C</u>

THROTTLE MASTERS .... OTHER LANE E

Set THROTTLE MASTER selectors for affected engines to opposite selection, MAIN or ALTERN.

SECONDARY AIR DOORS .... ABOVE 220 KT OPEN
BELOW 220 KT SHUT E

Set the SECONDARY AIR DOORS selectors to OPEN at speeds greater than 220 KT and to SHUT at speeds less than 220 KT.

MAXIMUM SPEED .... VMO MINUS 10 KT
MMO MINUS .05M C

This limitation is necessary because the ADC comparator function is lost with one ADC off.

END//

CAUTION

1. DO NOT USE THE AUTOPILOT IN MAX SPEED MODES DUE TO RISK OF A DRIFT IN LIMIT SPEED DATA GOING UNDETECTED.

2. DO NOT RE-ENGAGE THE ANTI-STALL SYSTEM ASSOCIATED WITH THE FAULTY ADC.

3. AFTER LOSS OF ADC 1, NO.1 AUTOSTAB SHOULD NOT BE RE-ENGAGED UNLESS NO.2 AUTOSTAB FAILS.

A complete summary of the effects of ADC failure is given in the CHECKLISTS Vol. 2B 07.05.04/07.

FAILURE OF CAROUSEL INS

STANDBY HORIZON .... USE C

Use the STANDBY HORIZON until it is established that information on ADI is correct.

FAILED INS .... IDENTIFY CP

Identify the failed INS by reference to the INS annunciator lights.

IF INS 1 OR INS 2 FAILED
ATT INS sw .... INS 3 CP

Set the ATT/INS switch to INS 3 to transfer the attitude source for the ADI to a serviceable INS and observe the G flag disappears. The weather radar system associated with the failed INS should not be used.

CLEAR ANY REMAINING FLAGS BY
APPROPRIATE SWITCH ACTION

To assist in the clearance of any remaining warning flags by the appropriate switch action: consult procedure NAVIGATION SYSTEM ABNORMAL INDICATIONS

CDU DATA sel .... DSRTK/STS CP

Rotate DATA selector on failed INS to DSRTK/STS position in preparation for tests.

TEST pb ....PRESS AND RELEASE CP

Press and release the TEST push button and observe action code display

IF ACTION CODE RETURNS
01 CODE .... OFF E

If action code 01 returns shut down the associated INS.

02 CODE .... ATT E

If action code 02 returns set the MSU rty sel to ATT.

03 CODE........................ ATT IF NAV DATA DEGRADES E

If action code 03 returns watch data displays and flight instruments for degradation.
Select ATT mode if necessary.

04 CODE - GROUND OPERATION ONLY

With aircraft on ground and stationary select STBY and carry out full loading procedure.

contd.

NAVIGATION SYSTEM

05 CODE .... CHECK MAL CODE CP

If action code 05 returns press TEST button and observe malfunction code

<u>IF MAL CODE 55</u>
NAV AID DATA .... RELOAD CP
Reload NAV AID data via the ADEU

06 CODE .... CHECK MAL CODE CP
If action code 06 returns press TEST button and observe malfunction code

<u>IF MAL CODE 41 OR 43</u>
PRESENT POSITION .... RELOAD CP

<u>IF MAL CODE 49</u>
MANUAL UPDATE .... CHECK AND FLUSH IF NECESSARY CP

Check the accuracy of the manual update and if necessary remove the update using the flushing procedure

END//

<u>IF ACTION CODE DOES NOT RETURN</u>
FLIGHT SYSTEM SWITCHES .... NORMAL CP

END//

NOTE

1. When an INS is set to ATT the Flight Director, Autopilot (except in INS and TRK modes) and Autothrottle may be used providing the associated compass coupler is supplied by INS 3 with INS 3 in NAV mode.

2.

If INS 1 switched OFF	AP/FD 1, AT 1 and weather radar No.1 stabilisation are lost.
If INS 2 switched OFF	AP/FD 2, AT 2 and weather radar No.2 stabilisation are lost.

NAVIGATION SYSTEM ABNORMAL INDICATIONS

G flag visible on ADI

ATT/INS sw .... INS 3 C/P

Set the ATT INS switch to INS 3 to obtain the attitude source for the ADI from a serviceable INS and observe the G flag disappears.

The weather radar system associated with the failed INS should not be used.

END//

ADI CHECK ATT lts (amber) on

STANDBY HORIZON .... CROSSCHECK AGAINST ADIs C/P

The malfunctioning ADI may have a G flag in view.

ATT INS sw .... INS 3 C/P

Set the ATT INS switch to INS 3 to obtain the attitude source for the ADI from a serviceable INS and observe the CHECK ATT lights off.

The weather radar system associated with the failed INS should not be used.

END//

HDG flag visible on HSI

(With RAD INS switch at INS)

NAV INS sw ....OTHER INS C/P

Set the NAV INS switch to NAV INS 1 or NAV INS 2 to obtain the navigational and true heading data from a serviceable INS and observe the HDG flag disappears.

(With RAD INS switch at RAD)

COMP sw ....OTHER SYSTEM C/P

Set the COMP switch to COMP 1 or COMP 2 to obtain the magnetic heading data from a serviceable compass coupler and observe HDG flag disappears.

END//

HSI HDG lts (amber) on

(With RAD INS switch at RAD)

Since there are only two compass systems, it may be difficult to determine the malfunctioning compass if no HDG flag visible or INS WARN light on.

Compare the standby compass with the HSI compass cards and observe the compass controller synchronization annunciator The unserviceable compass will probably be out of synch. As a last resort true headings of the INS may be crosschecked and then corrected for chart magnetic heading.

COMP sw ....OTHER SYSTEM C/P

Set the COMP switch to COMP 1 or COMP 2 to obtain the magnetic heading data from a serviceable compass coupler and observe both HDG lights off.

(With RAD INS switch at INS)

Compare the INS for true headings

NAV INS sw ....OTHER INS C/P

Set the NAV INS switch to NAV INS 1 or NAV INS 2 to obtain the navigational and true heading data from a serviceable INS and observe both HDG lights off.

END//

Heading Failure flag visible on RMI

COMP sw ....OTHER SYSTEM C/P

Set the COMP switch to COMP 1 or COMP 2 to obtain the magnetic heading data from a serviceable compass coupler and observe Heading failure flag disappears.

END//

Navigation flag visible on HSI

(With RAD INS switch at INS)

NAV INS sw ....OTHER INS C/P

Set the NAV INS switch to NAV INS 1 or NAV INS 2 to transfer the navigational and true heading data from a serviceable INS and observe the Navigation flag disappears.

(With RAD INS switch at RAD)

DEV sw ....OTHER SYSTEM C/P

Set the DEV switch to DEV 1 or DEV 2 to obtain the supply of HSI data from a serviceable VOR and/or ILS receiver and observe Navigation flag disappears.

END//

G/S flag visible on HSI and ADI

DEV sw ....OTHER SYSTEM C/P

Set the DEV switch to DEV 1 or DEV 2 to obtain the supply of glide slope data from a serviceable ILS receiver and observe G/S flag disappears.

END//

LOC flag visible in ADI

DEV sw ....OTHER SYSTEM C/P

Set the DEV switch to DEV 1 or DEV 2 to obtain the supply of localiser data from a serviceable ILS receiver and observe LOC flag disappears.

END//

Position Discrepancy is noted between INS

Discrepancy on INS 1 or INS 2

NAV INS sw ....OTHER INS C/P

Set the NAV INS switch to NAV INS 1 or INS 2 to obtain the navigational data from a serviceable INS.

CAUTION
DO NOT USE AP 1 (OR AP 2) IN INS MODE

Discrepancy in INS 3.

No action.

END//

INS COMP lt (amber) on

The comparison of INS data is inhibited, the attitude and navigation data must therefore be monitored by the crew.

END//

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ELECTRICAL

AC MAIN BUS LIGHT ON

If No.3 a.c. main busbar fails ADC 2 will be lost, This causes a spurious overspeed warning which can be cancelled by switching off ADC No.2.

It is possible that a single a.c. main busbar fault will momentarily cause a failure of the other a.c. main busbars.

ENGINE FEED PUMPS .... ALL ON E

Verify all ENGINE FEED PUMPS are switched ON as a precaution, since loss of an a.c. busbar will lose some feed pump supplies.

BTB sel .... TRIP E

Set the associated BTB selector to TRIP to confirm auto disconnect.

An a.c. main busbar fault will automatically trip the BTB and thus disconnect the affected busbar from the other a.c. main busbars.

GENERATOR .... TEST
CHECK VOLTS
& FREQUENCY E

Set the associated generator selector to TEST and the AC FREQ/VOLTS selector to the GEN number of the affected channel.
The frequency and volts should be observed normal.

Systems data:

AC frequency	396 to 404 Hz
AC volts	110 to 118 volts

An a.c. main busbar fault will automatically open the GCB and thus disconnect the affected generator from its associated a.c. main busbar.

IF VOLTS AND/OR FREQUENCY ARE ABNORMAL
GENERATOR .... OFF E

Set the associated generator selector to OFF.

Observe the associated GEN light (amber) is on, the associated GCB MI shows crossline, the KW KVAR meter reads 0 and the KW indications on the remaining generators are within limits.

contd.

SSB sw .... OPEN E

Set The SSB switch to OPEN thereby isolating No.1 and No.2 a.c. main busbars from No.3 and No.4 main busbars.

With an a.c. main busbar dead and the associated BTB open, setting the SSB switch to OPEN ensures that when the BTB selector is subsequently placed to RESET, the two busbars on the other side of the aircraft cannot be affected by any latent fault in the dead busbar.

BTB sel .... RESET E

Set the BTB selector to RESET and release, observe the AC MAIN BUS light off and the BTB MI inline.

CAUTION
WHEN THE BUSBAR SUPPLY HAS BEEN RECOVERED BY THE BTB SWITCH ACTION, THE ASSOCIATED GENERATOR MUST NOT BE RESELECTED.

IF AC MAIN BUS LIGHT ON, BTB MI CROSSLINE
BTB sel .... TRIP E

Set the BTB selector to TRIP thereby disconnecting the associated a.c. main busbar from the others, observe GEN light (amber) on and GCB and BTB MIs crossline.

SSB sw .... CLOSE E

Set the SSB switch to CLOSE to automatically parallel generators when voltage and frequency compatible, observe SSB MI inline.

NOTE
One a.c. main busbar has been lost.
Loss of a.c. main bus No.2 also loses busbars 10x and 12x.
Loss of a.c. main bus No.3 also loses busbars 11x and 13x.

IF NO 3 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 2 TO B
3 TO A E

With the AIR INTAKE LANE rotary selector for intake No.3 at the non-auto A position and intake No.2 at non-auto B position, the A control lane of intake No.3 and the B control lane of intake No.2 are powered from the a.c. essential busbars.

contd.

ELECTRICAL

IF NO 4 AC MAIN BUS LT ON

AIR INTAKE LANE rty sels .... 1 TO A
4 TO B E

With the AIR INTAKE LANE rotary selector for intake No. 1 at the non-auto A position and intake No.4 at the non-auto B position, the A control lane of intake No.1 and the B control lane of intake No.4 are powered from the a.c. essential busbars

END//

IF AC MAIN BUS LT OFF, BTB MI INLINE

SSB sw .... CLOSE E

Set the SSB switch to CLOSE to automatically parallel generators when voltage and frequency compatible, observe SSB MI inline.

EMERG GEN NORM/ISOL sw .... ISOL THEN NORM E

Set the EMERG GEN NORM/ISOL switch to ISOL for five seconds to switch off the emergency generator then return switch to NORM, observe SELECTED light off.

Failure of an a.c. main busbar automatically switches on the emergency generator which remains latched on until switched off by momentarily selecting ISOL.

ENGINE FEED PUMPS .... AS REQUIRED E

Set the ENGINE FEED PUMPS switches to agree with pump condition.

END//

IF VOLTS AND FREQUENCY ARE NORMAL

GENERATOR .... ON E

Set the generator selector to ON to connect its output to its a.c. main busbar.

The GEN light should be observed off.

IF AC MAIN BUS LT ON

GENERATOR .... OFF E

Set the associated generator selector to OFF.

Observe the associated GEN light (amber) is on, the associated GCB MI shows crossline, the KW KVAR meter reads 0 and the KW indications on the remaining generators are within limits.

SSB sw .... OPEN E

Set the SSB switch to OPEN thereby isolating No.1 and

contd.

No.2 a.c. main busbars from No.3 and No.4 a.c. main busbars.

With an a.c. main busbar dead and the associated BTB open, setting the SSB switch to OPEN ensures that when the BTB selector is subsequently placed to RESET, the two busbars on the other side of the aircraft cannot be affected by any latent fault in the dead busbar.

BTB sel .... RESET E

Set the BTB selector to RESET and release.
The AC MAIN BUS light should be observed off and the BTB MI inline.

CAUTION
WHEN THE BUSBAR SUPPLY HAS BEEN RECOVERED BY THE BTB SWITCH ACTION, THE ASSOCIATED GENERATOR MUST NOT BE RESELECTED

<u>IF AC MAIN BUS LIGHT ON, BTB MI CROSSLINE</u>
BTB sel .... TRIP E

Set the associated BTB selector to TRIP to confirm auto disconnect.

The GEN light (amber) should be observed on, the GCB and BTB MIs crossline.

SSB sw .... CLOSE E

Set the SSB switch to CLOSE to automatically parallel generators, when voltage and frequency compatible, observe SSB MI inline.

NOTE
One a.c. main busbar has been lost.
Loss of a.c. main bus No.2 also loses busbars 10x and 12x.
Loss of a.c. main bus No.3 also loses busbars 11x and 13x.

<u>IF NO.3 AC MAIN BUS LT ON</u>
AIR INTAKE LANE rty sels .... 2 TO B
3 TO A E

With the AIR INTAKE LANE rotary selector for intake No.3 at the non-auto A position and intake No.2 at the non-auto B position, the A control lane of intake No.3 and the B control lane of intake No.2 are powered from the a.c. essential busbars.

contd.

<u>IF NO.4 AC MAIN BUS LT ON</u>

AIR INTAKE LANE rty sels .... 1 TO A
4 TO B E

With the AIR INTAKE LANE rotary selector for intake No.1 at the non-auto A position and intake No.4 at the non-auto B position, the A control lane of intake No. 1 and the B control lane of intake No.4 are powered from the a.c. essential busbars.

END//

<u>IF AC MAIN BUS LT OFF, BTB MI INLINE</u>

SSB sw .... CLOSE E

Set the SSB switch to CLOSE to automatically parallel generators, when voltage and frequency compatible observe SSB MI inline.

EMERG GEN NORM/ISOL sw .... ISOL THEN NORM E

Set the EMERG GEN NORM/ISOL switch to ISOL for five seconds to switch off the emergency generator then return switch to NORM, observe selected light off.

ENGINE FEED PUMPS .... AS REQUIRED E

Set the ENGINE FEED PUMPS switches to agree with pump condition.

END//

<u>IF AC MAIN BUS LT OFF, GCB MI INLINE</u>

EMERG GEN NORM/ISOL sw .... ISOL THEN NORM E

Set the EMERG GEN NORM/ISOL switch to ISOL for five seconds to switch off the emergency generator then return switch to NORM, observe selected light off.

contd.

ELECTRICAL

ENGINE FEED PUMPS .... AS REQUIRED E

Set the ENGINE FEED PUMPS switches to agree with pump condition.

END//

NOTE
The navigation lights are inoperative if No. 1 a.c. main busbar 1x is lost.
The anti-collision lights are inoperative if No. 4 a.c. main busbar 4x is lost.

CAUTION
WHEN GENERATOR SUPPLY HAS BEEN RECOVERED AFTER AN AC MAIN BUS FAILURE, THE BTB SHOULD NOT BE RESET.

CAUTION
WHEN BUSBAR SUPPLY HAS BEEN RECOVERED BY BTB SWITCH ACTION THE ASSOCIATED GENERATOR MUST NOT BE RESELECTED.

AC ESS BUS LIGHT ON

With No. 1 AC ESS BUS light on, busbars 5x, 32x and 33x are lost.

With No. 2 AC ESS BUS light on, busbars 6x, 12x and 14x are lost.

With No. 3 AC ESS BUS light on busbars 7x, 13x and 15x are lost.

With No. 4 AC ESS BUS light on busbar 8x is lost.

AC ESS BUS sw .... EMERG E

Set the associated AC ESS BUS, NORM EMERG switch to EMERG, observe the AC ESS BUS light off and the SELECTED light (blue) on.

IF No.3 ESS BUS SW AT EMERG
ADC 2 .... OFF P

ADC No.2 will be lost. To prevent the nuisance of spurious overspeed warnings ADC No.2 is switched off.

IF AC ESS BUS LT REMAINS ON
EMERG GEN .... MANUAL E

Set the EMERG GEN selector to MANUAL and verify the EMERG GEN, NORM/ISOL switch is at NORM thereby causing the emergency generator to run. Observe the AC ESS BUS light off and the SELECTED light (blue) on.

If No. 2 a.c. essential busbar 6x is supplied from the emergency generator, busbars 10x and 12x are shed.

If No. 3 a.c. essential busbar 7x is supplied from the emergency generator, busbars 11x and 13x are shed.

If busbar 11X is shed ADC No.2 is lost. This causes a spurious overspeed warning which can be cancelled by switching off ADC No.2.

END//

contd.

The following major services are NOT AVAILABLE with

No.2 AC ESS BUS switch at EMERG	No.3 AC ESS BUS switch at EMERG
No.1 - AFCS - Autothrottle - Electric Trim - Safety Flight Control - Radar Blue & green Hydraulic contents gauges Nosewheel steering No.2 Compass standby supply	No.2 - AFCS - Autothrottle - Electric Trim - Autostabs - Artificial Feel - Safety Flight Control - ADC, ADI & HSI - ILS, VOR, DME & ADF - Captains VOR/RMI - Co-pilots ADF/RMI - Radio Altimeter Yellow Hydraulic Contents gauge No.2 compass normal supply

NOTE

No.2 compass will only be inoperative if both No.2 and No.3 switches are at EMERG.

EMERG GEN FAIL LIGHT ON

FAIL LT .... PRESS AND RELEASE E

Pressing the FAIL light resets the excitation circuit if it has been de-excited, observe FAIL light off.

IF FAIL LT REMAINS ON
EMERG GEN .... CHECK VOLTS & FREQUENCY E

Set the AC FREQ/VOLTS rotary selector to EMERG PWR. The AC FREQUENCY and VOLTS meters should be observed on-scale.

It is possible for a small undervoltage or underfrequency to operate the FAIL light but for the generator to be giving an acceptable output.

The above actions have done all that is possible to regain the emergency generator. If the AC VOLTS and/or FREQUENCY meters read off-scale or zero it is now necessary to isolate the emergency generator to reduce possibility of electrical and/or hydraulic system damage.

IF OFF-SCALE OR ZERO
EMERG GEN NORM/ISOL sw .... ISOL E

Set the EMERG GEN, NORM ISOL switch to ISOL to stop the generator from running, observe the O/HEAT light goes off.

SYSTEMS POWERED BY THE
AFFECTED AC ESSENTIAL BUSBARS .... MONITOR E

Monitor systems powered by the affected a.c. essential busbars.

END//

FAILURE OF ONE OR TWO GENERATORS

GENERATOR .... TEST
CHECK VOLTS
& FREQUENCY E

Set the associated generator selector(s) to TEST and the AC FREQ/VOLTS selector to the GEN number of the affected channel(s), observe frequency and volts normal.

Systems data:

AC frequency	396 to 404 Hz
AC volts	110 to 118 volts

<u>IF VOLTS AND FREQUENCY ARE ABNORMAL</u>

GENERATOR .... OFF E

Set the associated generator selector to OFF.

Observe the associated GEN light (amber) is on, the associated GCB MI shows crossline, the KW KVAR meter reads 0 and the KW indications on the remaining generators are within limits.

<u>IF KW INDICATIONS ON REMAINING GENERATORS ARE ABOVE LIMITS</u>

ELECTRICAL LOADS .... REDUCE E

Reduce electrical loads until the KW indications are within limits.

END//

<u>IF VOLTS AND FREQUENCY ARE NORMAL</u>

GENERATOR .... ON E

Set the generator selector to ON to connect its output to its a.c. main busbar.

NOTE

If two main generators are off-line and WING & INTAKE ANTI-ICING is selected, monitor loads and shed galleys if necessary.

END//

DC ESS BUS LIGHT ON

BATTERY sel .... BATT ON E

Set the battery selector to BATT ON and observe indication on battery ammeter within limits.

<u>IF BATTERY AMMETER OFF SCALE</u>
BATTERY sel .... BATT OFF E

Set the battery selector to OFF and observe BATT ISOLATE light (amber) on.

TRU sws .... ALL NORM E

Verify TRU NORM ISOL switches (4) at NORM

DC VOLTS sel .... AFFECTED BUSBAR E

Rotate DC VOLTS selector to affected busbar and observe voltage acceptable.

<u>IF ESS B VOLTAGE NOT ACCEPTABLE</u>
EMERG GEN .... MANUAL E

Unguard and set the EMERG GEN selector to MANUAL and observe SELECTED light (blue) on.

<u>When d.c. essential B busbar 4P fails</u>
The a.c. essential busbars 7X and 8X transfer to the emergency generator which must be started manually.

<u>The following are not available</u>

Avionics "B" busbar 11X
26V a.c. main "B" busbar 13X
Flying controls "B" busbar 23X (Blue channel)
BTB 3 and 4 SSB
Automatic selection of the emrgency generator

END//

<u>When d.c. essential A busbar 3P fails</u>
The a.c. essential busbars 5X and 6X transfer to the emergency generator which starts automatically.

<u>The following are not available</u>

Avionics "A" busbar 10X
26V a.c main "A" busbar 22X (Green channel)
BTB 1 and 2 SSB
Manual selection of the emergency generator.

END//

DC MAIN BUS LIGHT ON

Observe the essential main split MIs(2) inline.

The d.c. main busbar is in two parts, 1P and 2P, connected by fuses and each part is protected by its own undervoltage unit.

IF ESSENTIAL MAIN SPLIT MI(s) NOT INLINE

BATTERY sels (2) .... BATT ON   E

Verify battery selectors (2) at BATT ON

DC VOLTS sel .... MAIN A   E

Rotate DC VOLTS selector to MAIN A and observe voltage normal.

IF VOLTMETER READING IS 0

No.2 TRU sw .... NORM   E

Verify No.2 TRU switch is at NORM and observe No.2 TRU ammeter reads 0

REPEAT OPERATION FOR MAIN B (No.3 TRU)   E

END//

CSD LIGHT ON

CSD .... DISC E

Unguard and set the CSD disconnect switch to DISC and release.

Reset of the CSD is only possible on the ground with the engine stopped.

GENERATOR .... OFF E

Set the associated generator selector to OFF.

Observe the associated GEN light (amber) is on, the associated GCB MI shows crossline, the KW KVAR meter reads 0 and the KW indications on the remaining generators are within limits.

<u>IF KW INDICATIONS ON REMAINING GENERATORS ARE ABOVE LIMITS</u>

<u>ELECTRICAL LOADS</u> .... REDUCE E

Reduce the electrical loads until the KW indications are within limits.

END//

CSD OIL INLET TEMPERATURE LIGHT ON

CSD OIL INLET TEMPERATURE .... MONITOR E

Monitor the CSD OIL INLET temperature. The response rate of oil temperature to corrective action is relatively slow, therefore early warning is given by the CSD OIL INLET temperature light to minimise the possibility of infringing CSD OIL INLET temperature limitation.

IF CSD OIL INLET TEMPERATURE EXCEEDS 155° C

ENGINE FUEL TEMPERATURE
(SECONDARY INSTRUMENTS PANEL) .... OBSERVE E

Observe on the power plant secondary instruments panel the engine fuel temperature.

IF ENGINE FUEL TEMPERATURE ABOVE 70° C

FUEL HEATER .... OFF E

Set associated FUEL HEATER selector to OFF.

ELECTRICAL LOAD .... REDUCE IF PRACTICABLE E

IF CSD OIL INLET TEMPERATURE REMAINS ABOVE 155° C FOR 5 MINS

CSD .... DISC E

Unguard and set the CSD disconnect switch to DISC and release.

Reset of the CSD is only possible on the ground with the engine stopped

GENERATOR .... OFF E

Set the associated generator selector to OFF.

Observe the associated GEN light (amber) is on, the associated GCB MI shows crossline, the KW KVAR meter reads 0 and the KW indications on the remaining generators are within limits.

END//

CSD HIGH DIFFERENTIAL TEMPERATURE

IF THE CSD OIL DIFF TEMPERATURE EXCEEDS:-
20°C FOR ELECTRICAL LOADS UP TO 30 KW
OR
30°C FOR ELECTRICAL LOADS ABOVE 30 KW

GENERATOR .... OFF   E

Set the associated generator selector to OFF.

Observe the associated GEN light (amber) is on, the associated GCB MI shows crossline, the KW KVAR meter reads 0 and the KW indications on the remaining generators are within limits.

Observe CSD OIL DIFF TEMPERATURE

IF CSD OIL DIFF TEMPERATURE REMAINS ABOVE 20° C
CSD .... DISC   E

If with the generator switched OFF the CSD OIL DIFF temperature remains above 20° C.

Unguard and set the CSD disconnect switch to DISC and release.

Reset of the CSD is only possible on the ground with the engine stopped.

END//

BATT ISOLATE LIGHT ON

BATTERY sel ....BATT ON OR ESS/MAIN SPLIT E

Verify the battery selector is at BATT ON or ESS/MAIN SPLIT.
The BATT ISOLATE light should be observed off and the battery MI inline.

<u>IF BATT ISOLATE LT ON</u>

BATTERY sel ....BATT OFF E

Set the battery selector to BATT OFF to disconnect the battery from associated d.c. busbar.

END//

TRU OVERHEAT LIGHT ON

TRU sw ....ISOL E

Set TRU NORM/ISOL switch to ISOL. Observe the TRU ammeter indicating zero and after a delay the O/HEAT light off.

The TRU will cool when the a.c. supply to it is broken.

The O/HEAT light will go off when the TRU temperature drops.

END//

GENERATOR FAILS TO PARALLEL

Parallel assist is required when a generator does not accept automatic paralleling with other generators already online indicated by associated GEN light being on and associated GCB MI showing crossline.

A.C. FREQ .... COMPARE E

Set the AC FREQ/VOLTS rotary selector to the off-line generator then to another generator online to compare their frequencies.

NOTE
With the a.c. main busbars paralleled the frequency of any generator connected to the busbars will be the busbar frequency.

P/ASSIST pb(s) ....PRESS E

If the offline generator frequency is lower than the busbar frequency press the P/ASSIST push button of the offline generator.
If the offline generator frequency is higher than the busbar frequency press the P/ASSIST push button of the online generators.

GEN LT/GCB MI .... OBSERVE E

Observe the GEN light and GCB MI of the offline generator.

IF GEN LT ON AND/OR GCB MI SHOWS CROSSLINE

IN FLIGHT

GENERATOR .... OFF E

Set associated generator selector to OFF and ensure remaining generators are within limits.

END//

ON GROUND

BTB sel .... TRIP E

Set the BTB selector of the offline generator to TRIP and release.

BTB TRIP is required when the PARALLEL ASSIST procedure does not succeed in paralleling a generator with other generators online.

ELECTRICAL

AC MAIN BUS lt .... OBSERVE E

Observe the AC MAIN BUS light associated with tripped BTB.

<u>IF AC MAIN BUS LT ON</u>
GENERATOR .... OFF E

Set the associated generator selector to OFF and ensure remaining generators are within limits.

BTB sel .... RESET AND RELEASE E

Set the BTB selector to RESET and release

END//

<u>IF AC MAIN BUS LT OFF</u>
APPLY PROCEDURE : MANUAL PARALLEL

MANUAL PARALLEL

CAUTION
MANUAL PARALLELING MUST NOT BE ATTEMPTED IF THERE IS A DIFFERENCE OF MORE THAN 6 Hz ACROSS THE BTB.

PARALLEL PUSH TO ARM pb ....PRESS TO ARM OBSERVE LT CYCLES DIM AND BRIGHT E

Selective pressing of the parallel assist push button may slow the rate of the light cycle.

Should there be difficulty in reducing the rate of cycle of the parallel push button light the SSB may be selected open before manual paralleling is attempted. The SSB closes on the auto parallel circuit when reselected after the BTB s have been reset.

<u>WHEN PARALLEL PUSH TO ARM PUSH BUTTON LIGHT IS DIM</u>

BTB sel .... RESET AND RELEASE E

Set the BTB selector to RESET and release

GEN LT, GCB MI and BTB MI .... OBSERVE E

<u>IF GEN LIGHT REMAINS OFF, GCB MI REMAINS INLINE, BTB MI SHOWS INLINE OR CROSSLINE</u>

PARALLEL PUSH TO ARM pb .... PRESS TO DISARM E

END//

<u>IF GEN LIGHT IS ON, GCB MI SHOWS CROSSLINE BTB MI SHOWS INLINE</u>

PARALLEL PUSH TO ARM pb .... PRESS TO DISARM E

GENERATOR .... OFF E

Set the associated generator selector to OFF and ensure remaining generators are within limits.

END//

LANDING GEAR STANDBY LOWERING

L/GEAR NORMAL LEVER .... NEUTRAL P

With the normal landing gear lever at NEUTRAL the landing gear door selector valves go to their neutral position, thus removing green hydraulic pressure from the gear and door jacks.

YELLOW HYD PUMPS .... ON E

Set the yellow hydraulic pump selectors to ON because the yellow hydraulics system supplies for gear standby lowering and yellow pumps are not automatically switched on by gear standby lowering selections.

STANDBY LOWERING LEVER .... DOORS FOR 4 SECS THEN WHEELS E

Lift the guard, depress handle catch and set the standby lowering lever to DOORS. Wait four seconds to enable doors to be fully open (thereby preventing door/gear fouling), then, pressing the handle catch and release catch, set lever to WHEELS.
Gear should then lower, successful lowering being shown by normal gear down indication. It should be noted that the gear doors will remain open indicated by the transit lights (red) remaining on.

L/GEAR NORMAL LEVER .... DOWN P

Set the normal landing gear lever to DOWN making it and gear position agree.

ENGINES .... SHUT DOWN NO 4 LAST E

Shut down No. 4 engine last to ensure yellow hydraulic pressure is maintained in standby lowering system until the ground locks are fitted.

NOTE
The landing gear doors remain open,avoid large side slip angles.
Large side slip angles will put excessive side loads on the open gear doors.

END//

MAIN GEAR FREE FALL

L/GEAR NORMAL LEVER .... NEUTRAL P

With the normal landing gear lever at NEUTRAL the landing gear door selector valves go to their neutral position, thus removing green hydraulic pressure from the gear and door jacks.

STANDBY LOWERING LEVER .... NEUTRAL E

With the standby lowering lever at NEUTRAL the landing gear standby selector valve goes to the neutral position, thus removing yellow hydraulic pressure from the landing gear and door jacks.

AT EMERGENCY CONTROL POSITION

Remove the detachable panel in the rear cabin, immediately above the main gear bay in the cabin floor to gain access to the free fall release mechanism. The Instruction label is under access panel.

contd.

EMERGENCY RELEASE OPERATION

1. MOVE OPEN INDEX ON KNURLED KNOB TO RED LINE.

Turn the knurled knob counter clockwise until the open index on the knurled knob aligns with red line, using the control lever if necessary to turn knob.

Operation of the knurled knob causes an auto-depressurization valve in the main landing gear hydraulic system to open thus confirming cut off of the green hydraulic pressure to the main landing gears. It also vents the return side of the main landing gear and door jacks to atmosphere thereby losing a small amount of green hydraulic fluid.

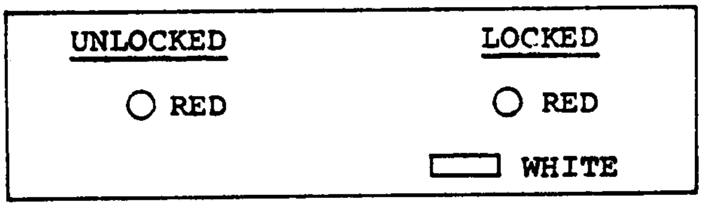
2. REMOVE PIN FROM BELLCRANK.

Insert the control lever in the top of the bellcrank facing forward and use the lever to relieve any pressure on the pip pin. Move the control lever to the right.

3. OPERATE BELLCRANK TO RIGHT HAND BY USE OF CONTROL LEVER.

The control lever when engaged with the bellcrank and moved to the right, through mechanical linkage releases the main landing gear and door uplocks. The main landing gear and doors free fall under their own weight and aerodynamic loads.

4. CHECK DOWNLOCK VISUAL INDICATION.



Press the optical viewer push button and observe indication through the eyepiece.

The light (red) on indicates that the viewer is serviceable and the bright line (white) indicates the gear is locked down.

5. IF DOWNLOCK IS NOT OBTAINED USE PNEUMATIC AID (LOCATED BETWEEN TWO CENTRE CROSSBEAMS).

If gear is not locked down remove cover from pneumatic line and attach to LH or/and RH pneumatic connector as appropriate, open cock to allow air into the telescopic side strut to lock leg down, when locked indication obtained close cock and remove air line from pneumatic connector.

Remove and stow control lever, replace panel.

(Unchanged)

contd.

L/GEAR NORMAL LEVER ....DOWN P

Move the guard to the left and set the normal landing gear lever to DOWN to make it and gear position agree.

END//

NOTE

The landing gear doors remain open.
Avoid large side slip angles.
If the green hydraulic system is not pressurised the tail wheel will not lower.

The above procedure takes approx. 3½ minutes.

LANDING GEAR

NOSE GEAR FREE FALL

L/GEAR NORMAL LEVER .... NEUTRAL P

With the normal landing gear lever at NEUTRAL the landing gear door selector valves go to their neutral position, thus removing green hydraulic pressure from the gear and door jacks.

STANDBY LOWERING LEVER .... NEUTRAL E

With the standby landing gear lever at NEUTRAL the landing gear standby selector valve goes to the neutral position, thus removing yellow hydraulic pressure from the landing gear and door jacks.

AT EMERGENCY CONTROL POSITION

Remove the detachable panel in the forward cabin immediately above the nose gear bay in the cabin floor to gain access to the free fall mechanism. The instruction label is next to the free fall controls.

contd.

EMERGENCY RELEASE OPERATION

1. PULL OUT PIN.

Remove the safety pin from the square drive to enable it to be moved.

2. LOCATE HAND WHEEL.

Fit the hand wheel on the square drive.

3. TURN HAND WHEEL FULLY CLOCKWISE

The hand wheel should be turned fully clockwise approximately six turns.

Operation of the hand wheel causes a decompression valve in the nose landing gear hydraulic system to direct pressure to the pressure and return valve isolating the normal hydraulic selectors from the green hydraulic system and connecting them to yellow return. It also opens the vent valves which allows the door and gear down lines to vent to atmosphere thereby losing a small amount of fluid and releases the door and gear uplocks allowing the gear to free fall.

4. CHECK DOWN LOCK VISUAL INDICATION

Remove the detachable panel in the forward cabin behind the free fall mechanism panel to gain access to the optical viewer.

UNLOCKED	LOCKED
○ RED	○ RED
	▭ WHITE

Press the optical viewer push button and observe indication through the eyepiece.

The light (red) on indicates that the viewer is serviceable and the bright line (white) indicates the gear is locked down.

L/GEAR NORMAL LEVER .... DOWN P

Set the normal landing gear lever to DOWN to make it and gear position agree.

END//

NOTE

The landing gear doors remain open, avoid large side slip angles.

WHEELS O/HEAT LIGHT ON IN FLIGHT

WITH LANDING GEAR UP

If shortly after take-off the WHEELS O/HEAT light comes on with landing gear up.

VISOR .... DOWN P

Verify that the visor is down since with the visor up landing gear normal lowering is inhibited.

LANDING GEAR .... DOWN P

Move the guard to the left and set the L/GEAR NORMAL LEVER to DOWN. The ENGINE RATING MODE sws will return to TAKE-OFF when the gear is lowered.

BRAKE FANS .... CONFIRM ON E

To assist in cooling the brakes, the BRAKE FANS sw should be set to ON.

WHEN BRAKES TEMP LESS THAN 150°C

LANDING GEAR .... UP: LTS OFF: NEUTRAL PE

Set the L/GEAR NORMAL LEVER to UP.

Observe landing gear position indication lights go off at the end of the retraction sequence.

Set L/GEAR lever to NEUTRAL.
Observe landing gear position indication lights off.

BRAKE FANS .... OFF E

Verify BRAKE FANS sw at OFF.

ENG RATING MODE .... FLIGHT E

Set the ENGINE RATING MODE sws to FLIGHT

END//

Contd

Deletio

WITH LANDING GEAR DOWN

PROVIDING SAFETY CONSIDERATIONS PERMIT LEAVE LANDING GEAR DOWN UNTIL BRAKES TEMP LESS THAN 150°C.

BRAKE FANS .... CONFIRM ON E

Verify BRAKE FANS switch is at ON during cooling of brakes.

END//

NOTE

If temperature 700 deg C for 5 minutes with gear down the warning can be considered false and gear may be retracted.

(Unchanged)

LANDING GEAR

USE OF BRAKES IN EMERG

The BRAKES FAIL light will come on to indicate a low hydraulic pressure condition in the normal brakes system.

THIS DRILL IS USED IF THE BRAKES FAIL LIGHT IS ON OR IF FOUR OR MORE R LIGHTS ARE OFF IN THE LANDING CHECKS.

BRAKE PEDALS .... RELEASE C

Release pressure from brake pedals before moving the brakes lever to EMERG to prevent possibility of brake overtorque.

BRAKES LEVER ....EMERG C

Pull BRAKES lever to EMERG, observe the BRAKES FAIL light off, BRAKES EMERG light (amber) on.

With the BRAKES lever at EMERG the brakes are hydraulically powered from the yellow system. Operation of the pilots pedals gives progressive and differential braking.

ANTI-SKID IS NOT AVAILABLE. USE THE BRAKES WITH CARE, APPLYING PRESSURE GENTLY AND MONITORING THE PRESSURE WITH REFERENCE TO THE BRAKES PRESSURE GAUGE.

ON A WET RUNWAY THE BRAKES MUST BE RELEASED EVERY 5 SECONDS AND THE FOLLOWING MAXIMUM PRESSURES MUST NOT BE EXCEEDED:

450 PSI AT SPEEDS ABOVE 75 KNOTS AND
900 PSI AT SPEEDS BELOW 75 KNOTS.

ON A DRY RUNWAY CONTINUOUS BRAKING TO A MAXIMUM OF 1100 PSI IS PERMITTED.

If use of the emergency braking system follows a loss in the yellow hydraulic system, only 15 brake applications are available from the brake accumulator.

APPLY BRAKES AS REQUIRED

LANDING GEAR

IF AIRCRAFT IS NOT BRAKED

BRAKES LEVER ....PARK P

Pull BRAKES lever to PARK.

CAUTION
PARK SHOULD ONLY BE USED WHEN ABSOLUTELY NECESSARY. NO MODULATION OF THE BRAKE PRESSURE IS AVAILABLE, BECAUSE AT PARK POSITION ALL AVAILABLE BRAKE ACCUMULATOR PRESSURE IS DELIVERED TO THE BRAKES.

END//

(Unchanged)

L/G ABNORMAL IND AFTER UP SELECT

The landing gear configuration is abnormal approximately 30 seconds after selection.

DO NOT EXCEED 250 KNOTS, AVOID EXCESS "G" C

LANDING GEAR - FAULT ANNUNCIATOR .... NOTE E

Observe and note state of landing gear indicator and landing gear fault annunciator.

VISOR ....VERIFY DOWN P

Verify the visor is down since with the visor up landing gear normal lowering is inhibited.

LANDING GEAR .... DOWN P

Move the guard to the left and set the L/GEAR NORMAL LEVER to DOWN.
Observe LH, NOSE, T and RH arrow lights (green) on and LH SHORT, RH SHORT, UPPER LOCKS and transit lights off at end of the lowering sequence.

<u>IF THE LANDING GEAR DOWN CONFIGURATION IS NOT CORRECT AFTER APPROXIMATELY 30 SECONDS</u>

APPLY PROCEDURE : LANDING GEAR STANDBY LOWERING

<u>IF THE LANDING GEAR DOWN CONFIGURATION IS CORRECT</u>

LANDING GEAR .... UP P

Set the L/GEAR NORMAL LEVER to up.
Observe the landing gear position indication lights go off at the end of the retraction sequence.

<u>IF THE LANDING GEAR CONFIGURATION IS NOT CORRECT</u>

LANDING GEAR - FAULT ANNUNCIATOR ....NOTE E

Observe and note state of landing gear indicator and landing gear fault annunciator.

LANDING GEAR .... DOWN P

END//

UPPER LOCKS LIGHT ON IN FLIGHT

CAUTION

1. AFTER LOWERING THE LANDING GEAR IT MUST NOT SUBSEQUENTLY BE RETRACTED.

2. THE LANDING GEAR MUST NOT BE SELECTED UP WITH THE UPPER LOCKS LIGHT ON.

AVOID EXCESS "G" CONDITIONS

END//

LOSS OF NOSEWHEEL STEERING

AT HIGH SPEED
STEER THE AIRCRAFT USING THE RUDDER PEDALS C

AT LOW SPEED
STEER THE AIRCRAFT USING DIFFERENTIAL BRAKING C

<u>WHEN THE AIRCRAFT SPEED IS APPROXIMATELY 5 KT</u>

NOSEWHEEL STEERING .... RESET P

Press the nosewheel steering push button, this will regain nosewheel steering if the failure was a transient one.

CAUTION

IF, WHEN THE RESET IS ATTEMPTED, THERE IS A STANDING SIGNAL FROM EITHER THE NOSE-WHEEL STEERING HANDLES OF THE RUDDER PEDALS, THE AIRCRAFT MAY TURN IN RESPONSE TO THE SIGNAL. IT IS THEREFORE ONLY SAFE TO USE THE RESET AT VERY LOW SPEEDS.

<u>IF THE NOSEWHEEL LIGHT ON</u>

CONTINUE WITH DIFFERENTIAL BRAKING FOR STEERING C

END//

HIGH ENERGY STOP

Following a high energy stop, energy absorption should be assessed by reference to brake temperature indication or by use of the brake kinetic energy graph. The kinetic energy graph is published in section 5 of the Cruise Control Manual and need only be used in the event of a brake temperature indication being unserviceable.

1. If the displayed (highest) brake temperature peaks at less than 700°C OR Kinetic Energy is less than 42.5 million Joules:-
   - (a) the aircraft may return to the ramp.
   - (b) record the PEAK brake temperatures.
   - (c) a visual inspection of tyres and water deflectors (including the nose position) must be carried out.
2. If any brake temperature is 700°C or greater OR Kinetic Energy is 42.5 million Joules or greater:-
   - (a) the aircraft must park clear of populated ramp areas.
   - (b) brake, wheel and tyre checks must be carried out as per Maintenance Manual 5-33-12.
   - (c) record each brake position that exceeds 700°C.

(Unchanged)

BRAKES OVERLOAD MI SHOWS WHITE (CLOVERLEAF)

ANTI-SKID R lts .... MONITOR P.E

Carefully monitor the ANTI-SKID R lts at speeds above 10 kt whilst taxiing and during the take-off roll.

<u>IF AT 10KT ANTI-SKID R lt(s) on</u>

TAKE-OFF .... ABANDON ALL

Abandon the take-off

END//

VISOR/NOSE UNLOCK LIGHT ON

●▶ WITH THE VISOR/NOSE UP

SPEED .... REDUCE TO LESSER OF 325 KT M = 0.95 C

Reduce speed using normal procedure to observe limitation with Visor/Nose up but unlocked, replan flight.

END//

●▶ WITH NOSE AT 5° OR DOWN AND NOSE MI READING UP

BEFORE LANDING

G.P.W. C/B .... TRIP E

Trip the Ground Proximity warning system circuit breaker to prevent nuisance warning on landing, when nose MI reads UP and the nose is down.

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4

AT LANDING

CG .... 52.5% E

Adjust the landing C.G. to 52.5% to compensate for the loss of artificial stability aids.

MINIMUM SPEED .... V_{REF} PLUS 10 KT C

Increase the V reference speed by 10 knots to take account of the loss of all high incidence protection systems.

NOTE

With the nose not in the up position the cause of the MI reading UP may be mechanical failure of the nose position transmitter. In this case both ADC incidence output signals used for indication and high incidence protection will be in error as follows:

Nose at 5° - Indicated incidence approximately 4° low.

Nose down - Indicated incidence approximately 11° low.

Continued

NOTE

In addition the weather radar datum will be along the droop nose axis. The datum can be corrected by setting the equivalent angle of the droop nose on the radar tilt selector (UP).

END//

IF 5^{O} LT ON

APPLY PROCEDURE NOSE 5^{O}L LIGHT ON.

NOSE 5°L LIGHT ON

Observe caution before lowering the nose.

CAUTION

WITH UNSAFE 5° LOCKS THE NOSE MAY, DURING THE LOWERING SEQUENCE, PASS THE 5° POSITION TOWARD THE DOWN POSITION. THEREFORE BEFORE SELECTING 5° REDUCE SPEED TO 270 KTS AND ALTITUDE BELOW 20000 FT.

WITH NOSE UP

CONTINUE WITH NORMAL FLIGHT.

Normal flight is permitted if the nose is to remain up, since the nose is positively held up by uplocks.

Observe the caution before lowering the nose.

END//

WITH THE NOSE AT 5°

NOSE .... SELECT UP P

Select the nose to up to engage the uplocks thereby preventing inadvertent movement of the nose to down.

Observe the caution before lowering the nose.

END//

VISOR/NOSE STANDBY LOWERING (VISOR UP TO NOSE 5°)

IF GREEN TANK LEVEL HAS FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR
APPLY PROCEDURE VISOR NOSE FREE FALL

If it appears that green hydraulic system fluid has been lost during or after the attempt to lower the visor do not use the STBY control as this may lead to loss of the yellow hydraulic system fluid.

END//

IF GREEN TANK LEVEL HAS NOT FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR
STBY CONTROL sw .... VISOR LOWER P

Lift guard and set NOSE/VISOR, STBY control switch to VISOR LOWER and observe the visor moves downwards, unlock light on then off, VISOR MI reads DOWN.

Setting the STBY control switch to VISOR LOWER onloads the yellow hydraulic system and selects it to release the visor uplock and drive the visor down.

When the standby system is used to lower the visor it must also be used to lower the nose.

If the visor will not lower and the yellow hydraulic system shows no signs of abnormality, the two most likely causes are, the visor hydraulic uplock may be inoperative or the visor may be frozen to the fuselage. Attempt to lower visor by lowering nose to 5°.

IF 5°L LT ON
SPEED .... REDUCE TO 270 KTS C
ALTITUDE .... BELOW 20,000 FT C

Observe caution when lowering the nose.

CAUTION
WITH UNSAFE 5° LOCKS THE NOSE MAY DURING THE LOWERING SEQUENCE PASS THE 5° POSITION, THEREFORE BEFORE LOWERING THE NOSE TO 5° REDUCE SPEED TO 270 KTS AND ALTITUDE BELOW 20,000 FT.

STBY CONTROL sw .... NOSE 5° P

Set the STBY control switch to NOSE 5° and observe the

contd.

NOSE AND VISOR

nose moves downwards, unlock light on then off, NOSE MI reads 5° and the 5°L light remains off.

Setting the STBY control switch to NOSE 5° selects the yellow hydraulic system to release the nose uplocks thus allowing the nose to fall to the 5° position under its own weight and aerodynamic loads.

If prior to selection of NOSE 5° the visor was at up the following sequence occurs:-
as the nose falls to 5° the visor moves with it.
A mechanical linkage trips the visor uplock and the visor is driven down, relative to the nose, by the yellow hydraulic system.

IF NOSE WILL NOT LOWER TO 5°
APPLY PROCEDURE: VISOR/NOSE FREE FALL

IF NOSE LOWERS TO 5°

WHEN REQUIRED

APPLY PROCEDURE: NOSE STANDBY LOWERING (5° to DOWN)

END//

NOSE AND VISOR

NOSE STANDBY LOWERING (5° TO DOWN)

● ▶ <u>IF GREEN TANK LEVEL HAS FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR</u>
PREPARE TO LAND WITH NOSE AT 5° AND
EXISTING VISOR POSITION C

GPW C/B .... TRIP E

The ground proximity warning system may be inhibited in order to prevent nuisance warnings when nose at 5° or higher by tripping the following circuit breaker.

GRND PROXIMITY WARNING AC SUP	13-215	G4

tripping this circuit breaker will inhibit all modes of operation of the ground proximity warning system.

END//

● ▶ <u>IF GREEN TANK LEVEL HAS NOT FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR</u>
STBY CONTROL sw .... NOSE DOWN P

Set the STBY control switch to NOSE DOWN and observe 5°L light on then off, unlock light on then off, down light (green arrow) on, NOSE MI reads DOWN.

The STBY control switches must be at VISOR DOWN and NOSE 5° to position the sequence plate before the STBY control switch can be moved to NOSE DOWN.

<u>IF NOSE WILL NOT LOWER TO DOWN</u>
PREPARE TO LAND AS PRESENTLY CONFIGURED C

GPW C/B .... TRIP E

The ground proximity warning system may be inhibited in order to prevent nuisance warning with nose at 5° or higher by tripping the following circuit breaker.

GRND PROXIMITY WARNING AC SUP	13-215	G4

END//

VISOR/NOSE FREE FALL

GPW C/B .... TRIP E

The ground proximity warning system may be inhibited in order to prevent nuisance warning with the nose at 5° or higher by tripping following circuit breaker.

CIRCUIT BREAKER	PANEL	GRID REF
GROUND PROXIMITY WARNING AC SUP	13-215	G4

Tripping this circuit breaker will inhibit all modes of operation of the ground proximity warning system.

<u>IF 5°L LIGHT ON</u>
SPEED .... REDUCE TO 270 KT C
ALTITUDE .... BELOW 20,000 FT C

CAUTION
WITH UNSAFE 5° LOCKS THE NOSE MAY DURING THE LOWERING SEQUENCE, PASS THE 5 ° POSITION TOWARD THE DOWN POSITION, THEREFORE BEFORE SELECTING 5° REDUCE SPEED TO 270 KTS AND ALTITUDE BELOW 20000 FT.

EMERGENCY NOSE/VISOR
UPLOCK RELEASE .... OPERATE FULLY TO ENGAGE LATCH E

Release the pip pin from the EMERGENCY NOSE/VISOR UPLOCK RELEASE and pull the handle outwards and upwards to fully engage the latch, observing the visor and/or nose lowers.

If prior to the handle being pulled upwards the visor was at up the following sequence occurs:

As the nose falls to 5° the visor moves with it, a mechanical linkage trips the visor uplock and the visor falls relative to the nose.

PREPARE TO LAND AS PRESENTLY CONFIGURED C

END//

VISOR FAILS TO RISE

Verify VISOR/NOSE lever UP

WINDSHIELD WIPERS .... PARKED P

Verify both windshield wipers are correctly parked below the red marks on the inside surface of the forward screen adjacent to the centre pillar using wiper EMERG PARK facility if necessary.

IF VISOR FAILS TO RISE WITH BOTH WIPERS CORRECTLY PARKED

WIPER O/RIDE sw .... WIPER O/RIDE P

Set WIPER O/RIDE switch to WIPER O/RIDE to bypass the visor raise inhibition.

IF VISOR FAILS TO RISE

WIPER O/RIDE sw .... NORMAL P

Set WIPER O/RIDE switch to NORMAL.

Replan flight with visor down

END//

IF VISOR RISES

WIPER O/RIDE sw .... NORMAL P

Set WIPER O/RIDE switch to NORMAL

END//

SHUT DOWN OF AIR CONDITIONING GROUPS

BLEED VALVES .... SHUT E

Set the associated BLEED VALVES switch to SHUT to prevent any hot air flow through the relief valve into the engine nacelle and observe the associated BLEED VALVES MI shows crossline.

COND VALVE .... OFF E

Set the associated COND VALVE selector to OFF and observe the conditioning valve MI crossline.

ASSOCIATED GROUP sw .... FAILED E

Set the associated temperature control changeover switch to FAILED to enable all areas of cabin to be temperature controlled and observe group 1,2,3 MIs showing supplies maintained.

COND VALVES FOR OTHER GROUPS .... BOOST E

Set the COND VALVE selectors for the other groups to BOOST to raise regulation value of mass flow.

AFTER SHUT DOWN OF A SECOND GROUP

DISCHARGE VALVE sw FOR
SYSTEM IN USE .... AFT SHUT E

Set DISCHARGE VALVE switch for system in use to AFT SHUT thereby ensuring forward rack cooling by directing outflow from aircraft via the forward discharge valve.

FWD EMERGY RELIEF sw .... OPEN E

Set the FWD EMERGY RELIEF switch to OPEN to enable rack cooling flow to be discharged.

FWD EXTRACT FANS .... ALL ON E

Set the FWD EXTRACT FANS to ALL ON in an attempt to restore the forward rack cooling.

(Deletion)

The fan air by-passes the forward mass flow sensor via the emergency relief valve.

contd.

SPEED .... OBSERVE MAX TAT $100^{\circ}C$ C

Adjust aircraft speed as required to limit the total temperature to $100^{\circ}C$

END//

AFTER SHUT DOWN OF A THIRD GROUP

TEMPERATURE SELECTOR .... COOLEST AUTO SETTING E

For the remaining group, set the TEMPERATURE SELECTOR to O COOL AUTO

SPEED .... SUBSONIC C

Aircraft speed is not to exceed M = 1.0

END//

NOTE
If STANDBY temperature control system is used, COLD or negative settings may only be used at altitude greater than 30,000 ft.

BOTH FWD EXTRACT FLOW LIGHTS ON

This may or may not be accompanied by abnormal flow readings.

<u>WITH THE CONTROLLING FWD DISCHARGE VALVE SHUT</u>
DISCHARGE VALVES sws .... NORM E

Verify the DISCHARGE VALVES SYS 1 and SYS 2 switches are set to NORM to ensure that the forward DISCHARGE VALVE in use is not shut.

If the DISCHARGE VALVE for the controlling system is SHUT it will prevent forward rack cooling flow when the forward extract fans are not operating.

SYSTEM SELECT sws ....OTHER SYSTEM E

Set the SYSTEM SELECT switches to the other selection in an attempt to restore forward rack cooling flow, observe forward discharge valve regulates outflow.

<u>IF FWD DISCHARGE VALVES REMAIN SHUT</u>
<u>AND FWD FLOW LTS ON</u>
FWD EMERGY RELIEF sw .... OPEN E

Set the FWD EMERGY RELIEF switch to OPEN to enable rack cooling flow to be discharged.

FWD EXTRACT FANS .... ALL ON E

Set the FWD EXTRACT FANS to ALL ON in an attempt to restore the rack cooling.

The fan air by-passes the forward mass flow sensor via the emergency relief valve.

(Deletion)

IF FWD FLOW LTS STILL REMAIN ON
CABIN & FLIGHT DECK
TEMPERATURE SELECTORS ....COOLEST AUTO SETTING E

Set the FWD CABIN and FLIGHT DECK TEMPERATURE SELECTORS to O COOL AUTO

AIR INTAKES, INS &
WEATHER RADAR .... MONITOR E

Equipment should be monitored for effects of overheating leading to false indication or malfunction

Shut down affected equipment as soon as possible after landing to reduce probability of failures due to overheating.

DME may become unreliable.
ARINC internally cooled boxes in the forward racking are to be removed for check after landing.

Cabin differential pressure of 1 psi or more is normally adequate to maintain normal forward extract flow with fans off.

END//

CAUTION
IF AIR INTAKE FAILURE OCCURS REDUCE SPEED TO SUBSONIC AND APPLY APPROPRIATE PROCEDURES.

WITH THE CONTROLLING FWD DISCHARGE VALVE
REGULATING NORMALLY
FWD EMERGY RELIEF sw ....SHUT E

Verify FWD EMERGY RELIEF switch at SHUT since rack flow is lost if this valve is open with fans off.

(Deletion)

IF FWD FLOW LTS REMAIN ON

FWD EMERGY RELIEF sw .... OPEN E

Set the FWD EMERGY RELIEF switch to OPEN to enable rack cooling flow to be discharged.

FWD EXTRACT FANS .... ALL ON E

Set the FWD EXTRACT FANS to ALL ON in an attempt to restore the forward rack cooling.

The fan air by-passes the forward mass flow sensor via the emergency relief valve.

IF FWD FLOW LTS STILL REMAIN ON

CABIN & FLIGHT DECK
TEMPERATURE SELECTORS ....COOLEST AUTO SETTING E

Set the CABIN and FLIGHT DECK TEMPERATURE SELECTORS to 0 COOL AUTO

AIR INTAKES, INS &
WEATHER RADAR ....MONITOR E

Equipment should be monitored for effects of overheating leading to false indication or malfunction.

DME may become unreliable
ARINC internally cooled boxes in the forward racking are to be removed for check after landing

Cabin differential pressure of 1 psi or more is normally adequate to maintain normal forward extract flow with fans off.

END//

CAUTION
IF AIR INTAKE FAILURE OCCURS REDUCE SPEED TO SUBSONIC AND APPLY APPROPRIATE PROCEDURES

(Deletion)

RH OR LH FWD EXTRACT FLOW LIGHT ON

This may or may not be accompanied by abnormal flow readings

If the total forward extract flow is reduced to approximately half the normal value, for any reason, operation of left hand or right hand FWD EXTRACT FLOW lights may occur individually, due to tolerance on pressure switch settings and duct pressures.

CABIN & FLIGHT DECK TEMPERATURE SELECTORS ....COOLEST AUTO SETTING E

Set the CABIN and FLIGHT DECK TEMPERATURE SELECTORS to O COOL AUTO

AIR INTAKES, INS & WEATHER RADAR ....MONITOR E

Equipment should be monitored for effects of overheating leading to false indication or malfunction.

In the event of loss of cooling to left hand racks, DME may become unreliable.

ARINC internally cooled boxes in the affected racking are to be removed for check after landing

Cabin differential pressure of 1 psi or more is normally adequate to maintain normal forward extract flow with fans off.

CAUTION

IF AIR INTAKE FAILURE OCCURS, REDUCE SPEED TO SUBSONIC AND APPLY APPROPRIATE PROCEDURES.

END//

(Unchanged)

REAR EXTRACT FLOW LIGHT ON

REAR EXTRACT STANDBY FAN ....ON E

Set the REAR EXTRACT STANDBY switch to on in an attempt to re-instate rear rack cooling flow.

<u>IF FLOW LT REMAINS ON</u>
SPEED ....SUBSONIC C

Reduce speed using normal descent technique to subsonic. This is a precautionary measure to cover possible failure of the engine intake control system.

HF & ADF .... MINIMUM USE C

Keep operation of HF and ADF to a minimum to reduce heat output.

REAR CABIN
TEMPERATURE SELECTORS ....COOLEST AUTO SETTING E

Set the REAR CABIN TEMPERATURE SELECTORS to O COOL AUTO.

IMMEDIATELY THE AIRCRAFT SPEED FALLS BELOW M = 1.30

RAMP/SPILL MASTER sws .... ALL MAN E

Set the RAMP/SPILL MASTER switches (4) to MAN to reduce heat output from rear racks.

AICU C/Bs .... TRIP E

The AICU circuit breakers should be tripped without delay once the aircraft speed falls below M = 1.30 in order to prevent overheating of AICU control boxes and to reduce heat load in rack enclosures.

CIRCUIT BREAKER	PANEL	GRID REF
AICU 1B SUP	14-216	A 5
AICU 4A SUP	14-216	B 5
AICU 2A SUP	13-216	A 3
AICU 3B SUP	13-216	B 3
AICU 4B SUP	2-213	B14
AICU 1A SUP	2-213	D14
AICU 3A SUP	2-213	H13
AICU 2B SUP	2-213	H14

ARINC internally cooled boxes in the rear racking are to

AIR CONDITIONING

be removed for check after landing.
If time permits, rack closure panels may be removed to allow additional cooling.

END//

CABIN EXCESS PRESSURE

CABIN DIFF PRESSURE ....CONFIRM WARNING E

Observe the cabin differential pressure above 11 psi.

CABIN ALT sel .... CONFIRM SETTING. IF NECESSARY SWITCH TO OTHER SYSTEM E

Verify cabin altitude selector setting is compatible with aircraft altitude.

If necessary set the SYS SELECT switch to the other system, and observe that cabin differential pressure decreases and the O/PRESS light is off.

The cabin differential pressure is limited to 10.7 psi by the amplifier of the selector system and to 11.2 psi by the cabin pressure limiter of each discharge valve.

END//

NAC/WING O/HEAT LIGHT ON

BLEED VALVE ....SHUT E

Set the associated BLEED VALVES switch to SHUT, since a leak from the engine bleed system may be the cause of the overheat condition.

FOR AFFECTED SYSTEM
APPLY PROCEDURE : SHUT DOWN OF AIR CONDITIONING GROUPS

END//

NOTE

If the warning light remains on 2 minutes after selecting the Bleed Valve shut, this indicates a possible hot air leak within the nacelle. Continued operation of the affected engine is permitted.

AIR CONDITIONING

DUCT LIGHT ON

CAUTION
DO NOT ATTEMPT TO RESET THE DUCT DETECTION SYSTEM BY PRESSING THE DUCT LIGHT.

COND VALVE ....OFF E

Set the associated COND VALVE selector to OFF to confirm auto closure and de-activate the latched shut position.

IF THE COND VALVE, BLEED VALVES AND CROSSBLEED MIs SHOW CROSSLINE
CROSSBLEED VALVES sws ....SHUT E

Set associated CROSSBLEED switches to SHUT.

APPLY PROCEDURE : SHUT DOWN OF AIR CONDITIONING GROUPS (SHUT DOWN OF ONE GROUP)

CAUTION
UNDER NO CIRCUMSTANCES MAY THE AFFECTED BLEED VALVE AND CROSSBLEED VALVES BE OPENED.

IF THE BLEED VALVE MIs SHOW INLINE
DUCT LT .... MONITOR E

IF THE DUCT LT REMAINS ON
APPLY PROCEDURE : SHUT DOWN OF AIR CONDITIONING GROUPS (SHUT DOWN OF ONE GROUP)

IF THE DUCT LT GOES OFF
FUEL EXCH LT .... OBSERVE E

contd.

AIR CONDITIONING

IF THE FUEL EXCH LT ON
FUEL VALVE .... OPEN E

Set the associated FUEL VALVE selector to OPEN since an overheat condition at the fuel heat exchanger latches the FUEL EXCH light and latches the fuel valve. Setting the selector to open confirms auto operation to open and de-activates the latch of valve and FUEL EXCH light.

FUEL VALVE .... AS REQUIRED E

Set the associated FUEL VALVE selector to OPEN or SHUT to make its MI agree with FUEL VALVE MI indications of other systems.

IF THE FUEL EXCH LT OFF
TEMPERATURE SELECTOR .... STANDBY E

Set the required duct temperature on the STANDBY arc of the associated temperature selector.

COND VALVE .... ON E

Set the associated COND VALVE selector to ON and observe the conditioning valve MI inline.

Adjust the temperature as required, monitoring the corresponding compartment temperature and DUCT temperature.

END//

AIR CONDITIONING

ABNORMAL RATE OF CLIMB AFTER TAKE-OFF

The normal cabin rate of climb is approximately 400 ft/min

GROUND PRESSURE RELIEF VALVE MI .... OBSERVE E

The ground pressure relief valve should automatically shut when the aircraft is airborne.

IF MI READS OPEN
GROUND PRESSURE RELIEF VALVE .... SHUT E

Set GROUND PRESSURE RELIEF VALVE selector to SHUT 1 or SHUT 2. There are two separate motors, either will shut the valve.

DISCHARGE VALVE POSITION INDICATOR .... OBSERVE

Observe DISCHARGE VALVE POSITION INDICATOR

IF DISCHARGE VALVE OF UNSELECTED SYSTEM IS OPEN
DISCHARGE VALVE .... SHUT E

Set selector for unselected system open discharge valve to FWD SHUT or AFT SHUT as appropriate.

IF VALVE REMAINS OPEN
REPLAN FLIGHT

END//

IF DISCHARGE VALVE OF SELECTED SYSTEM IS ABNORMALLY OPEN
SYSTEM SELECT sws ....OTHER SYSTEM E

Set the SYSTEM SELECT switches to other selection.

IF VALVE REMAINS ABNORMALLY OPEN
DISCHARGE VALVE .... SHUT E

Set DISCHARGE VALVE selector to FWD SHUT or AFT SHUT as appropriate.

IF VALVE REMAINS OPEN
REPLAN FLIGHT

END//

BLEED OVERPRESSURE AND/OR OVERPRESS LIGHT ON

BLEED VALVE .... SHUT E

Set the associated BLEED VALVE switch to SHUT since an overpressure condition latches on the OVERPRESS light and shuts and latches the BLEED VALVE. Setting the switch to SHUT confirms auto closure and de-activates the latch of valve and OVERPRESS light.

COND VALVE .... OFF E

Set the COND VALVE selector to OFF to prevent surge in conditioning system when BLEED VALVE is subsequently opened.

BLEED VALVE .... OPEN E

Set BLEED VALVE to OPEN and observe the bleed pressure gauge reads approximately 75 psi.

IF BLEED PRESSURE 85 PSI AND/OR OVERPRESS LT ON

BLEED VALVE .... SHUT E

Set associated BLEED VALVE switch to SHUT

CROSS BLEEDS .... OPEN E

Set the associated CROSS BLEED sws (2) to OPEN and observe the bleed pressure gauge reading normal pressure.

COND VALVE .... ON E

Set COND VALVE selector to ON.

END//

PRIM EXCH LIGHT ON

COND VALVE .... OFF E

Set the associated COND VALVE selector to OFF since an overheat condition latches the PRIM EXCH light on and closes and latches the COND VALVE. Setting the selector to SHUT confirms auto closure and de-activates the latch of valve and PRIM EXCH light.

Observe the CAU IN temperature decreasing.

WAIT THREE MINUTES

IF PRIM EXCH LT OFF
COND VALVE .... ON E

Set associated COND VALVE selector to ON.

Observe the PRIM EXCH light remains off

IF PRIM EXCH LT ON
APPLY PROCEDURE:SHUT DOWN OF AIR CONDITIONING GROUPS

END//

SEC EXCH LIGHT ON

COND VALVE .... OFF   E

Set the associated COND VALVE selector to OFF since an overheat condition latches the SEC EXCH light on and closes and latches the COND VALVE. Setting the selector to SHUT confirms auto closure and de-activates the latch of valve and SEC EXCH light.

Observe the CAU IN temperature decreasing.

WAIT THREE MINUTES

IF SEC EXCH LT OFF

COND VALVE .... ON   E

Set associated COND VALVE selector to ON.

Observe the SEC EXCH light remains off

IF SEC EXCH LT ON

APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS

END//

AIR CONDITIONING

LOSS OF AUTOMATIC TEMPERATURE CONTROL

TEMPERATURE SELECTOR .... STANDBY E

Manually control the temperature, with the rotary selector at STANDBY, by adjusting the setting to obtain a reading between 20° and 24° on the temperature indicator of the affected compartment.

Once the temperature rotary selector is in the STANDBY arc, the required duct temperature is set on the numerical scale (graduated in degrees X10).

NOTE
With STANDBY temperature control system in use, COLD or negative settings may only be used at altitudes greater than 30,000 ft.

IF DUCT TEMPERATURE CAN BE CONTROLLED
END//

IF DUCT TEMPERATURE CANNOT BE CONTROLLED
APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS

END//

BLEED VALVE MALFUNCTION

BLEED VALVE .... SHUT E

Set associated BLEED VALVE switch to SHUT.

COND VALVE .... OFF E

Set associated COND VALVE selector to OFF.

CROSS BLEEDS .... OPEN E

Set the associated CROSS BLEED sws (2) to OPEN

The cross bleed valves open allow cross bleeding between two adjacent supplies on the same side of the aircraft.

WHEN BLEED PRESSURE IS READING NORMAL
COND VALVE .... ON

Set associated COND VALVE selector to ON

Observe COND VALVE MI inline within 30 secs.
Bleed pressure will be normal when the other system on that side is operating.

END//

LEAK LIGHT ON

MASS FLOW .... MONITOR E

IF MASS FLOW INDICATION SHOWS BELOW THE GREEN ARC
APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS

IF MASS FLOW DOES NOT FALL BELOW GREEN ARC
CONTINUE WITH NORMAL PROCEDURES

END//

COMPARATOR LIGHT ON

COMPARATOR LIGHT .... MONITOR E

IF COMPARATOR LIGHT STILL ON AFTER TEN MINUTES
GROUP 3 OR 4 sw .... FAILED E

GROUP 3 TEMPERATURE SELECTOR .... STANDBY 1 E

GROUP 3 OR 4 switch at FAILED unslaves group 3 from group 4 leaving both under AUTO control.

Group 3 is set to STANDBY control and to a fixed medium temperature so that group 4 continues to control the compartment temperature. This avoids any cycling of temperature demand between the two groups.

IF COMPARATOR LIGHT OFF
CONTINUE WITH NORMAL PROCEDURES

END//

AIR CONDITIONING

FUEL/AIR EXCHANGER OVERHEAT

FUEL VALVE .... OPEN E

Set the associated FUEL VALVE selector to OPEN since an overheat condition at the fuel heat exchanger latches the FUEL EXCH light and latches the fuel valve: setting the selector to open confirms auto operation to open and de-activates the latch of valve and FUEL EXCH light.

FUEL VALVE ....AS REQUIRED E

Set the associated FUEL VALVE selector to OPEN or SHUT to make its MI agree with FUEL VALVE MI indications of other systems.

RETURN TO NORMAL PROCEDURES

END//

LOSS OF MASS FLOW

TEMPERATURE SELECTORS .... CHECK E

For the affected group, set the TEMPERATURE SELECTORS rty sel(s) from COLD to HOT in STANDBY mode, then back to AUTO. Observe the temperature control valve position indicator moving from C to H.

The mass flow valve has no magnetic indicator to monitor its position. Thus the selection COLD to HOT is to check that the mass flow valve has opened and the temperature control valve is operating.
Because the temperature control valve is a pneumatic servo, it requires mass flow to operate.

▶ IF TEMPERATURE CONTROL VALVE IS NOT MOVING

COND VALVE .... OFF E

Set associated COND VALVE selector to OFF

Apply procedure: SHUT DOWN OF AIR CONDITIONING GROUPS

IF TEMPERATURE CONTROL VALVE POSITION INDICATOR SHOWS MOVEMENT FROM C TO H

RETURN TO NORMAL PROCEDURES.

END//

USE OF PASSENGER OXYGEN

CABIN ALTITUDE EXCEEDS 14,000 FT

When the cabin altitude exceeds 14,000 ft the oxygen regulator ouput pressure is increased to approximately 90 psi. This emergency pressure opens the therapeutic valve, thus pressurizing the passenger mask supply line. The emergency pressure in the passenger mask supply line causes automatic presentation of the mask units in the cabin. The oxygen will flow continuously when the mask is pulled down on to the users face.

If the cabin altitude stabilizes below 18,000 ft the oxygen regulator output pressure is decreased to normal pressure. The passenger masks are operating on demand.

EMERG LT .... OBSERVE E

The EMERG light (yellow) should be observed on indicating that the pressure in the passenger mask supply line exceeds 70 psi.

IF EMERG LIGHT OFF
PASSENGER SUPPLY PRESSURE INDICATOR .... OBSERVE E

The PASSENGER SUPPLY PRESSURE indicator pressure should be observed.

IF PASSENGER SUPPLY PRESSURE SHOWS GREATER THAN 85 PSI
NO FURTHER ACTION

IF PASSENGER SUPPLY PRESSURE SHOWS LESS THAN 85 PSI
PASSENGER SYSTEM EMERG
MANUAL O/RIDE sw .... ON E

Lift guard and set PASSENGER SYSTEM EMERG MANUAL O/RIDE switch to ON thereby electrically overriding the barometric control of the regulator thus pressurizing the passenger mask supply line at emergency pressure.

EMERG LT .... OBSERVE E

IF EMERG LIGHT OFF
EMERGENCY MANUAL OVERRIDE .... PULL ON S

Request cabin staff to lift guard and pull EMERGENCY MANUAL OVERRIDE knob.

Pulling the EMERGENCY MANUAL OVERRIDE knob mechanically overrides the barometric control of the regulator thus pressurizing the passenger mask supply line at emergency pressure.

contd.

The supply will remain at emergency pressure until the EMERGENCY MANUAL OVERRIDE knob is pushed back.

WHEN CABIN ALTITUDE STABILIZES AT OR SUBSEQUENTLY FALLS BELOW 16,500 ft.

EMERG LT .... OBSERVE E

If the cabin altitude returns to less than 16,500 ft and the EMERG light (yellow) remains on, the only means to stop loss of oxygen, due to continuous flow, is to restow the check valve of each non-required passenger mask into the corresponding clip located in the stowage box.

PASSENGER SYSTEM EMERG
MANUAL O/RIDE sw ....OFF E

Set PASSENGER SYSTEM EMERG MANUAL O/RIDE switch to OFF.

Once the PASSENGER SYSTEM EMERG MANUAL O/RIDE switch is set to OFF it leaves the therapeutic control valve open thus keeping the passenger mask supply line at normal pressure.

EMERGENCY MANUAL OVERRIDE .... PUSH OFF S

Request cabin staff to push back EMERGENCY MANUAL OVERRIDE knob.

Once the EMERGENCY MANUAL OVERRIDE knob is pushed back it leaves the therapeutic supply valve open thus keeping mask supply line at normal pressure.

END//

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ANTI-ICING LEFT & RIGHT INT & CYCLIC LIGHTS ON

● ▶ TOTAL TEMPERATURE IS GREATER THAN +15°C

WING & INTAKE ANTI-ICING
rty sels (2) .... OFF E

Verify both WING & INTAKE ANTI-ICING rotary selectors at OFF.

If the wing and intake anti-icing system is switched on with the total temperature greater than +15°C, or with the aircraft on the ground, the CYCLIC and INT lights will come on.

If the aircraft lands with the wing and intake anti-icing switched on, the CYCLIC and INT lights will come on.

END//

● ▶ TOTAL TEMPERATURE IS LESS THAN +15°C

WING & INTAKE ANTI-ICING
SELECTED rty sel .... OFF E

Set selected WING & INTAKE rotary selector to OFF.

If, in flight, the total temperature is below +15°C, INT lights (2) (yellow) are on and CYCLIC lights (2) (yellow) on together indicate a failure of the control lane.

WING & INTAKE ANTI-ICING
OTHER rty sel .... 4 SECS ON E

Set the other WING & INTAKE ANTI-ICING rotary selector to 4 SECS ON position and observe INT & CYCLIC lights off.

▶ IF LEFT OR RIGHT INT LT ON
LE//

▶ IF CYCLIC LT ON
APPLY PROCEDURE : ANTI-ICING CYCLIC LIGHT ON

IF LEFT AND RIGHT INT & CYCLIC LTS REMAIN ON

WING & INTAKE ANTI-ICING
ALTERN rty sel .... 4 SECS ON E

Verify the WING & INTAKE ANTI-ICING ALTERN rotary selector is at 4 SECS ON

TEMP O/RIDE pb .... PRESS E

Press and hold the TEMP O/RIDE push button, observe the INT and CYCLIC lights off.

Pressing the TEMP O/RIDE push button with ALTERN selected will override the ADC signal if it is giving a false output showing above +15°C.

If the ADC is in a power failed condition it will give an output showing above +15°C

IF LEFT AND RIGHT INT & CYCLIC LTS REMAIN ON
LEAVE ICING CONDITIONS

END//

(Unchanged)

ANTI-ICING INT LIGHT ON

● ▶ WITH WING & INTAKE ANTI-ICING MAIN OR ALTERN rty sel AT 4 SECS ON

LE//

Observe and log entry the number of the light on the CYCLIC AND CONTINUOUS DE-ICING diagnosis and test panel.

END//

● ▶ WITH WING & INTAKE ANTI-ICING rty sels (2) AT OFF
CONTINUOUS DE-ICING AC POWER C/B's ....TRIP E

Trip the associated AC circuit breakers

CIRCUIT BREAKER	PANEL	GRID REF
LH WING CONTN IND	15-216	B15
INT 4 REAR RAMP HTR SUP	14-216	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	A15
RH WING SECT 13.7,15.3 HTRS CONTN SUP	14-216	B12
RH WING SECT 14.1,14.2 HTRS CONTN SUP	14-216	B13
RH WING FAIRING & SECT 13. HTRS CONTN SUP	14-216	B15
RH WING SECT 13.5,13.6 HTRS CONTN SUP	14-216	C12
RH WING SECT 15.1,15.2 HTRS CONTN SUP	14-216	C13
RH WING SECT 13.2,13.3 & 13.4 HTRS CONTN SUP	14-216	C15
INT 3 AUX DOOR D BOX HTR SUP	13-216	A10
INT 3 REAR RAMP HTR SUP	13-216	A11
INT 2 AUX DOOR D BOX HTR SUP	13-215	A 9
INT 2 REAR RAMP HTR SUP	13-215	A10
INT 1 REAR RAMP HTR SUP	14-215	B 6
INT 1 AUX DOOR D BOX HTR SUP	14-215	B 7

ICE AND RAIN PROTECTION

LH WING SECT 13.7, 15.3 HTRS CONTN SUP	14-215	C 6
LH WING SECT 14.1,14.2 HTRS CONTN SUP	14-215	C 7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	C 8
LH WING SECT 13.5, 13.6 HTRS CONTN SUP	14-215	D 6
LH WING SECT 15.1, 15.2 HTRS CONTN SUP	14-215	D 7
LH WING SECT 13.2,13.3 & 13.4 HTRS CONTN SUP	14-215	D 8
RH WING CONTN IND	15-215	B11

END//

ANTI-ICING CYCLIC LIGHT ON

WING & INTAKE ANTI-ICING rty sels (2) AT OFF
WING & INTAKE ANTI-ICING
DC C/Bs .... TRIP E

Trip associated circuit breakers.

CIRCUIT BREAKER	PANEL	GRID REF
LH WING CONTN IND	15-216	B15
RH CYCLIC TIMER CONT	15-216	D14
RH WING CONTN IND	15-215	B11
LH CYCLIC TIMER CONT	3-213	B11

END//

WING & INTAKE ANTI-ICING MAIN OR ALTERN rty sel AT 4 SECS ON
CYCLIC LT ....OBSERVE E

IF CYCLIC LT ON STEADY FOR MORE THAN 16 SECS
WING & INTAKE ANTI-ICING
rty sel .... OFF E

Set selected WING & INTAKE rotary selector to OFF.

CYCLIC light on steady indicates that a fault which could cause damage has been detected in a cyclically heated area. The cyclic de-icing system for that side of the aircraft is shut down.

IF CYCLIC LT REMAINS ON
WING & INTAKE ANTI-ICING
DC C/Bs ....TRIP E

Trip associated circuit breakers

CIRCUIT BREAKER	PANEL	GRID REF
LH WING CONTN IND	15-216	B15
RH CYCLIC TIMER CONT	15-216	D14
RH WING CONTN IND	15-215	B11
LH CYCLIC TIMER CONT	3-213	B11

LEAVE ICING CONDITIONS

END//

IF CYCLIC LT OFF
WING & INTAKE ANTI-ICING
rty sel ....4 SECS ON E

contd.

ICE AND RAIN PROTECTION

CYCLIC LT ....PRESS AND RELEASE E

Press and release the CYCLIC light and observe the CYCLIC light is off.

A cyclic de-icing system which has automatically shut down after detecting a fault can be restarted by setting the rotary selector momentarily to OFF and then pressing the relevant CYCLIC light.

IF CYCLIC LT ON
LEAVE ICING CONDITIONS

CAUTION
RESET OF THE CYCLIC DE-ICING SYSTEM MUST NOT BE REPEATED.

IF CYCLIC LT OFF AFTER A MAXIMUM OF 16 SEC
FAULTY AREA ....LOG E

Observe and log entry the number shown by the digital indicator on the CYCLIC AND CONTINUOUS DE-ICING diagnosis and test panel.

END//

MAST LIGHT ON

DRAIN MAST HTRS .... OTHER ON POSITION E

Set the associated DRAIN MAST HTRS selector to the alternative ON position and observe the MAST lights off.

<u>IF MAST LT REMAINS ON</u>
DRAIN MAST HTRS .... OFF E

Set the associated DRAIN MAST HTRS selector to OFF.
Inform the senior cabin crew member of lost drain facility.

NOTE
In subsonic flight any washbasin associated with a lost drain facility must be placarded "Not to be used".

END//

W/SHIELD DE-ICE O/HEAT LIGHT ON

W/SHIELD DE-ICE O/HEAT LT ....OBSERVE E

Observe the W/SHIELD DE-ICE O/HEAT light. If the light is on and off for short periods it indicates the system is operating safely on overheat control.

IF W/SHIELD DE-ICE O/HEAT LT ON STEADY
W/SHIELD EMERGY DE-ICE sws (2) .... OFF E

Verify the W/SHIELD EMERGY DE-ICE switches (2) are OFF and guarded.
It should be observed the W/SHIELD DE-ICE O/HEAT light is off and the W/SHIELD DE-ICE MIs read inline and crossline for short periods.

The W/SHIELD DE-ICE MIs read inline when power is supplied to the windshield.
The W/SHIELD DE-ICE MIs read crossline when windshield heat has reached control temperature and power is off. If the system is switched off the MIs read crosshatched.

IF W/SHIELD DE-ICE MI READS INLINE STEADY AND O/HEAT LT ON
W/SHIELD DE-ICE .... OFF E

Set the associated W/SHIELD DE-ICE switch to OFF

W/SHIELD DE-ICE CBs .... TRIP E

Trip the associated a.c. circuit breaker.

CIRCUIT BREAKER	PANEL	GRID REF
L/H W/SCREEN HTR SUP	2-213	E 20
R/H W/SCREEN HTR SUP	14-216	F 11

A W/SHIELD DE-ICE O/HEAT light on steady with the associated MI reading inline steady indicates an uncontrolled power supply to the heated panels, hence the necessity to break the supply.

END//

VISOR DE-ICE O/HEAT LIGHT ON

VISOR DE-ICE O/HEAT LT .... OBSERVE E

Observe the VISOR DE-ICE O/HEAT light. If the light is on and off for short periods it indicates the system is operating safely on overheat control.

IF VISOR DE-ICE O/HEAT LT ON STEADY
VISOR DE-ICE .... OFF E

Set the associated VISOR DE-ICE switch to OFF.

VISOR DE-ICE CBs ....TRIP E

Trip the associated a.c. circuit breakers.

CIRCUIT BREAKER	PANEL	GRID REF
LH BOTTOM VISOR HTR SUP	14-215	E 9
LH FLAT VISOR HTR SUP	14-215	G 5
LH CURVED VISOR HTR SUP	14-215	G 8
RH BOTTOM VISOR HTR SUP	13-216	B10
RH CURVED VISOR HTR SUP	13-216	G10
RH FLAT VISOR HTR SUP	13-216	G13

END//

DV DEMIST O/HEAT LIGHT ON

DV DEMIST O/HEAT LT .... OBSERVE E

Observe the DV DEMIST O/HEAT light. If the light is on and off for short periods it indicates the system is operating safely on overheat control.

<u>IF DV DEMIST O/HEAT LT ON STEADY</u>
DV DEMIST .... OFF E

Set the associated DV DEMIST switch to OFF

DV DEMIST CB ....TRIP E

Trip the associated a.c. circuit breaker.

CIRCUIT BREAKER	PANEL	GRID REF
LH DV WINDOW HTR SUP	14-215	D 9
RH DV WINDOW HTR SUP	13-216	C10

END//

ADS/ENGINE PROBE HEATER LT ON

CAUTION
THE ADS 1, ADS 2 AND STBY PROBE HEATERS MUST NOT BE SET TO OFF DURING FLIGHT.

IF T_1 (1,2,3 or 4) LT ON

ASSOCIATED ENGINE THROTTLE MASTER ....ALTERN E

Set the associated engine THROTTLE MASTER sel to ALTERN

ADJACENT ENGINE THROTTLE MASTER .... MAIN E

Set the adjacent engine THROTTLE MASTER sel to MAIN

END//

Should any other ADS or ENGINE PROBE HEATERS light be on regard data from the unheated sensor(s) as suspect during or after encounter with icing conditions.

INDICATION	MALFUNCTION
STBY	Captain's standby ASI/MACHMETER Captain's and first officer's AIRSPEED indicator and altimeter in standby mode. Air intake sensor unit No.2 (Lane 2A) (Lane 3B)
S or P (LH)	ADC 1 Air intake sensor unit No.1 (Lane 1A) (Lane 4B)
S or P (RH)	ADC 2 Air intake sensor unit No.3 (Lane 4A) (Lane 1B) Air intake sensor unit No.4 (Lane 3A) (Lane 2B)
β α or T_t (LH)	ADC 1
β α or T_t (RH)	ADC 2
NOTE: α probe malfunction is displayed as total intake incidence signal failure.	

(Unchanged)

END//

ICE AND RAIN PROTECTION

WINDSHIELD EMERGENCY DE-ICING

CAUTION
ONLY USE WINDSHIELD EMERGENCY DE-ICING IF LOSS OF VISION, THOUGHT TO BE DUE TO LACK OF HEATING, IS LEADING TO A DANGEROUS SITUATION.

CAUTION
WINDSHIELD EMERGENCY DE-ICING MUST NOT BE USED UNLESS THE VISOR IS DOWN AND CABIN DIFFERENTIAL PRESSURE IS LESS THAN 2.5 PSI.

CAUTION
IF WINDSHIELD EMERGENCY DE-ICING IS USED WHEN THE AIRCRAFT IS ON THE GROUND THERE IS A DANGER OF CRACKING THE GLASS.

W/SHIELD EMERGY DE-ICE sw(s)................................ ON   C E

Set W/SHIELD EMERGY DE-ICE switch(es) ON as appropriate.

With the W/SHIELD EMERGY DE-ICE switch at ON the associated W/SHIELD DE-ICE MI will not indicate system operation and the associated O/HEAT light will be ON.

Switch OFF W/SHIELD EMERGY DE-ICE as soon as practicable.

END//

<u>IF THE ENG O/HEAT LT IS OFF AT ONE OR MORE TEST POSITIONS F1,F2 OR F3</u>

FLAME SENSORS sel .... ALTERNATIVE A OR B POSN E

Set associated FLAME SENSORS selector to the alternative A or B position.

The ENGINE O/HEAT light off at any of the F1,F2 or F3 positions indicates the flame sensor loop under test is not serviceable. The FLAME SENSOR warning from the loop not under test must therefore be regarded as a true warning.

ON ILLUMINATION OF THE RED ENG MWS AND ENGINE SHUT DOWN HANDLE LTS FOR THE AFFECTED ENGINE
APPLY PROCEDURE : ENGINE FIRE OVERHEAT OR SEVERE DAMAGE

END//

FIRE SENSOR LIGHT ON

Set associated FIRE SENSOR selector to A or B so that the associated FIRE SENSOR light remains off.

Continue operation with selected single loop operating.

END//

PRINTED

(Unchanged)

WHEEL BRAKE FIRE

This drill is not published in expanded form.

Refer to abnormal drill Vol.2B. 07.13.06

AMBER RADIATION LIGHT ON

OBTAIN PROVISIONAL ATC CLEARANCE FOR DESCENT IN THE EVENT THAT RADIATION REACHES THE "ACTION" LEVEL (RED RADIATION LIGHT ON).

Radiation meter dose rate pointer in the amber segment indicates instantaneous radiation level is heading toward "action" level.

END//

RED RADIATION LIGHT ON

CONFIRM ATC CLEARANCE AND ADVISE DESCENDING

Air/Ground communication may be interrupted by solar cosmic radiation.

Instantaneous radiation level in excess of 50 millirems per hour does not justify an emergency uncleared descent to or through a flight level occupied by underflying aircraft.

The appropriate ATC unit must be advised, as soon as possible, of action which has been taken during any period of interrupted communication.

DESCEND TO AN ALTITUDE SUCH THAT INTENSITY IS BELOW "ACTION" LEVEL I.E. THE RED RADIATION LIGHT OFF.

Cosmic radiation intensity decreases with descent.

<u>IF WARNING PERSISTS BELOW FL 470</u>
NO FURTHER ACTION

If the red radiation light remains on or the radiation meter dose pointer is above 50 millirems per hour below 47000 ft then a false indication should be suspected. consult meteorological data for forecast radiation level.

Replan for flight at new flight level.

NOTE

If due to communication failure descent clearance cannot be obtained descent is at the captain's discretion.

END//

MWS HEALTH MONITOR

AUDIO CANCEL pb ....PRESS AND RELEASE P

NOTE

The health monitor audio (gong) at one second intervals indicates either.
- loss of the master warning primary gong or
- total loss of the master warning system.

SYSTEM LIGHT ....PRESS E

Press any red or amber system light which is connected to the master warning system.
Observe the associated MWS light.

IF MWS LIGHT ON, BUT NO AUDIO

SYSTEM LIGHT .... RELEASE E

BRIEF FOR FLIGHT WITH MWS PRIMARY GONG INOPERATIVE

NOTE

The auxiliary gong is still operative and will give an audio (gong) every ten seconds if a class 1 (red) light remains on and unrecognised.

END//

IF MWS LIGHTS OFF

SYSTEM LIGHT ....RELEASE E

BRIEF FOR FLIGHT WITH MWS TOTALLY INOPERATIVE

END//

DOORS WARNING WITH AIRCRAFT PRESSURIZED

IF UPPER CARGO OR LOWER CARGO OR MISC HATCHES LT(S) ON
CABIN DIFFERENTIAL PRESSURE .... MAINTAIN ABOVE 1.0 PSI FOR REMAINDER OF FLIGHT

END//

IF FRONT LEFT OR FRONT RIGHT OR CENTRE LEFT OR CENTRE RIGHT OR REAR LEFT OR REAR RIGHT DOOR LT(S) ON
ASSOCIATED DOOR HANDLE ....OBSERVE POSITION E

PRESSURISATION .... CHECK E

IF DOOR HANDLE POSITION IS CORRECT
AND
IF PRESSURISATION IS STABLE WITHOUT EVIDENCE OF LEAKAGE
NO FURTHER ACTION

CAUTION
DO NOT MOVE HANDLE

With the aircraft correctly pressurized and with the door locking handle in the correct position the door is secure.

END//

IF THE DOOR HANDLE POSITION IS NOT CORRECT
OR
IF THE PRESSURIZATION IS UNSTABLE
OR
IF THERE IS EVIDENCE OF LEAKAGE
EMERGENCY DESCENT PROCEDURE ....APPLY C
CABIN DIFFERENTIAL PRESSURE ....REDUCE TO 1.0 PSI E

END//

CAUTION
MAINTAIN CABIN DIFFERENTIAL AT 1.0 PSI UNTIL AFTER LANDING.

CONDITIONAL PROCEDURES

LIST OF CONTENTS

(Unchanged)

contd.

CONDITIONAL PROCEDURES

LIST OF CONTENTS

MISCELLANEOUS

USE OF REVERSE THRUST IN FLIGHT

Aircraft must be within flight envelope for in-flight use of reverse thrust.

The procedures for in-flight reverse thrust are based on the use of both inner engines. If reverse thrust is selected on one inner engine only, the change in area and increase in idle speed on the adjacent engine apply only to the side on which reverse thrust is selected.

THROTTLES...IDLE C

FLIGHT REV ARM pb.................................PRESS E

Press the FLIGHT REV ARM push button and observe OPEN light on.

IF OPEN LT OFF
Do not use reverse thrust in flight.

END//

REVERSE...SELECT C

Lift No.2 and No.3 reverse thrust levers to the reverse baulk position and observe No.2 and No.3 REV lights flashing then remain on, No.2 and No.3 CON lights off.

Transit into reverse should be accomplished within about 10 seconds and the area should be less than 15% within 15 seconds of reverse thrust selection. If at the extremes of the flight envelope the buckets fail to achieve reverse (REV light remains flashing), cancel reverse thrust and reselect as required at a lower altitude.

The N2 of engines No.2 and No.3 will increase to reverse idle speed, and their primary nozzle areas will increase to maximum during their bucket movement, and reduce to less than 15% after the buckets are closed. The N2 of engines No.1 and No.4 increases slightly during the movement of engines No.2 and No.3 buckets, and then reduces to their prevailing idle when the buckets are closed. During the use of reverse thrust in flight, the baulk preventing power being applied on reversing engines is not removed when the buckets are closed.

(Completely Revised)

contd.

IF CON LT(S) ON
Observe AREA instrument.

IF AREA LESS THAN 15%
Continue use of reverse thrust.

IF AREA GREATER THAN 15%
Cancel reverse thrust on associated engine.

With the primary nozzle area greater than 15% over heating of the secondary nozzle could occur, even with the power at idle, because of the length of time use of reverse thrust is permitted in flight.

END//

IF REV LT(S) OFF OR REMAIN FLASHING
Cancel reverse thrust on associated engine.

END//

WHEN CANCELLATION OF REVERSE THRUST IS REQUIRED

REVERSE LEVERS..............................FORWARD BAULK C

Push No.2 and No.3 reverse thrust levers to the forward baulk position, and observe No.2 and No.3 REV lights flashing then remain off.

The N2 of engines No.2 and No.3 will reduce by approximately 4% and their primary nozzle areas will return to their normal scheduled area.
The N2 of engines No.1 and No.4 increases slightly during the movement of engines No.2 and No.3 buckets and then to their prevailing idle when the reverse thrust levers of engines No.2 and No.3 are pushed fully down.

IF REV LT(S) ON OR FLASHING INTERMITTENTLY
observe associated SECONDARY NOZZLE instrument(s)

IF ASSOCIATED BUCKETS NOT WITHIN THE RANGE 0-27 DEG
Set the HP VALVE to SHUT.
Apply procedure: PRECAUTIONARY ENGINE SHUT DOWN

contd.

(Completely Revised)

IF ASSOCIATED REV LTS OFF OR BUCKETS ARE WITHIN 0-27 DEG

REVERSE LEVERS..IDLE C

Push No.2 and No.3 reverse thrust levers fully down and observe N2 of No.2 and No.3 engines return to prevailing idle.

IF REVERSE THRUST LEVERS CANNOT BE MOVED PAST THE FORWARD BAULK POSITION

BAULK OVERRIDE HANDLE..........................OVERRIDE P

Lift and turn clockwise forward BAULK O/RIDE handle.

REVERSE LEVERS..................................IDLE C

CAUTION
IF THE FORWARD BAULK O/RIDE HAS BEEN USED IT MUST BE RESET IMMEDIATELY THE REVERSE THRUST LEVERS ARE FULLY DOWN.

Advance throttle levers as required and observe OPEN light off.

When any of the throttle levers is advanced more than 10% from idle the magnetic latch of the FLIGHT REV ARM button is released, disarming the in-flight reverse system which causes the air supply isolation valves to shut.

IF OPEN LT ON
Pull FLIGHT REV ARM button and observe OPEN light off.

END//

CAUTION
IF THE OPEN LIGHT ON AND/OR FLIGHT REV ARM PUSH BUTTON FAILS IN THE ARMED POSITION, DO NOT MOVE THE REVERSE THRUST LEVERS OF No.2 AND No.3 ENGINES ABOVE REVERSE IDLE DURING THE USE OF REVERSE THRUST ON LANDING UNTIL THEIR PRIMARY NOZZLE AREAS IS LESS THAN 15%.

(Completely Revised)

POWER PLANT

DRY MOTORING CYCLE

If the engine OIL TEMP is colder than -35°C but not colder than -40°C, a dry motoring cycle should be carried out. This should raise the OIL TEMP to -35°C or warmer and it is then possible to proceed with a normal start.

COCKPIT PREPARATION AND PRE-START CHECKS .... COMPLETE ALL

DEBOW sw .... DEBOW E

Set associated DEBOW switch to DEBOW and observe DEBOW switch light (yellow) on.

START/RELIGHT sel .... START E

Set associated START/RELIGHT selector to START.

Observe START/RELIGHT selector is latched at START. START VALVE MI reads OPEN, ENGINE DEBOW switch light off, START PUMP light (yellow) on, N2 rises.

During the dry motoring cycle the air supply to the air turbine starter must be controlled to maintain N2 below 16% and duct pressure below 35 psig to prevent air turbine starter limitations being exceeded.

<u>30 SECONDS AFTER SELECTING START/RELIGHT SELECTOR TO START</u>

DEBOW sw ....NORMAL E

Set the associated DEBOW switch to NORMAL to terminate motoring cycle.

When the DEBOW switch is set to NORMAL the START/RELIGHT selector will unlatch and return to the OFF position causing the start valve to shut, this being indicated by the START VALVE MI.
The START PUMP will run for approximately 30 secs after DEBOW switch is set to NORMAL.

END//

(Completely Revised)

CROSS BLEED START

CAUTION
BEFORE INITIATING A CROSS-BLEED START THE GROUND AIR SUPPLY MUST BE DISCONNECTED AND THE START CONNECTION BLANKING CAP FITTED.

ON RUNNING ENGINE

BLEED VALVE .... OPEN E

Verify associated BLEED VALVE switch at OPEN and observe BLEED VALVE MI inline.

CROSSBLEED VALVE .... OPEN E

Set associated CROSSBLEED VALVE selector to OPEN and observe CROSSBLEED VALVE MI inline.

COND VALVE .... OFF E

Set associated COND VALVE selector to OFF observe COND VALVE MI Crossline.

THROTTLE ....AS REQUIRED E

Advance throttle lever of running engine to obtain 29-35 psi on associated bleed pressure gauge.

ADJACENT ENGINE .... START E

Start adjacent engine using normal starting technique.

WHEN ENGINE BEING STARTED OBTAINS 25% N2 AND ASSOCIATED START VALVE MI READS SHUT

THROTTLE .... IDLE E

Retard throttle lever of donor engine to idle.

AFTER ENGINE START

CROSS BLEED VALVE .... SHUT E

Set associated CROSS BLEED VALVE selector to SHUT and observe CROSS BLEED VALVE MI Crossline.

(Completely Revised)

contd.

COND VALVE .... ON E

Set donor engine COND VALVE selector to ON and observe COND VALVE MI inline.

END//

(Compl ly Revise

USE OF FUEL FWD TRANS SWITCH

FUEL FWD TRANS sw .... O/RIDE P

Unguard and set the FUEL FWD TRANS switch to O/RIDE. Monitor the forward movement of the CG.

The tank 11 pumps will continue to run and the tanks 5 and 7 inlet valves will remain open until the FUEL FWD TRANS switch is returned to its guarded position.

TRIM TRANS AUTO MASTER .... OFF E

Verify the TRIM TRANS AUTO MASTER selector at OFF.

The TRIM TRANS AUTO MASTER selector at OFF ensures that the transfer of fuel is solely under the control of the FUEL FWD TRANS switch and that when the FUEL FWD TRANS switch is returned to its guarded position normal fuel transfer does not resume.

<u>WHEN CG AS REQUIRED</u>

FUEL FWD TRANS sw .... GUARD P

Set the FUEL FWD TRANS switch to its guarded position.

END//

CROSSFEED

CAUTION
CROSSFEEDING IS NOT TO BE USED DURING TAKE-OFF OR LANDING.
THE MINIMUM ENGINE FEED PUMPS REQUIREMENT DURING OTHER PHASES OF FLIGHT IS:
- TWO PER ENGINE WITH T/O SELECTED
- THREE PER TWO ENGINES WITH REHEAT ON,
- ONE PER ENGINE DURING SUPERSONIC CRUISE,
- ONE PER TWO ENGINES DURING SUBSONIC CRUISE.

DO NOT FEED MORE THAN TWO ENGINES FROM A SINGLE TANK.

CROSSFEED .... AS REQUIRED E

Verify ENGINE FEED PUMPS switches of the collector tank in use to ON.
Rotate the CROSSFEED rotary selectors of the collector tank in use and the engines to be supplied to inline and observe crossfeed MIs in line.
Set the ENGINE FEED PUMPS switches of the unused collector tank to OFF.

WHEN CROSSFEED NO LONGER REQUIRED

ENGINE FEED PUMPS .... ALL ON E

Set all ENGINE FEED PUMPS switches to ON

CROSSFEED rty sels .... CROSSLINE E

Rotate CROSSFEED rotary selectors crossline and observe CROSSFEED MIs show crossline.

END//

CONTINUOUS RUNNING OF SCAVENGE PUMP IN FLIGHT

TRIM PIPE DRAIN sw ....SHUT E

Verify TRIM PIPE DRAIN switch is at SHUT to ensure fuel is not draining from trim transfer pipes into scavenge tank and causing pump to run.

SCAVENGE PUMP MI ....OBSERVE E

Observe SCAVENGE PUMP magnetic indicator

If the scavenge pump had been operating due to an open trim pipe drain valve it will continue to run while fuel remains in the scavenge tank.

IF SCAVENGE PUMP MI READS ON
CONTINUE NORMAL FLIGHT

Continue with fuel system normal procedures but carefully monitor fuel tank quantities and pressure.

END//

(Unchanged)

LATERAL TRIM

This procedure transfers fuel from the "down elevon" collector tank (2 or 3) to the "up elevon" main transfer tank (5 or 7) via tank 11.

FEED PUMPS .... ALL ON .... E

Set all Feed Pump sws to On and observe Pump Low Pressure lights out.

TANK 11 CONTENTS .... NOTE .... E

This figure will be the datum to which to restore tank 11 contents.

ON THE UP ELEVON SIDE

TANK 5 OR 7 INLET VALVE .... OPEN .... E

Set the tank 5 or 7 Inlet Valve selector, as appropriate, to OPEN.

TANK 11 ELECTRIC PUMP .... ON .... E

Set the tank 11 electric pump selector, that is on the same side of the aircraft as the "up elevon", to ON. This enables fuel to be transferred from tank 11 to tank 5 or 7 as appropriate.

ON THE DOWN ELEVON SIDE

TANK 11 INLET VALVE .... OPEN .... E

Set the tank 11 Inlet Valve selector, that is on the same side of the aircraft as the "down elevon", to OPEN. The valve will not open until tank 11 contents have fallen below high-level.

TANK 2 OR 3 JETTISON VALVE .... OPEN .... E

Set to OPEN the tank 2 or tank 3 Jettison Valve switch (on the same side as the opened tank 11 Inlet Valve). This enables fuel from the selected collector tank to transfer by engine feed pump action, via the opened jettison valve and trim transfer pipe, into tank 11.

WHEN ELEVONS ARE NEUTRAL IN ROLL

TANK 11 ELECTRIC PUMP .... AUTO .... E

Set the tank 11 electric pump selector to AUTO to stop the transfer from tank 11 to the selected main transfer tank.

TANK 5 OR 7 INLET VALVE .... AUTO .... E

This action closes the valve.

(Completely Revised)

Cont'd.

WHEN TANK 11 CONTENTS AT ORIGINAL VALUE OR HIGH LEVEL

TANK 11 INLET VALVE .... AUTO .... E

This action closes the valve and stops the transfer from the selected collector tank to tank 11. If high level was reached, the valve would already be closed.

TANK 2 OR 3 JETTISON VALVE .... SHUT .... E

This action closes the valve thus directing the 1st and 2nd standby pumps delivery to the engine.

END//

(Completely Revised)

LONGITUDINAL TRIM

This procedure is required when the elevon angle in pitch is outside the range 1 degree down to neutral.

IF THE ELEVONS ARE UP

TANK 1 & 4 sw .... AFT TRIM E

Set the Tank 1 & 4 switch to AFT TRIM and observe TANK 1 & 4 MI reads AFT.

Once the aft trim operation is initiated it should not be interrupted. If during the aft trim operation the elevons should move down greater than one degree, or the CG move aft of 59% do not stop the aft trim but apply procedure "IF THE ELEVONS ARE DOWN MORE THAN 1 DEG" or CG AFT OF 59%.

Observe the tank 1 & 4 quantities decrease and stabilize at approximately 2000 kg.

IF THE ELEVONS ARE DOWN MORE THAN 1 DEG

TANK 5 & 7 INLET VALVES .... OPEN E

Set the tank 5 and 7 INLET VALVE selectors to OPEN

TANK 11 PUMPS .... ON E

Set the tank 11 PUMPS left and right hand selectors to ON
Monitor the elevon angle on Flying Control Position Indicator.

WHEN ELEVON ANGLE HALF DEGREE DOWN.

TANK 11 PUMPS Sel .... AUTO E

Set tank 11 PUMPS selectors to AUTO

TANK 5 & 7 INLET VALVES .... AUTO E

Set tank 5 and 7 INLET VALVES selectors to AUTO

END//

FUEL SYSTEM

CG AFT OF 59%

TANK 5 & 7 INLET VALVES .... OPEN E

Set tank 5 and 7 INLET VALVE selectors to OPEN

TANK 11 PUMPS .... ON E

Set tank 11 PUMPS left and right hand selectors to ON and monitor CG position.

<u>WHEN CG is 59%</u>

TANK 11 PUMPS .... AUTO E

Set tank 11 PUMPS left and right hand selectors to AUTO.

TANK 5 & 7 INLET VALVES .... AUTO E

Set tank 5 and 7 INLET VALVE selectors to AUTO.

END//

REINSTATEMENT OF LANDING GEAR AFTER TEST STANDBY LOWERING

L/GEAR NORMAL LEVER .... NEUTRAL P

Verify normal landing gear lever at NEUTRAL.

With the normal landing gear lever at NEUTRAL the landing gear door selector valves go to their neutral position thus removing green hydraulic pressure from the gear and door jacks. Therefore it is essential during this procedure to verify that the normal landing gear is at NEUTRAL to prevent the landing gear doors closing prematurely.

STANDBY LOWERING LEVER .... NEUTRAL E

Set the standby lowering lever to NEUTRAL and reset guard.

With the standby lowering lever at NEUTRAL the landing gear standby selector valve goes to the neutral position thus removing yellow hydraulic pressure from the landing gear and door jacks.

L/GEAR NORMAL LEVER .... DOWN P

Set normal landing gear lever to down.

Setting the normal landing gear lever to DOWN causes the landing gear doors to close.

Reinstatement of the landing gear will cause a transfer of a quantity of fluid between the green and yellow tanks.

END//

(Completely Revised).

REINSTATEMENT OF LANDING GEAR AFTER TEST OF FREE FALL

CAUTION
REINSTATEMENT OF LANDING GEAR AFTER A TEST OF FREE FALL LOWERING CAUSES YELLOW HYDRAULIC TANK LEVEL TO FALL APPROXIMATELY 5 US GALLONS. THIS IS SUFFICIENT TO CAUSE A YELLOW TANK LOW LEVEL BUT IN THIS CASE THE HYDRAULIC TANK LOW LEVEL DRILL NEED NOT BE APPLIED.

L/GEAR NORMAL LEVER .... NEUTRAL P

Verify normal landing gear lever at NEUTRAL.

With the landing gear lever at NEUTRAL the landing gear door selector valves go to their neutral position thus removing green hydraulic pressure from the gear and door jacks. Therefore it is essential during this procedure to verify that the normal landing gear is at NEUTRAL to prevent the landing gear doors closing prematurely.

STANDBY LOWERING LEVER ....NEUTRAL E

With the standby lowering lever at NEUTRAL the landing gear standby selector valve goes to the neutral position, thus removing yellow hydraulic pressure from the landing gear and door jacks.

YELLOW HYD PUMPS .... ON E

Set YELLOW PUMPS selectors to ON.

The YELLOW PUMPS selectors are set to ON because the yellow hydraulics system supplies for gear standby lowering and yellow pumps are not automatically switched on by gear standby lowering selections, and yellow hydraulic system pressure is essential for reinstatement of landing gear uplocks.

L/GEAR FREEFALL MECHANISM .... RESET E

Reset main gear and nose gear EMERGENCY RELEASE OPERATION mechanism, using the removable control lever and knurled knob for the main gear, and hand wheel for the nose gear.

STANDBY LOWERING LEVER ....DOORS FOR 4 SECS THEN WHEELS E

Lift the guard depress handle catch and set standby lowering lever to DOORS.

(Completely Revised)

The standby lowering lever at DOORS reinstates the main and nose door uplock mechanism and lowers the TAIL gear.

Wait four seconds to enable doors to be fully open (thereby preventing door/gear fouling), then, pressing the handle catch and release catch, set lever to WHEELS.

The standby lowering lever at WHEELS reinstates the main and nose gear uplock mechanism.

STANDBY LOWERING LEVER .... NEUTRAL E

Set the standby lowering lever to NEUTRAL and reset guard.

L/GEAR NORMAL LEVER .... DOWN P

Set the normal landing gear lever to DOWN, causing the main and nose gear doors to close.

END//

REINSTATEMENT OF NORMAL SYSTEM AFTER TEST OF STANDBY OR EMERGENCY SYSTEM

YELLOW PUMPS .... ON E

Verify the yellow PUMPS selectors at ON before reinstatement of NOSE AND VISOR to normal system to prevent transfer of green system fluid to yellow tank.

VISOR/NOSE ....CONFIRM POSITION P

Set VISOR/NOSE control lever to correspond with nose position.

EMERGENCY NOSE/VISOR
UPLOCK RELEASE .... NORMAL E

Set the EMERGENCY NOSE/VISOR UPLOCK RELEASE to normal by supporting the weight of the handle and depressing the latch release plunger in the handle pivot allowing the handle to fall to its normal position and engage pip pin.

STBY CONTROL SWITCH .... OFF P

Set NOSE/VISOR standby control switches to OFF by returning the NOSE DOWN and NOSE 5^{o} switches to OFF and the VISOR DOWN switch to OFF and guarded.

During reinstatement the nose will give an upward kick as hydraulic pressure arrives at the nose jacks. This is not harmful.

VISOR/NOSE ....AS REQUIRED P

Set the NOSE and VISOR as required.

END//

USE OF CREW OXYGEN

CREW OXYGEN .... REQUIRED ALL

Remove headset, squeeze the red levers and pull out mask from stowage box.

Don oxygen mask, release red levers.

Releasing the red levers vents the oxygen from the harness.

Adjust the strap for final fitting as necessary

Don headset.

Verify the N-100% switch at 100%

On the associated audio selector panel rotate the BOOM-MASK rotary selector to MASK.

END//

(Completely Revised)

USE OF PASSENGER/CREW OXYGEN INTERCONNECTION

Crew supply pressure gauge pointer not in green arc while in flight.

WHEN CREW OXYGEN REQUIRED

PAX-CREW OXYGEN
INTERCONNECT valve .... INLINE E

Open the upper door of the forward amenity stowage, remove the locking wire then, push and rotate to inline the PAX-CREW OXYGEN INTERCONNECT valve.

WHEN CREW OXYGEN NO LONGER REQUIRED

PAX-CREW OXYGEN
INTERCONNECT valve .... CROSSLINE E

Push and rotate to crossline PAX-CREW OXYGEN INTERCONNECT valve.

END//

(Completely Revised)

WINDSHIELD WIPERS AND RAIN REPELLENT

W/S WIPERS .... ON CP

Rotate the W/S WIPERS rotary selector to SLOW or FAST as required

If the windshield wipers do not operate, the nose must be lowered to fully down before rain repellent is used in order to achieve affective rain clearing flow across the windshield.

At 200 kt, in moderate or heavy rain, wipers alone are not effective.

If taking off into moderate or heavy rain apply repellent (two applications) before take-off run commences. Repellent alone is effective above 50 kt, therefore the wipers should be switched off as soon as possible above this speed as their use degrades the effectiveness of the repellent.

CAUTION
IF, FOR ANY REASON, RAIN REPELLENT FLUID IS APPLIED TO A DRY WINDSHIELD THE FLUID WILL DRY ON A SMALL AREA AND WILL DEGRADE VISIBILITY.

IF RAIN REPELLENT REQUIRED

RAIN REPEL pb .... PRESS AND RELEASE P

Press and release RAIN REPEL push button as necessary to obtain full coverage.

WHEN THE WINDSHIELD WIPERS ARE NO LONGER REQUIRED

W/S WIPERS rty sel ....OFF CP

Rotate the W/S WIPERS rotary selector to OFF
Observe windshield wipers park below the red marks on the inside surface of the forward screen adjacent to the centre pillar.

IF WINDSHIELD WIPER WILL NOT PARK
W/S WIPERS rty sel .... EMERG PARK CP

CAUTION

IF THE WINDSCREEN WIPER BLADE CANNOT BE PARKED BELOW THE RED SCREEN MARKS USING EITHER THE NORMAL OR EMERGENCY PARKING SYSTEM THE WIPER O/RIDE SWITCH MUST NOT BE USED TO BYPASS THE INHIBITION OF VISOR RAISING.

END//

ENGINE ANTI-ICING

- Engine anti-icing should be turned on during all ground or flight operations when icing conditions exist and for take-off if ambient temperature is below + 3°C and visibility is less than 1000 metres.

ENGINE ANTI-ICING .... ON E

Verify ENGINE ANTI-ICING switches at ON and observe IGV PRESS lights

The IGV light(s) may not come on until N2 is greater than 70%.

<u>IF IGV PRESS LTS DO NOT COME ON</u>
APPLY PROCEDURE: ENGINE ANTI-ICING MALFUNCTION

ICE AND RAIN PROTECTION

ICE WARNING RECEIVED IN FLIGHT OR,
KNOWN ICING CONDITIONS EXISTING.

CAUTION
IF THE VISOR IS DOWN DURING ICING CONDITIONS IT IS RECOMMENDED THAT IT BE LEFT DOWN DURING THE REMAINDER OF THE FLIGHT UNLESS IT IS CERTAIN THAT ALL THE ICE IN THE VISOR/WIND-SHIELD INTERFACE HAS BEEN CLEARED.

WING & INTAKE
ANTI-ICING rty sel .... 4 SECS ON E

Set the WING & INTAKE ANTI-ICING, MAIN OR ALTERN rotary selector to 4 SECS ON
Observe INT lights off, CYCLIC lights off

If the wing and intake anti-icing system is switched on with total air temperature above + 15°C, or with the aircraft on the ground, the CYCLIC and INT lights will come on

If the aircraft lands with the wing and intake anti-icing system switched on the CYCLIC and INT lights will come on

ENGINE ANTI-ICING sws .... ALL ON E

Set the ENGINE ANTI-ICING switches ON and observe IGV PRESS lights on, ICE light off

IF THE VISOR IS UP

VISOR DE-ICE sws .... ON P

(Unchanged)

Set the VISOR DE-ICE switches ON and observe O/HEAT lights off

If possible, verify that the visor is up when in icing conditions

IF O/HEAT LTS ON
Observe O/HEAT lights on and off for short periods

IF THE VISOR IS DOWN

W/SHIELD DE-ICE sels .... HIGH P

Set the W/SHIELD DE-ICE selectors to HIGH and observe clear vision is maintained

contd.

ICE AND RAIN PROTECTION

At HIGH the windshield panels are heated by high voltage and automatically maintained at working temperature

With a W/SHIELD DE-ICE selector at HIGH, the associated windshield de-icing system will automatically change to low condition if the visor is raised or the aircraft is on the ground

IF CLEAR VISION NOT MAINTAINED
APPLY PROCEDURE: WINDSHIELD EMERGENCY DE-ICING

AIRPLANE GENERAL

USE OF JP4 TYPE FUEL

INTRODUCTION

This procedure is applicable whenever the aircraft is to be operated using fuel to the following specifications.

Grade (Type)	Specification
Wide-cut Type (AVTAG: JP 4)	D.Eng. R.D. 2486 Issue 8 Amendment 1 AIR 3407/B Issue 3 ASTM D1655-74 Jet B MIL-T-5624J JP4 Grade I.A.T.A. (Nov. 1974) JP 4 Type 3-GP-22h D.Eng. R.D. 2454 Issue 3 Amendment 1

DISPATCH DEVIATIONS

Until the investigation into the use of this procedure in combination with other procedures are completed the use of this procedure with the following procedures is not authorized.

(a) Configuration Deviation List
(b) Dispatch with One Reheat System inoperative
(c) Dispatch with One Secondary Nozzle inoperative
(d) Dispatch with Both Autothrottles inoperative
(e) Dispatch with Two Wheelbrakes or Two Anti-skid units inoperative
(f) Dispatch with One Green Hydraulic Pump inoperative
(g) Dispatch with One or more Secondary Air Door systems inoperative
(h) Three engine Ferry
(i) Flight with Landing Gear extended
(j) Dispatch without Nose or Main Gear Water Anti-ingestion devices
(k) Operation from Precipitation covered runways
(l) Crew Training (including C of A renewal)
(m) Continuous operation of Anti-icing system
(n) Unreheated Take-Off

LIMITATIONS

The use of Contingency Rating is prohibited. The manual and automatic Contingency Rating selection systems must be inhibited in accordance with the procedure defined in the Maintenance Manual, 12-11-28, "Refuelling with Wide-Cut Fuel".

(Completely Revised)

AIRPLANE GENERAL

USE OF JP 4 TYPE FUEL

Fuel Temperatures

The following fuel temperature limits, as indicated on the engine secondary instrument panel, must be observed.

(a) Minimum Fuel Temperature for starting and relighting = -40°C.
(b) Minimum fuel temperature before advancing the throttle above Idle = -40°C.
(c) Maximum fuel temperature prior to take-off = 35°C.
(d) Maximum continuous fuel temperature = 50°C.
(e) Absolute maximum fuel temperature = 75°C.

Fuel Specifications

Only fuel to the specifications listed in the introduction to this procedure are approved for use, when the following limitations must be observed.

(a) Fuel specifications D.Eng R.D. 2454 and MIL-T-5624J, already include corrosion inhibitor HITEC E515 and anti-icing additive to specification D.Eng. R.D. 2451 issue 2 or MIL-I-27686E. When using these fuels the limitations defined for Kerosine type fuels containing HITEC E515 are also to be observed.

(b) The use of anti-icing additives to D.Eng. R.D. 2451 issue 2, AIR 3562/A or MIL-I-27686E is mandatory in fuels which do not include an anti-icing constituent in the basic fuel.

(c) Shell ASA-3 static dissipator must be present in the fuel at concentrations which result in the electrical conductivity of the fuel remaining within the specification limits, up to a maximum concentration of 1.0 mg/litre (0.35 lbs per 35,000 imperial gallons).

(d) The only optional additives that may be used are those approved for use with Kerosine fuels.

(e) Fuels which deviate from the approved specifications in aromatic content to 25% by volume maximum and smoke point 18 mm minimum, or fuels to specification ASTM ES2-74 Jet B may be used on an exception basis observing the limitations specified for similar deviations from Kerosine fuel specifications, i.e. the minimum fuel temperature limitation specified at Vol.II.01.06.01 para 2.

(f) On completion of a flight using Wide-cut fuel the aircraft fuel tanks must be drained of residual fuel, in accordance with the Complete Defuelling procedures defined in the Maintenance Manual, before refuelling with Kerosine type fuel.

(Comp. ely Revised)

AIRPLANE GENERAL

USE OF JP 4 TYPE FUEL

Fuel Specifications (continued)

If this requirement is not observed, the limitations associated with the use of Wide-cut fuels must be applied to subsequent flights, using a mixture of Wide-cut and Kerosine type fuels.

Flight Envelope

(a) The aircraft is limited to subsonic flight within the approved flight envelope, subject to a maximum altitude of 36,000 ft.

(b) Supersonic operation and continuous operation with a Total Temperature greater than 15°C is prohibited. In order to allow for changes in atmosphere conditions, operation with a Total Temperature greater than 15°C is permitted for a maximum time of 15 minutes per flight.

AIRCRAFT HANDLING

There are no handling difficulties.

PERFORMANCE

Due account must be taken of reduction in performance with use of JP4 type fuel. (See Performance Manual. Section 5).

(Completely Revised)

AIRPLANE GENERAL

USE OF JP 4 FUEL

ALTERATIONS TO NORMAL PROCEDURES DURING USE OF JP 4 TYPE FUEL

PRELIMINARY COCKPIT CHECKLIST

New Item CONTINGENCY .... CHECK INHIBITION

Observe that the CONTINGENCY INHIBITED locking device has been fitted and that the selectors cannot be moved to the CTY position.

Set REHEAT sels to RHT
Push to ARM, T/O MONITOR pb
Observe CTY lt off

The CTY light remaining off indicates that the automatic selection of contingency rating has been rendered inoperative.

Pull to INHIB, T/O MONITOR pb
Set REHEAT sel to OFF

FLIGHT ENGINEER'S COCKPIT PREPARATION

IGNITION .... BOTH

Set IGNITION rty sel to BOTH to minimize the possibility of a false start.

FUEL HEATERS .... OFF

Set FUEL HEATERS sels to OFF

The use of the FUEL HEATERS is prohibited except under certain conditions in flight as defined in the Procedure FUEL FILTER LIGHT ON during use of JP4 type fuel.

ENGINE INSTRUMENTS .... CHECK

Check serviceability of FUEL TEMP instruments
Only one FUEL TEMP instrument may be unserviceable for despatch with JP 4 type fuel.

AFTER START CHECK LIST

New Item ENGINE RECIRCULATION VALVES .... OPEN ... E

Set ENGINE RECIRCULATION VALVES sws to OPEN

The ENGINE RECIRCULATION VALVES are set to OPEN for all engine ground operation to prevent the fuel temperature limitations being infringed.

BEFORE TAKE-OFF CHECK LIST

New Item

FUEL TEMPERATURE .... MAXIMUM 35°C... E

Check FUEL TEMP on engine secondary instrument panel

The check of the fuel temperature must be carried out before closing the RECIRCULATION VALVES and at least ten minutes after the engine has reached idling conditions.
During this ten minute period it is permissible to operate the engines transiently above idle in order to start the aircraft moving.

CAUTION
If the FUEL TEMP of any engine is greater than 35°C take-off is not permitted due to the possibility of infringing the fuel temperature limitations in flight.

ENGINE RECIRCULATION VALVES .... SHUT .. E

Set ENGINE RECIRCULATION VALVES sws to SHUT

IN FLIGHT

FUEL
Throughout the flight the collector tanks should be kept as full as is practicable in order to keep the engine FUEL TEMP as low as possible.
If at any time the FUEL TEMP reaches 50°C refer to the Procedure FUEL TEMP EXCEEDS 50°C.
If crossfeeding is required refer to the Procedure CROSSFEEDING during use of JP4 type fuel.

Where possible throughout the flight the aircraft speed and altitude should be adjusted to maintain an engine FUEL flowrate greater than 2500 kg/hr.
In the event of the FUEL flowrate falling below 2500 kg/hr the ENGINE RECIRCULATION VALVE for the associated engine is to be selected OPEN.
If other considerations require ENGINE RECIRCULATION VALVES to be selected SHUT, the SHUT selection is to take priority.

AIRPLANE GENERAL

USE OF JP 4 FUEL

AIR CONDITIONING
Whenever the TOTAL TEMP is greater than 25°C normal operation of the air conditioning system is permitted. However in order to minimize the engine FUEL TEMP whenever the engines are operating with a TOTAL TEMP less than 25°C the FUEL VALVES are to be selected SHUT

AFTER LANDING CHECKLIST

New Item ENGINE RECIRCULATION VALVES ....OPEN .... E

Set ENGINE RECIRCULATION VALVES sws to OPEN

USE OF JP4 TYPE FUEL

FUEL TEMP EXCEEDS 50°C

ENGINE FUEL HEATER .... OFF ....E
ENGINE RECIRCULATION VALVE .... OPEN .... E
AUTO IGNITION .... OFF .... E
THROTTLE .... ADVANCE IF POSSIBLE .... E
ENGINE FUEL TEMPERATURE .... MONITOR .... E

IF FUEL TEMP REDUCES OR REMAINS CONSTANT AT LESS THAN 75°C
CONTINUE NORMAL FLIGHT

IF FUEL TEMPERATURE GREATER THAN 75°C
APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

FUEL FILTER LIGHT ON

CAUTION
WITH THE FUEL FILTER LIGHT ON A LOSS OF ENGINE POWER MAY OCCUR

ENGINE FUEL TEMPERATURE .... OBSERVE .... E

IF ENGINE FUEL TEMPERATURE ABOVE + 50°C
APPLY PROCEDURE: FUEL TEMP EXCEEDS 50°C

IF ENGINE FUEL TEMPERATURE BETWEEN + 40°C AND + 50°C
ENGINE RECIRCULATION VALVE ....SHUT .... E

IF ENGINE FUEL TEMPERATURE IS BELOW + 40°C
FUEL HEATER .... ON .... E
ENGINE RECIRCULATION VALVE .... SHUT .... E

WHEN ENGINE FUEL TEMPERATURE ABOVE + 40°C
FUEL HEATER .... OFF .... E
ENGINE FUEL TEMPERATURE .... MONITOR .... E

MISCELLANEOUS

USE OF JP4 TYPE FUEL

FUEL TEMP EXCEEDS 50°C

ENGINE FUEL HEATER .... OFF E

Set associated FUEL HEATERS selector to OFF, since in the event of the high temperature in the fuel system being caused by an inadvertent operation of the fuel heater, setting the FUEL HEATERS selector to OFF should reduce the fuel temperature immediately.

ENGINE RECIRCULATION VALVE .... OPEN E

Set associated ENGINE RECIRCULATION VALVES switch to OPEN.

If the high fuel temperature is caused by a malfunction other than a fuel heater failure, the opening of the recirculation valve is one of the means of attempting to keep the temperature within limits.

AUTO IGNITION .... OFF E

Set AUTO IGNITION switch for associated engine to OFF

Fuel temperature in excess of 50°C may cause fuel pump cavitation resulting in a loss of engine power or even flame out. The AUTO IGNITION system is switched off under these conditions since the system could aggrevate engine power loss and flame out situation caused by fuel starvation.

THROTTLE .... ADVANCE IF POSSIBLE E

Advance throttle lever of associated engine in an attempt to lower the fuel temperature by increasing the fuel flow to the engine.

To minimize the FUEL TEMP, the associated engine should be operated at the maximum power consistent with other engine limitations and overall aircraft operational requirements.

ENGINE FUEL TEMPERATURE .... MONITOR E

Monitor FUEL TEMP instrument reading on secondary instrument panel

▶ <u>IF ENGINE FUEL TEMP REDUCES OR REMAINS CONSTANT AT LESS THAN 75°C</u>
CONTINUE NORMAL FLIGHT

▶ <u>IF ENGINE FUEL TEMP GREATER THAN 75°C</u>
APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

USE OF JP4 TYPE FUEL

FUEL FILTER LIGHT ON

CAUTION
WITH THE FUEL FILTER LIGHT ON A LOSS OF ENGINE POWER MAY OCCUR.

ENGINE FUEL TEMPERATURE .... OBSERVE E

Observe **FUEL TEMP** instrument reading of affected engine on secondary instrument panel

IF ENGINE FUEL TEMPERATURE ABOVE + 50°C
APPLY PROCEDURE: FUEL TEMP EXCEEDS 50°C

IF ENGINE FUEL TEMPERATURE BETWEEN + 40° and + 50°C
ENGINE RECIRCULATION VALVE .... SHUT E

Verify associated ENGINE RECIRCULATION VALVE switch at SHUT to ensure that the possibly restricted flow across the fuel filter is available for engine use.

IF ENGINE FUEL TEMPERATURE IS BELOW + 40°C
FUEL HEATER .... ON E

Set the FUEL HEATER selector to ON since with a fuel temperature of less than plus 40°C in the burner manifold a fuel temperature may exist at the fuel filter, leading to the formation of ice crystals in the fuel, causing clogging of the filter giving rise to high differential pressure.

ENGINE RECIRCULATION VALVE .... SHUT E

Verify associated ENGINE RECIRCULATION VALVE switch at SHUT to ensure that the possibly restricted flow across the fuel filter is available for engine use.

WHEN ENGINE FUEL TEMPERATURE ABOVE + 40°C
FUEL HEATER .... OFF E
ENGINE FUEL TEMPERATURE .... MONITOR E

END//

MISCELLANEOUS

USE OF JP4 TYPE FUEL

CROSSFEED

CAUTION
CROSSFEEDING IS NOT TO BE USED DURING TAKE-OFF OR LANDING.
THE MINIMUM ENGINE FEED PUMPS REQUIREMENT DURING OTHER PHASES OF FLIGHT IS:
- TWO PER ENGINE WITH T/OFF SELECTED,
- THREE PER TWO ENGINES WITH REHEAT ON,
- ONE PER ENGINE DURING CRUISE ABOVE 20,000 FT.
- ONE PER TWO ENGINES DURING CRUISE BELOW 20,000 FT.

DO NOT FEED MOPE THAN TWO ENGINES FROM A SINGLE TANK.

This requirement must be taken in account in the event of the need to carry out the Emergency Drills for Failure of Four Main Generators or Electrical Smoke or Fire.

CROSSFEED .... AS REQUIRED E

Verify ENGINE FEED PUMPS switches of the collector tank in use to ON.
Rotate the CROSSFEED rotary selectors of the collector tank in use and the engines to be supplied to inline and observe crossfeed MIs in line.
Set the ENGINE FEED PUMPS switches of the unused collector tank to OFF.

WHEN CROSSFEED NO LONGER REQUIRED

ENGINE FEED PUMPS .... ALL ON E

Set all ENGINE FEED PUMPS switches to ON

CROSSFEED rty sels .... CROSSLINE E

Rotate CROSSFEED rotary selectors crossline ~~and~~ observe CROSSFEED MIs show crossline.

END//

MISCELLANEOUS

USE OF JP4 TYPE FUEL

FALSE START

The FALSE START procedure may only be applied after 2 min has elapsed since previous operation of air turbine starter.

COND VALVE .... OFF E

Verify COND VALVE selector at OFF and observe COND VALVE MI shows crossline.

HP VALVE .... SHUT E

Verify HP VALVE switch at SHUT to prevent flooding the engine with fuel.

IGNITION rty sel .... BOTH E

Verify IGNITION rotary selector at BOTH

ENGINE DEBOW sw .... DEBOW E

Set ENGINE DEBOW switch to DEBOW and observe DEBOW switch light on.

START/RELIGHT sel .... START E

Set START/RELIGHT selector to START

Start clock

Observe START/RELIGHT selector is latched at START, START VALVE MI reads OPEN, ENGINE DEBOW switch light off, START PUMP light (yellow) on, N2 rises.

During the dry motoring cycle the air supply to the ram air turbine starter must be controlled to maintain N2 below 16% and duct pressure below 35 psig to prevent air turbine starter limitations being exceeded.

<u>30 SEC AFTER START/RELIGHT SELECTOR AT START</u>

START/RELIGHT sel .... OFF E

Set START/RELIGHT selector to OFF

<u>OBSERVE AIR STARTER COOLING LIMITATION THEN</u>

START/RELIGHT sel .... START E

Set START/RELIGHT selector to START

Start clock

USE OF JP4 TYPE FUEL

Observe START/RELIGHT selector is latched at START, START VALVE MI reads OPEN, ENGINE DEBOW switch light off, START PUMP light (yellow) on, N2 rises.

20 SEC AFTER SETTING START/RELIGHT SEL TO START

HP VALVE .... OPEN E

Set HP VALVE switch to OPEN and observe RH IGN and LH IGN lights (green) on, EGT rising.

IF EGT NOT RISING WITHIN 8 SEC OF OPENING HP VALVE

HP VALVE .... SHUT E
START/RELIGHT sel .... OFF E
ENGINE DEBOW sw .... NORMAL E

Set HP VALVE switch to SHUT, START/RELIGHT selector to OFF and ENGINE DEBOW switch to NORMAL.

END//

IF EGT RISING

Continue as if normal engine start.

END//

TAKE-OFF WITHOUT REHEAT

INTRODUCTION

At light weight, take-off is permitted with reheat selected OFF on all engines. For training, unreheated take-offs are more representative of reheated take-offs at normal service weights. In addition, sideline noise is reduced.

DISPATCH DEVIATIONS

Use of this procedure with the following procedures is not authorised.

(a) Configuration Deviation List
(b) Dispatch with One Wheelbrake or One Anti-skid unit inoperative
(c) Dispatch with One Green Hydraulic Pump inoperative
(d) Three engine Ferry
(e) Flight with Landing Gear extended
(f) Dispatch without Nose or Main Gear Water Anti-ingestion devices
(g) Operation from Precipitation covered runways
(h) Continuous operation of Anti-icing system
(i) Use of JP4 type fuel

The above list does not include dispatch with one Reheat Inoperative and dispatch with one or more Secondary Air Doors Systems Failed Shut since all the actions required by these procedures are contained within this procedure.

AIRCRAFT HANDLING

There are no handling difficulties

PERFORMANCE

See Performance Manual section 5 for Performance penalties and procedures.

Deletion.

MISCELLANEOUS

ALTERATIONS TO NORMAL PROCEDURES FOR TAKE-OFF WITHOUT REHEAT

BEFORE START CHECKLIST

Vol.2B,06-08-02 SECONDARY AIR DOORS .... SHUT ... E

Set the SECONDARY AIR DOORS sels to SHUT

NOTE
This is to prevent reverse flow through the engine bay at low speeds with reheat inoperative.

Vol.2B,06-08-04 CLOCK, ENGINE & TLA BUGS .... SET . ALL

Set the P7 bug to the required value
Set the Fuel Flowmeter bug to zero
Set the throttle angles indices to the required value.

NOTE
Setting the Fuel Flowmeter bugs to zero allows the green clear to go lights to operate normally.

BEFORE TAKE-OFF CHECKLIST

VOL.2B,06-13-02 REHEAT .... OFF ... E

Confirm the REHEAT sels are at OFF.

NOTE
The performance is based on the assumption that in the event of engine failure neither reheat nor contingency ratings are selected. Such selections are however, not prohibited in the event of engine failures.

AT M=0.7 CLIMB CHECKLIST

Vol.2B,06-15-03 SECONDARY AIR DOORS .... AUTO/OPEN ... E

Set the SECONDARY AIR DOORS sels to AUTO when speed greater than 250 kts.
Observe the SECONDARY AIR DOORS MI's read OPEN

AIDS LIMIT LIGHT ON or DATA RECALL REQUIRED PVS 1580 ONLY

● ▶ LIMIT LIGHT ON

LIMIT LIGHT........................PRESS & RELEASE.........E

The LH display will show the 4-digit parameter code. The RH display will show the highest recorded value of that parameter, in engineering units.

Repeat the above action until the Limit Light extinguishes, noting parameter code and value in each case.
Parameter codes are listed below.

END//

● ▶ DATA RECALL REQUIRED

Maximum positive and negative vertical 'g' in flight, maximum positive and negative vertical 'g' on landing, maximum brake application speed, are all available on recall, to enable the requirement for turbulence/heavy landing checks to be assessed and to facilitate brake energy calculations after abandoned take-off.

PARAMETER CODE...................INSERT.................E

Parameter codes are listed below

DISPLAY KEY......................PRESS..................E

The LH display will show the 4-digit parameter code. The RH display will show the highest recorded value of that parameter, in engineering units.

NOTE

In order to erase this data before the next take-off, the CLEAR MEMORY key must be pressed whilst the DOORS MWS is on. i.e. door or hatch open.

END//

PARAMETER CODE	PARAMETER
2010 2020 2030 2040	No. 1 N_2 No. 2 N_2 No. 3 N_2 No. 4 N_2
2011 2021 2031 2041	No. 1 N_1 No. 2 N_1 No. 3 N_1 No. 4 N_1
2012 2022 2032 2042	No. 1 EGT No. 2 EGT No. 3 EGT No. 4 EGT
2003 2004 2005 2006	max + 'g' in flight max - 'g' in flight max + 'g' landing max - 'g' landing
2007	max brake application speed

(U...anged)

MISCELLANEOUS

TRANSIT HANDLING GUIDANCE

Occasions will arise when Concorde will transit off-line stations. These notes do not constitute a complete schedule of activities but are produced to highlight particular aspects of Concorde that may be different to other aircraft:

Prior to Arrival at Unscheduled/Off-line Stations

Call ahead on a company frequency when available (see Nav. Manual 3-10-13) or telephone before initial departure e.g. New York to Gander giving a selection of the following details as considered appropriate:-

GROUND EQUIPMENT REQUIREMENTS

AIR START UNIT - with 3 ins quick release coupling to MS33740.

PRE-CONDITIONED AIR UNIT - with 8 in quick release coupling to MS33562.

GROUND POWER UNIT - with 200V 3 PHASE 400 Hz 90 Kva supply.

The ground power socket is located in the lower fuselage right side just forward of nose gear doors 13 ft above ground.

PASSENGER STEPS - for a sill height of approximately 15 ft.

FUEL - estimated volumetric uplift.

There are four couplings of 2.5 in bayonet type to MIL MS29514-29520. Flow rate 540 US gl/min 2046 litre/min per connection. Max pressure 50 psi at aircraft coupling.

ON ARRIVAL

Follow Normal Check lists down to Parking Check List item ground power.
Before accepting a ground power unit of unknown capacity, keep one engine running only and reduce electrical loads by switching off the following items:

THROTTLE MASTERS (non operating engines)................OFF E

Set THROTTLE MASTER selectors for non operating engines to OFF.

FLIGHT CONTROL INVERTERS ....PWR OFF P

Move the guard and set BLUE INVERTER sel to PWR OFF. Observe FAIL lt (red) on. Move the guard and set GREEN INVERTER sel to PWR OFF. Observe FAIL lt (red) on.

TRANSIT HANDLING GUIDANCE

TRANSPARENCY DE-ICE DEMIST ....OFF C

Verify WINDSHIELD DE-ICE sels at OFF
Verify VISOR DE-ICE sws at OFF
Verify DV DEMIST sws at OFF

RADAR ....OFF E

On both radar screens
Set IND OFF-LEFT-AHEAD-RIGHT rty sel to OFF

Press OFF pb lt on radar controller
Observe OFF pb lt (white) on

HF RADIOS ....OFF P

Set HF 1 and HF 2 sels to OFF

AIR DATA COMPUTERS ....OFF E

Set ADC1 and ADC2 sws to OFF
Observe flags visible on associated instruments

NOTE
When the ADCs are switched off the secondary nozzle buckets of the operating engine will move to 0° due to the loss of ADC signal to the NASU.

INS ....OFF E

Set INS 1, INS 2 and INS 3 mode sels to OFF

BRAKE FANS ....AS REQUIRED E

Set BRAKE FANS sw to OFF if temp less than 250°C and falling

ENGINE VIBRATION SUPPLY ....OFF E

Set the ENGINE VIBRATION SUPPLY sel to OFF.

FUEL PUMPS ....ALL OFF E

Verify Tanks 5A, 5, 6, 9, 10, 11, 7A, 7, 8 PUMPS sws and sels at OFF
Set ENGINE FEED PUMPS sws (12) to OFF

WATER HEATERS ....OFF E

Set WATER HTRS sw to OFF

MISCELLANEOUS

TRANSIT HANDLING GUIDANCE

GALLEY POWER ....OFF E

Set GEN 1 & 3 and GEN 2 & 4 GALLEYS sws to OFF

AICU SUPPLY CBs ....TRIP E

Trip the circuit breakers for AICUs

CIRCUIT BREAKER	PANEL	GRID REF
AICU 1B SUP	14-216	A 5
AICU 4A SUP	14-216	B 5
AICU 2A SUP	13-216	A 3
AICU 3B SUP	13-216	B 3
AICU 4B SUP	2-213	B14
AICU 1A SUP	2-213	D14
AICU 3A SUP	2-213	H13
AICU 2B SUP	2-213	H14

FWD SUPPLY FANS.....................................OFF E

Set ONLY the equipment bay cooling FWD SUPPLY fan sel to OFF

GROUND POWER ....ON E

Observe GRND POWER AVAILABLE lt (white) on

Set ground power sw to CLOSE and release and live generator sel to OFF

IF... Ground power rejected
Set the equipment bay cooling FWD EXTRACT FAN 2 sel to OFF and the REAR EXTRACT LH fan sw to OFF.

Re-establish ground power

IF... Ground power still rejected
Set all equipment bay cooling fans sels and sws to OFF

. Re-establish ground power

When ground power stable
Set equipment bay cooling FWD EXTRACT FAN 2 sel to ON
When ground power stable
Set REAR EXTRACT LH fan sw to ON

PARKING AND STOPOVER CHECKLISTS .... COMPLETE ALL

MISCELLANEOUS

TRANSIT HANDLING GUIDANCE

ENGINE START WITH SUSPECT GROUND POWER

This procedure is only for use on those occasions during transit, when ground power was suspect before engine shut down. Do not carry out panel scans or use the normal checklists. Leave all items in position set at time of shut down, and use the following procedure to start the first engine.

BRAKES ....PARK/CHECKED P.E.

Verify brake control lever at PARK and observe dual BRAKES pressure gauge reads full scale and BRAKES EMERG lt (amber) on

THROTTLES ....IDLE E

Verify throttles at idle.

THROTTLE MASTER No 3 ....ON E

Set No 3 THROTTLE MASTER sel to MAIN or ALTERN

IGNITION sel ....BOTH E

Set the ignition rty sel to BOTH

GROUND HYD CHECK OUT ....YELLOW YELLOW/OFF E

Verify the GROUND HYD CHECKOUT rty sel at YELLOW YELLOW
Verify PUMP 1 G-Y and PUMP 2 B-Y sws at OFF.

BATTERIES ....ON E

Set battery sels (2) to BATT ON.

Observe BATT A and BATT B MIs show inline, BATT ISOLATE lts off and LH and RH ESS/MAIN SPLIT MIs show inline.

NOTE
BATT ON is selected to prevent any interruption of the d.c. supply during engine start.

ENGINE No 3 INSTRUMENT C/Bs ....SET E

CAUTION
DO NOT RESET THE AICU SUPPLY C/Bs.

Reset <u>ONLY</u> the white C/Bs in table.

MISCELLANEOUS

TRANSIT HANDLING GUIDANCE

CIRCUIT BREAKER	PANEL	GRID REF
ENG INST BUS 5XS	2-213	H 4
ENG INST BUS 7XS	4-213	G 2
ENG & FUEL INST BUS 3XS	13-216	G 3

No 3 ENGINE ....START E

Start No 3 engine

No 3 GEN ....ON LINE E

Set No 3 generator selector to ON
Observe No 3 GCB shows inline

ANTI-COLLISION LIGHTS .... ON E

Set ANTI-COLN sw to ON.

ENGINE FEED PUMPS ....ON E

Set No 3 ENGINE FEED PUMP sws to ON and the ENGINE FEED PUMP sw as appropriate for continuation of engine starting sequence

BLEED VALVE ....OPEN E

Set No 3 engine BLEED VALVES sw to OPEN
Observe pressure gauge indicator approximately 20 psi

CROSSBLEED VALVES ....OPEN E

Set No 3 and 4 CROSS BLEED VALVES sws to OPEN

COND VALVES 3 AND 4 .... ON E

Set No 3 and 4 COND VALVE sels to ON
Observe M1 in line within 30 secs and mass flow satisfactory

EQUIPMENT BAY COOLING PANEL ....SET E

Observe FLOW lts are off.
Verify Fan 2 sel and Fans 1 and 3 sel at AUTO.
Observe Forward Extract M1 reads ON.

Verify Forward Supply Fans sel at NORM.
Observe LH and RH Supply Fan MIs read ON.

Verify Rear Extract LH and RH Fans sws at ON
and Standby Fan sw at OFF.
Observe LH and RH Rear Extract Fan MIs read ON.

Verify Forward Emergency Relief Valve at SHUT
and MI reads SHUT.
Observe Forward Flow Indicator reads 0.85 to 1.1 kgs/sec.
Observe Hydraulic Bay Fan MI reads ON.

CIRCUIT BREAKERS ....SET E

Set all flight deck C/Bs unless collared

PRE FLIGHT CHECKS ....PERFORM ALL

Carry out pre flight checks including panel scans from COCKPIT PRELIMINARY PREPARATION onwards.

NOTE

The INSs will take approximately 15 minutes to count down to status 5, therefore it is recommended that on completion of scan checks, No.2 engine be started in order to give complete crossbleed capability. The remaining 2 engines will be started after selection of INSs to NAV using normal procedures.

LIST OF CONTENTS

MANUFACTURER'S MINIMUM EQUIPMENT LIST

INTRODUCTION

The applicable operational rules permit the publication of a MANUFACTURERS MINIMUM EQUIPMENT LIST (M.M.E.L.) designed to provide operators with the authority to operate an aeroplane with certain items or components inoperative provided an acceptable level of safety is maintained by appropriate operating limitations, by a transfer of the function to another serviceable component or by reference to other instruments or components providing the required information.

For the sake of brevity, the M.M.E.L. does not include obviously required items such as wings, rudders, engines, landing gear, etc. Also, the list does not include items which do not affect the airworthiness of the aircraft such as galley equipment, entertainment systems, passenger convenience items etc. However, it is important to note that ALL ITEMS WHICH ARE RELATED TO THE AIRWORTHINESS OF THE AIRCRAFT AND NOT INCLUDED ON THE LIST ARE AUTOMATICALLY REQUIRED TO BE OPERATIVE.

This M.M.E.L. does not define "where and when" an inoperative item is to be repaired or replaced but rather indicates through approval of minimum equipment lists those instruments and items of equipment that may be inoperative for certain flight conditions with the intent that no flight can take off from an airport with inoperative equipment other than that specified. However, unless otherwise stated, repairs must be made on return to the main base or as soon as possible. The failure of instruments or items of equipment in excess of those allowed to be inoperative by the M.M.E.L. causes the aircraft to be unairworthy.

The operator is responsible for exercising the necessary operational control to assure that no aircraft is despatched with multiple items inoperative without first determining that any interface or inter-relationship between inoperative systems or components will not result in a degradation in the level of safety and/or an undue increase in crew workload.

The exposure to additional failures during continued operation with inoperative systems or components must also be considered in determining that an acceptable level of safety is being maintained. It should be noted that the M.M.E.L. is not intended to provide for continued operation of the aircraft for an indefinite period with airworthiness items inoperative.

Unless otherwise stated in the text, this M.M.E.L. is valid for Cat. 1, Cat 2 and Cat 3 landings.

INTRODUCTION

NOTE:

(1) Asterisk (*) requires inoperative unit or components to be placarded in the cockpit.

(2) Double asterisk ** (o) indicates that a special operating procedure must be applied.
Double asterisk ** (m) indicates a maintenance procedure.

These operating or Maintenance actions are detailed in the Dispatch Deviation Procedures, contained in Section 2 at the back of this M.M.E.L.

(3) A dash (-) in Columns 5 or 6 indicates a variable quantity.

(4) Definitions for the purpose of this list:

A. "VMC flight conditions" means atmospheric environment is such as to allow the flight to proceed under the Visual Meteorologic Conditions applicable to the flight.

B. "Icing Condition" means the atmospheric environment is such that ice can form on the aircraft or in the engine.

C. DAY operation is any flight conducted from the point of take-off to landing between 30 minutes before sunrise and 30 minutes after sunset.

D. "Inoperative" means any time a system and/or component malfunctions to the extent that it does not accomplish its intended purpose and/or is not consistently functioning within its designed operating limit(s) or tolerance.

NOTE: ANY ITEM ANNOTATED $\boxed{P}$ SHALL BE ENTERED IN THE PERFORMANCE A.D.D. FILE (YELLOW) ONLY.
$\boxed{P}$ ANNOTATION INDICATES ITEMS OF EQUIPMENT WHICH WHEN UNSERVICEABLE, OR MISSING, CARRY A PERFORMANCE PENALTY. CAPTAINS MUST REFER TO THE INSTRUCTIONS IN THE PERFORMANCE MANUAL AND LIAISE WITH THE GROUND ENGINEER TO ENSURE THAT AN ADVISORY SIGNAL IS SENT TO ONWARD FLIGHT PLANNING STATIONS. AT LHR, DETAILS OF ANY OUTSTANDING PERFORMANCE ITEMS MUST BE PASSED TO PRODUCTION ENGINEERING CENTRAL CONTROL, H2 TBA, FOR ONWARD TRANSMISSION TO APPROPRIATE STATIONS.

(Unchanged)

AIR CONDITIONING

ATA 21

REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Air Conditioning Group	4	3	3	**(o) Shut down the affected group.
2	Bleed and Pressure - Control Valve	4	2	2	(a) Failed Shut One Valve per side may be failed shut, provided cross bleed Valves to at least one adjacent system can be opened
			2	2	(b) Failed Open ** (m) The failed valves must be closed mechanically before engine start.
3	Cross Bleed Valve	4	2	2	Multiple Valve failures are permitted provided that at least one valve per side is closed. If a valve is failed open the associated Air Conditioning Valve should be confirmed closed for engine start.
4	Conditioning Valve	4	3	3	(a) Failed Shut **(o) Shut down the affected group. (b) Failed Open **(o) **(m) Normal operation is permitted if Mass Flow Valve can be opened and closed using the Airconditioning test panel after engine start. If the Mass Flow Valve is unserviceable, the Conditioning Valve must be closed mechanically.
5	Jet Pump	4	0	0	
6	Over Pressure Detection	4	3	3	The affected Bleed and Pressure Control Valve should be switched to SHUT.
7	Pressure Indicator	4	2	2	

(Deletion)

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT		LIMITATION/PROCEDURE
8	Ram Air Valve	4	2	2	(a)	Failed Open Normal operation of group permitted.
			3	3	(b) **(m) **(o)	Failed Shut Normal operation permitted if the Ram Air Valve can be opened mechanically. If it cannot be so opened, shut down the group.
9	Fuel Throttle Valve	4	2	2	(a)	Failed Open Normal operation permitted.
			3	3	(b) **(m) **(o)	Failed Shut Normal operation permitted if the Fuel Throttle Valve can be opened mechanically. If it cannot be so opened, shut down the group.
10	Temperature Control System	4	3	3	**(o)	If no control in Auto and Standby, shut down the associated group.
11	Temperature Control Valve Indication	4	2	2		Normal operation permitted provided the associated duct Temperature Indicator is serviceable.
12	Cabin Inlet Safety Valve	4	3	3	**(o)	One valve may be failed shut provided that the associated group is shut down.
13	PRIM EXCH. SEC EXCH DUCT warnings	4	3	3	**(o)	Shut down the associated group.
14	Cold Air Unit Inlet Indication	4	0	0		
	Duct Temperature Indication.	4	2	2		Normal operation permitted provided the associated T.C.V. position indicators are serviceable

(Unchanged)

AIR CONDITIONING

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT		LIMITATION/PROCEDURE
15	Mass Flow Indication	4	2	2		Normal operation permitted provided all other indications for the associated group are normal.
16	Temperature indication Flight-deck and Cabin.	3	1	1		
17	Cold Air Unit Leak Detection	4	3	3	**(o)	Shut down the associated group.
18	Nac/Wing Overheat Detection	4	3	3		See MEL 26-4.
19	Air Conditioning Smoke Detection	4	3	3		One may have active failure (provided the Rotary Switch is set to INHIBIT) or passive failure (FAULT LIGHT).
20	Cabin Pressure Control System	2	2	2		Both Rear Discharge Valves may be failed shut.
21	Discharge Valve Position Indicator	1	-	-	**(o)	Both Position Indications from one system may be inoperative
22	Cabin Altimeter	2	0	0	**(o)	Differential pressure indicator must be serviceable
23	Differential Pressure	1	0	0	**(o)	One cabin altimeter must be serviceable.
24	Cabin Altitude Rate of Change Indication	1	0	0		One cabin altimeter must be serviceable
25	Thrust Recuperator System	1	0	0		
26	Landing Gear Ventilation Valve	1	0	0		
27	Ground Pressure-Relief Valve	1	0	0		If failed shut, the switch must be selected to either SHUT 1 or SHUT 2 and the valve confirmed closed.
28	Hyd. Bay Vent. fan	1	0	0		Prolonged engine ground running should be avoided.

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
29	Fwd.Chassis Vent. Valve	1	0	0	
30	Fwd. Rack Supply Fans	2	1	1	
31	Fwd. Rack Extract Fans	3	2	2	**(o) **(m)
32	Fwd. Rack FLOW Warning	2	2	2	No concession.
33	Rear Rack Extract Fans	3	2	2	Any one of the three may be U/S
34	Rear Rack FLOW Warning.	1	1	1	No concession
35	Emergency relief valve	1	1	1	No concession
36	Duct Outward Relief Valve	1	1	1	(a) Failed Shut No concession
			0	0	(b) Failed Open May be failed open provided all 3 Forward Extract Fans are serviceable and are selected On for the complete flight.
37	Inward Relief Valve	1	1	1	(a) Failed Shut No Concession
			0	0	(b) Failed Open May be failed open provided all three Fwd. Rack Extract Fans are serviceable and are selected On for the complete flight.
38	Fan Bypass Duct NRV	1	1	1	No Concession
39	Not Used				

(Unchanged)

	REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	1	Automatic Pilot & Flt Director	2	1	1	(a) Associated Auto Stab must be serviceable. Both longitudinal APs must be in racks and connected when failed. Both APs and one FD required for cat 3 landing.
	2	Instinctive disconnect button.	2	-	-	(a) Both needed for automatic landing. (b) ONE may be inoperative if approach procedures are not based on its use. Coupled approach must be flown by the pilot whose disconnect is serviceable.
				0	0	(c) Normal flight permitted if AP is not used. 'AUTO PILOT' to be placarded 'NOT TO BE USED'.
	3	Autostabilisation				All axes of both systems required for cat 3 landing
		Pitch	2	1	1	**(m) **(o) The stick shaker and the remaining wobbler must be serviceable.
		Roll	2	1	1	
		Yaw	2	1	1	
P	4	Autothrottle	2	1	0	Normal flight permitted with one system U/S. **(O) If both systems U/S subsonic flight only, is permitted provided that a manual landing without Flight director is made.
	5	Electric Trim	2	1	1	
	6	A.F.C.S. Warning and landing display	2	1	1	
P				0	0	Normal flight permitted if AP and AT are placarded 'NOT TO BE USED'. Equipment must be left in rack and connected.

AUTOMATIC FLIGHT

ATA 22

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
7	Inertial system comparator.	1	-	-	Must be serviceable for cat 3 landing. **(o) May be inoperative to return to main base providing: - all attitude sources are serviceable and, - operational procedure is applied - take-off & climb can be made in visible horizon conditions. Aircraft must not depart a station where repair or replacement can be made. Equipment must be left in rack and connected.
8	Altitude Alert Light	2	0	0	
9	Airspeed Discrepancy Light	2	0	0	
10	Flight Director Changeover Switch	2	0	0	
11	I.T.E.M.	2	0	0	Equipment must be left in rack and connected unless Maintenance Procedure applied. **(m)

COMMUNICATIONS

ATA 23

REF. NO.	NORMAL COMPLEMENT — ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	HF	2	1	1	
2	VHF Comm.	2	2	2	No concession.
3	Selcal	1	0	0	
4	Audio Selector Panel	4	3	3	Captains, First Officers and Flight Engineers panels must be serviceable.
5	Flight Deck interphone (Between crew members)	1	1	1	Must be serviceable for each person on flight deck duty.
6	Service/Cabin interphone cabin/flight deck.	1	0	0	Providing that the public address system is serviceable.
7	Public address system	1	1	1	Providing that megaphores & a cabin interphone system are serviceable.
8	Flight Deck Loud Speakers	2	2	2	Required for Audio-Warning Signalling.
9	Cockpit voice recorder	1	-	-	Must be serviceable ex LHR. May be U/S for a total of 6 consecutive sectors en route provided that the Flight Data Recorder is serviceable.
10	Static dischargers	26	13	13	50% may be missing from right and left wing, rudder and tail cone respectively.
11	Evacuation alert System	1	0	0	Provided public address system is serviceable.

(Unchanged)

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Generation Channel including CSD.	4	3	3	Normal flight permitted with one channel inoperative provided the GCB is open. If the CSD is in any way damaged, disconnect it. In the event of a CSD input shaft oil seal failing, engine oil will appear from the seal interspace overboard drain. To prevent further loss of oil the drain pipe may be blanked in accordance with DDP 24.1 on page 05.03.05.
2	KW/KVAR Meters	4	2	2	Normal flight permitted if BTB can be operated.
3	Emergency Generator	1	1	1	No Concession.
4	A.C. Voltmeter	1	0	0	) Normal flight permitted if
5	Frequency meter	1	0	0	) remainder of generation system
6	D.C. Voltmeter	1	0	0	) is serviceable.
7	CSD Oil Low Pressure Indication	4	3	3	Normal flight permitted providing respective oil temp. ind. and KW/KVAR meter are serviceable.
8	CSD Oil Temp. Indicators	4	3	3	Normal flight permitted providing Low pressure warning is serviceable.
9	Auto Paralleling System	4	3	3	On faulty channel, apply Abnormal Procedure: MANUAL PARALLEL.
10	TRU	4	3	3	1 and 4 must be serviceable.
11	Inverter 26 V 1800Hz	2	2	2	No Concession.
12	1800 Hz Protection System Unit	2	2	2	No Concession.
13	Transformer 26V	2	2	2	No Concession.
14	Batteries	2	2	2	No Concession.
15	Not Used				
16	Not Used				
17	Battery Ammeter	2	1	1	
18	TRU Ammeter	4	3	3	

EQUIPMENT FURNISHING

ATA 25

REF. NO.	ITEM (NORMAL COMPLEMENT)	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Seat Belts - Flight Deck				One harness per Crew Member must be available.
2	Seat Belts - Cabin				One Belt for each person on board.
3	Doors - Emergency Exits Escape Slides/Slide Rafts	6	5	5	**(o) **(m) One emergency exit may be inoperative OR one escape slide or slide/raft unserviceable.
4	Crew Seats power actuation	3	0	0	With power failed, the Captain's and E/O's seats must not be moved in flight, except in cruise.
5	Escape Rope (Flight Deck)	2	2	2	No concession
6	Megaphone	2	1	1	Provided public address is serviceable
7	Cabin Crew seats and Harness				Any number may be unserviceable provided: (a) Cabin Crew assigned to affected jump seat occupies a passenger seat as close to, or nearer than the nearest seated passenger to the associated exit and (b) The Passenger Seat to be used by the Cabin Crew is placarded for that purpose.

(Unchanged)

REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Power Plant fire detection	2	1	1	Normal flight permitted with one loop serviceable (per engine).
2	Power plant combustion chamber flame detection	2	1	1	Normal flight permitted with one system serviceable (per engine)
3	Engine fire extinguishers	4	4	4	No Concession
4	Nac/Wing Overheat (Light On)				**(m) Differentiate between NAC & WING overheat indication.
	Nac Overheat or failure to test	4	0	0	**(m) Inspect engine. If OK, disconnect faulty loop.
	Wing Overheat	4	3	3	**(o) Shut down associated air-conditioning group.
5	Fuel vent protection ignition detector and suppressor.	1	1	1	No Concession
6	Portable extinguishers Cabin/flight Deck				
	For more than 60 pax	5	4	4	1 CO_2 on the flight deck 1 CO_2 in fwd cabin stowage 1 CO_2 in rear cabin stowage 1 other approved extinguisher in the cabin.
	For 31 to 60 pax (inclusive)	5	3	3	1 CO_2 on the flight deck 1 CO_2 in the fwd cabin stowage 1 CO_2 in the rear cabin stowage
	For less than 31	5	2	2	1 CO_2 on the flight deck 1 CO_2 in the fwd cabin stowage
7	Smoke Detection System	10	8	8	Not more than 8 flights permitted with either: **(o) (a) Not more than 2 detectors inoperative, or (b) Persistent false smoke alarm, confirmed by Ground Inspection of affected zone.
8	Fuel leak detection (Dry Bays)	4	4	4	No Concession.

FLIGHT CONTROLS

ATA 27

REF. NO.	NORMAL COMPLEMENT / ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Electrical Control Mode (Blue or Green)				Normal flight permitted with one of the electrical control modes inoperative on one only of the three following groups of control surfaces:
	- Inner Elevons	2	1	1	The inner elevons
	- Middle-Outer Elevons	2	1	1	OR the middle and outer elevons
	- Rudder	2	1	1	OR the rudder
2	Artificial Feel				
	Pitch	2	1	1	**(o) **(m) One Lane may be inoperative provided check is made of serviceability of the Second Lane, the Shaker and the appropriate Wobbler.
	Roll	2	1	1	**(m) One Lane may be inoperative provided serviceability of the second Lane is checked.
	Yaw	2	1	1	**(m) One Lane may be inoperative provided serviceability of the second Lane is checked including check of second threshold
3	1800 Hz inverter and protection unit.	2	2	2	No Concession.
4	Main servo control Hydraulic Selector Unit				
	(a) Blue LP Warning Lt.	1	1	1	No concession
	(b) Green LP Warning Lt	1	1	1	No concession
	(c) PFC selector pea lights	8	4	4	One light per pair may be U/S
	(d) Blue Jam Warning Lt	1	1	1	No concession
	(e) Green Jam Warning light	1	1	1	No Concession
5	Relay Jack Panel	1	1	1	No Concession
6	Not used				

(Unchanged)

FLIGHT CONTROLS

ATA 27

REF. NO.	NORMAL COMPLEMENT — ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
7	**Mech Jam Light**	1	-	-	Normal flight is permitted if, - with pitch and roll control runs static, the warning cannot be cancelled or re-appears. - the warning only appears with rapid control movements.
8	Control Position Indicator.				
	(a) Control surface position indicators	8	-	-	****(o) Normal flight permitted provided a visual check of control surface movement is made prior to take-off** Note: Both Middle surface indicators must be serviceable if one CG indicator is unserviceable for a supersonic flight.
	(b) Control mode MI	8	-	-	**One per pair of control surfaces may be inoperative**
	(c) Warning Lights	8	-	-	**One per pair of control surfaces may be inoperative**
9	**Inner elevon warning light**	1	0	0	**(o) Normal flight is permitted provided that the inner elevons position indicators are serviceable.
10	**Trim Mechanical**	3	3	3	**No concession**
11	**SFC** - Emergency Flight Control	2	1	1	**(o) The stick shaker and the **(m) remaining wobbler must be serviceable.
	SFC - Anti Stall System	2	1	1	**(m) The stick shaker and the **(o) remaining wobbler must be serviceable plus: **(o) for cat 3 landing **(o) for dispatch with SFC computer removed.
12	Stick Shaker	1	1	1	No concession.

TEMPORARY REVISION

Insert facing 05.02. Page 13.

REASON FOR ISSUE:

Pending modification of the nose position transmitter.

ACTION:-

19	Nose Magnetic Indicator	1	0 0	Flight with identified nose position transmitter failures is not permitted.

	REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
		DROOP NOSE AND VISOR				
P	13	Visor Raising System	1	1	0	For speed limitations see Flying Manual Section 1.
P	14	Nose raise 5° to 0° System	1	1	0	For speed limitations see Flying Manual Section 1.
	15	Standby Lowering System	1	0	0	Provided that there are no known faults in the normal and emergency lowering system.
P	16	Emergency Lowering System	1	1	0	Nose not to be raised to 0° Apply limitations as for Visor Down. See Flying Manual Section 1.
	17	5° locks and indication System.	1	0	0	Speed limitation appropriate to Nose Fully 'DOWN' must be observed when nose is not locked in the 'UP' position. See Flying Manual Section 1.
	18	Visor Magnetic Indicator	1	0	0	Position of visor to be checked visually.
	19	Nose Magnetic Indicator	1	0	0	**(m) Position of nose to be checked visually and validity of signal to nose MI verified. Flight is not permitted if signals cannot be verified.
	20	Green down light	1	0	0	Position of visor and nose to be checked visually.
P	21	Visor uplock and Indication	1	1	0	Limitation: Speed not greater than 325 knots and not greater than M=0.95.

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
		ENGINE FEED				
P	1	Collector Tank Pumps	12	11	11	**(o) **(m) For take-off, the same side tank 9 pump must be used in place of the failed pump provided that tank 9 is full. **OR** **if tank 9 is not full, reheat must not be used on affected engine** See Performance Manual Section 5, Dispatch with One Reheat U/S.
	2	Pump Low Pressure Indication (Collector tanks 1 to 4).	12	8	8	Only one pump indication unserviceable per collector tank
	3	Fuel Accumulator, Air Supply Control Unit and Function/Failure Pressure Switch Unit.	4	3	3	
	4	Cross Feed Valves	4	4	4	No Concession
	5	Low Pressure Valves	4	4	4	No Concession
P	6	Fuel Temperature Probes	8	7	0	) Subsonic flight permitted) provided engine fuel temp.) indication is serviceable
P	7	Fuel Temp Indicators	2	2	0	
	8	By-Pass Valve	4	3	3	**(m) Normal flight permitted if defective valve functions satisfactorily in the spring loaded mode.
	9	Fuel/Hydraulic Heat Exchanger	6	5	5	**(m) Normal flight permitted provided defective Heat Exchanger can be identified and its associated Hydraulic Pump depressurised, provided there is no leakage.
	10	Fuel/Air Heat Exchanger	4	3	3	**(m) **(o) Normal flight permitted provided that there is no leakage and that the associated airconditioning group is shut down.

(Unchanged)

REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
11	Fuel Control Throttle Valve				See MEL 05.02.02 Item 9.
12	Engine Low Pressure Warning	4	4	4	No Concession
13	Low Pressure Recirculation Valve	4	0	0	Only required for ground running of Air Conditioning.
14	Recirculation Pressure Holding Valve	4	4	4	Failed shut. No concession.
		4	0	0	Failed Open.
14A	Fuel Consumed Indicators	4	2	2	Both Total Contents serviceable.
	MAIN TRANSFER				
15	Pumps (Tanks 5 to 8)	8	6	6	Normal flight permitted with any two unserviceable pumps in different tanks providing. (a) They do not feed the same collector tank. (b) Transfer Valves and Sensors for remaining pumps and interconnect valves are serviceable.
16	5A & 7A Pumps	4	-	-	Normal flight permitted with one pump per tank U/S. **(o) If both pumps in one tank or both pumps in both tanks U/S, apply procedure.
17	Pump pressure indication	10	6	6	Provided there is one serviceable pressure switch in each tank and it is associated with a serviceable pump and tanks 5A/7A pressure switch captions have failed off.
18	Transfer Control Valves	8	6	6	**(o) Normal flight permitted with one unserviceable valve and sensor per side of A/C, provided the pumps for remaining valves of associated tanks are serviceable and not on same busbar.
19	Transfer Shut-off Valves (Tanks 5A and 7A)	2	0	0	**(o) Failed shut. Flight permitted provided tank(s) empty.
		2	0	0	Normal flight permitted provided failed open.
P 20	Tank interconnect Valves (5-8, 6-7)	2	0	0	(a) Subsonic flight permitted with valves failed in any position provided fuel pumps, transfer valves are serviceable in the affected tanks.

(Unchanged)

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	20					(b) Supersonic flight permitted only if valves failed shut, and pumps transfer valves are serviceable in the affected tanks.
	21	Aft Trim Solenoid Valves	4	4	4	Failed closed (at Aft Trim position), no concession.
			4	0	0	Failed open (at Normal position), control 1 and 4 tank levels by selective use of transfer pumps.
		TRIM TRANSFER				
P	22	Pumps Tank 9	2	2	1	Provided associated engine feed pumps are serviceable
					0	Provided mission does not require fuel to be stored in Tank 9.
P	23	Pumps Tank 10	2	2	1	If fuel required in Tank 10, use contents of Tank 10 at beginning of flight.
				0	0	Provided mission does not require fuel to be stored in Tank 10.
P	24	Pumps Tank 11	4	4	2	The Blue Hydraulic Fuel Pump must be serviceable.
P	25	Pump Low Pressure Indication				
		Tanks 9 and 11	6	6	6	No Concession
		Tank 10	2	0	0	**(o) Provided no fuel in Tank 10 and pumps and inlet valves Circuit Breakers tripped.
P	26	Inlet Valves				
		Tank 9	2	2	1	Subsonic Flight permitted provided valve failed shut.
		Tank 11	2	1	1	Flight permitted provided valve failed shut (Reduces Aft Trim Transfer rates)
P	27	Inlet Valves				
		Tanks 5 and 7	2	0	0	Flight permitted provided valves failed shut and refuelling valves of Tanks 5 and 7 are serviceable (Reduces Trim Transfer Rates).

REF. NO.		ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	28	Trim Pipe Drain Valve	2	2	2	Failed open. No concession
			2	O	O	Provided both failed shut.
		JETTISON				
	29	Collector Tanks Jettison Valves	4	4	4	Failed open. No concession
			4	3	3	Provided failed shut.
	30	Master Jettison valves	2	2	2	Failed open. No concession
			2	1	1	Normal flight permitted provided valve failed shut. (Jettison time doubled)
		DE-AERATION				
P	31	Pump Tank 10	1	O	O	Normal flight permitted for:- (a) A maximum of three flights if tank 10 contents is greater than 10,500 kg at an altitude of above 30,000 feet OR (b) Unlimited flights if tank 10 contents less than 10,500 kg above 30,000 feet.
		VENT AND FUEL PRESSURISATION				
	32	Vent Shut-off valves, pressure switches and over pressure switches	2	1	1	Normal flight permitted with valves failed shut provided overflow/relief pressure switches and forward gallery inward relief valves are serviceable.
			2	O	O	**(o) Flight permitted with valves failed open or one failed shut and one failed open and Circuit Breakers tripped.
P	33	Pressure control valve	1	O	O	If the Tank Pressure Warning Light illuminates, apply procedure, TANK PRESS LIGHT ON.
	34	Scavenge pump and Sensor	1	O	O	**(o) Normal flight permitted with Circuit Breaker tripped.

(Unchanged)

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
35	Overflow/relief Valve and Sensors.	1	1	1	No concession
36	Tank Pressure sense line drain Valve	1	1	1	Failed open. No concession
		1	0	0	Failed shut.
37	Tank Pressure Indication	1	1	1	No concession
38	Scavenge Non-Return Valve	1	0	0	**(o) Normal flight permitted with non-return Valve failed shut and Scavenge Pump Circuit Breaker tripped.
39	Tank Pressure Relief Valves	16	16	16	No concession.
40	Air no Fuel Valves	30	12	12	Normal flight permitted provided one Valve serviceable per Tank.
41	Thermal expansion Non-Return Valve	2	0	0	Normal flight permitted with Non-Return Valves failed shut and Scavenge system operating.
42	Forward Gallery inward relief Valves	2	1	1	Normal flight permitted provided Valve shut.
43	Vent burst Discs	9	9	9	No concession
	REFUEL/DEFUEL				
44	Refuel Control Unit	2	0	0	Normal flight permitted provided couplings are shut after refuelling
45	Refuel Protection Pressure Switch	2	0	0	
46	Refuelling Valves tanks 5A/7A/9	3	0	0	Normal flight permitted provided all valves are shut after refuelling. **(o) Flight permitted with no fuel in tank 5A and/or 7A **(m) Valves can be shut manually.
47	Refuelling Valves (Tanks 1,2,3,4,5,6,7,8 & 10)	9	7	7	One failed shut per side permitted. **(m) Valves can be shut manually.

FUEL

ATA 28

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	F.Q.I. 's				
48	Tank probes	80	-	-	**(o) Normal flight permitted provided:
49	Quantity Packs	2	-	-	
50	Fuel Quantity Indicators	13	-	-	— Only one tank's quantity information or one channel of a trim transfer tank is unserviceable. — The level switching for the defective tank is serviceable. — The defective tank refuel valve shuts satisfactorily and the refueler meter confirms the correct total fuel added. (Use the manual fuel level indicator to confirm the contents of a part full tank with defective quantity information. — The trim transfer system is fully serviceable. — Flight control position indicators for middle elevons are serviceable. — With a single channel tank system unserviceable, all four fuel consumed indicators are serviceable. — Should a tank 9, 10 or 11 FQI be suspect the failed channel must be identified. If identification is not possible from the warning lights the Dispatch Deviation Procedure 28.50 should be used. — Both Pitch Autostabs are serviceable. — And the Dispatch Deviation Procedure - DESPATCH WITH FAILED FUEL GAUGING CHANNEL - is applied.

REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
51	Fuel Total Contents	2	0	0	Provided all four fuel consumed indicators are serviceable.
52	Fuel consumed indicators.	4	2	2	Provided both Total Fuel Contents indicators serviceable.
	LEVEL SENSORS				
53	Overfull				
	(a) Tanks 1,2,3,4,	12	12	12	Note: Loss of any overfull or high level indication requires continuous monitoring during refuelling
	(b) Tanks 5,7,	4	4	4	
	(c) Tanks 6,8,	2	0	0	
	(d) Tank 9	2	0	0	
	(e) Tank 10	2	0	0	
	(f) Tank 11	2	2	0	Overfull not required in Tank 11 for Subsonic flight if High Level serviceable.
	(g) Tanks 5A/7A	2	0	0	
54	High Level				
	(a) Tanks 1,2,3,4,	4	4	4	High Level not required in Tank 11 for Subsonic flight if Overfull serviceable.
	(b) Tanks 5,7,	4	4	4	
	(c) Tanks 6,8,	2	0	0	
	(d) Tank 9	2	2	0	
	(e) Tank 10	2	0	0	
	(f) Tank 11	2	2	0	
	(g) Tanks 5A/7A	2	0	0	
55	Underfull, Tanks 1,2,3,4,	4	3	3	Provided main transfer pumps and transfer control valves feeding the affected tank are serviceable.
56	Low Level				
	(a) Tanks 1 and 4	2	2	2	No concessions.
	(b) Tanks 2 and 3	4	4	4	
57	Not used,				

(Unchanged)

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	CENTRE OF GRAVITY				
58	C.G. Indicators	2	1	1	Provided (a) If Captains C.G.indicator failed, bugs on Captain and Co-Pilot machmeters are serviceable. (b) If Flight Engineers' C.G. indicator failed, bugs on either Captain or Co-Pilot machmeter are serviceable. (c) Flight control position indications for middle elevons must be serviceable.
59	C.G. Computers	3	2	0	(a) Flight control position indications for Middle elevons must be serviceable. **(o) (b) Subsonic flight permitted with 3 C.G. Computers inoperative provided all F.Q.I. indicators are serviceable & zero fuel C.G. is between 52% and 54% (c) Both Pitch Autostabs are serviceable.
60	F.Q.I. Control Panel (a) Numerical Indicator (b) Z.F.W. Setting Knob	1	1	1	Partial system failures are permitted. May be inoperative **(o) May be inoperative provided margin between preset and real Z.F.W. is less than ± 3000 kgs.

(Deletion)

HYDRAULIC GENERATION

ATA 29

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	1	Hydraulic Pumps	6	5	5	**(o) One pump may be inoperative **(m)
	2	Pump Low Pressure Warnings	6	4	4	Any two from different systems may be U/S provided that the associated pump is checked serviceable.
	3	Manifold Pressure Switch	3	2	2	
	4	Pump MIs	6	0	0	
	5	System Pressure Indicator	3	2	2	Provided the corresponding pump Low Pressure Warnings are serviceable.
	6	Shut-off valve MI	6	0	0	MI may be inoperative provided SOV confirmed open.
	7	Reservoir de-aeration	3	2	2	**(m)
	8	Reservoir Low Level Warning	3	3	3	No Concession
	9	Hydraulic Contents Indicator	3	2	2	**(m) Provided the level is checked at the reservoir and the associated pressure switch (manifold) is serviceable
	10	Reservoir "Low Pressure Indication	3	1	1	**(m) Provided the pressure is checked on gauges at the reservoir.
	11	Reservoir Temperature Indicator	3	0	0	
	12	Overheat Warning	3	2	2	**(o)
	13	Main System Accumulator	3	0	0	
	14	Pump (R.A.T.)	2	2	2	No concession.

(Unchanged)

British airways

4 OCT.79

TEMPORARY REVISION
Insert facing 05.02 page 22

REASON FOR ISSUE:

Withdrawal of the concession to dispatch with one blue hydraulic pump unserviceable.

ACTION:

1. Hydraulic pumps 6 5 5 **(o) Both blue hydraulic
**(m) pumps must be serviceable.

HYDRAULIC GENERATION

ATA 29

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
15	Filters	15	-	-	**(m)
16	Ground Hydraulic Pumps	2	O	O	
17	Reservoir Compressor	1	O	O	

(Unchanged)

ICE AND RAIN

ATA 30

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	1	Wing and intake Anti-icing	2	-	-	If weather forecasts indicate that icing conditions are likely to be met (a) Complete loss of either LH or RH de-icing is not permitted. (b) Not more than 1 cyclic and 1 continuous load per side may be inoperative.
			2	0	0	If weather forecasts indicate that icing conditions are not likely to be met.
	2	ADS Probe/Sensor Heating				
		Pitots 1 and 2	2	2	2	No concession
P		Side slip sensors	2	-	-	Any one of the 6 heaters may be failed provided weather forecasts indicate that icing conditions are not likely to be met.
		Incidence sensors	2	-	-	
		Total temperature probes (T_t) (Lower Fuselage)	2	-	-	For failure of incidence sensor heater ensure no possibility of the sensor being frozen during take-off.
P		Static vent heaters	4	2	2	Provided both operative heaters are associated with the same ADC and weather forecasts indicate that icing conditions are not likely to be met.
	3	Engine T_1 Probe Heaters	4	3	3	Provided all 4 engine control units on the same side of the aircraft as the faulty heater are operative.
	4	Standby instruments Pitot Static Heating	1	1	1	No Concession
	5	Forward Windscreen Heating	2	1	1	Provided Emergency Power Supply to screens is available.
	6	Side and DV Window Heating	2	0	0	
	7	Windscreen Wipers	2	1	1	Provided that the rain repellant system of the failed wiper is serviceable.

ICE AND RAIN

ATA 30

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
8	Rain Repellent	2	1	1	Providing associated windscreen wiper is serviceable.
9	Ice Detection	2	1	1	
10	Visor Glazing Heating	6	0	0	
11	Water Drain Mast	3	1	1	Wash basin facility must be placarded NOT TO BE USED during subsonic flight.

INSTRUMENTS

ATA 31

	REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	1	**Cosmic Radiation Meter**	1	0	0	May be U/S unless a Red or Amber warning is forecast
	2	**Flight Data Recorder system**	1	0	0	The Accident Recorder must be serviceable ex LHR unless unserviceability occurred during or after pre-flight checks, when the aircraft may proceed with the recorder U/S until its return to LHR, provided that the Cockpit Voice Recorder is serviceable. The aircraft may depart from any line station with the Accident Recorder U/S provided that the Cockpit Voice Recorder is serviceable. The Long Term recorder is not mandatory.
	3	Clock	3	1	1	
	4	Master Warning System				See ATA 33

LANDING GEAR AND BRAKES

ATA 32

REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	LANDING GEAR				
1	Pitch damper	4	2	2	At least one damper per landing gear must be serviceable.
2	Downlock indication lights.				
	Main & Nose Gear	3	2	2	One may be U/S provided that the associated optical lock indicator is serviceable.
	Tail Gear	1	0	0	
3A	Tail Gear Transit Light	1	0	0	
4	'Short' Light-failure to illuminate	2	0	0	
5	'Upper Locks' light-failure to illuminate	1	0	0	May be unserviceable provided it is verified that the three gear up-locks are correctly open prior to take-off.
	BRAKES				
P 6	Braking System (a) Brake Units	8	7	7	**(o) **(m) One brake unit may be inoperative provided that it is hydraulically isolated. The remaining 7 brake systems must be fully serviceable. See Performance Manual section 5 for performance penalty.
	(b) Anti-skid Channels ('R' lt continuously on or continuously off).	8	7	7	**(o) **(m) Apply procedure to determine whether indication or system fault
	(c) Overload Channels (Clover leaf indication plus white MI).	8	7	7	**(o) **(m) Apply procedure to determine whether indication or system fault

LANDING GEAR AND BRAKES

ATA 32

REF. NO.	ITEM (NORMAL COMPLEMENT)				LIMITATION/PROCEDURE
		NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	
7	Not used.				
8	Dual standby pressure indicator	1	1	1	No concession
9	Brake accumulator pressure indicator	1	0	0	**(m) May be inoperative provided pressure is checked on accumulator gauge
P 10	Brake temperature sensor	8	7	7	** (o) One sensor may be ** (m) inoperative
11	Brake temperature warning light	8	-	-	One or more may be inoperative if gauge is serviceable and is used to verify temperature of brakes concerned before take-off and gear retraction.
12	Brake temperature gauge	1	0	0	May be inoperative provided that the eight temperature warning lights are serviceable
13	Overheat warning	1	0	0	** (o) May be inoperative provided that all brake temperature warning lights are operative
P 14	Brake fan	8	-	-	* (o) * (m)
15	Emergency Brake Warning Light	1	0	0	May be inoperative providing parking brake is checked OFF
16	Nosewheel steering	1	0	0	Caution must be taken in sharp turns and in ramp area
17	Nosewheel Selector Valve	1	0	0	Flight Crew Check may be negative

REF. NO.		NORMAL COMPLEMENT — ITEM	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	18	Water anti-ingestion deflectors	-	-	** (m) May be partly or totally missing providing: (a) take-off runway is dry, or if wet, there are no significant pools of standing water. (b) Take-off is not permitted from runways on which the average depth of precipitation that covers all or most of the runway exceeds 3mm.

LIGHTS

ATA 33

REF. NO.		NORMAL COMPLEMENT — ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	1	Flight Deck				Normal flight permitted if there are sufficient lights to illuminate all instruments and controls.
	2	Passenger Cabin				There must be sufficient lights to illuminate the full length of the Pax. compartment. Avoid, wherever possible, adjacent lamp failures.
	3	Servicing/Freight Hold				Normal flight permitted.
P	4	Navigation Lights	3	3	3	No Concession for night operations.
				O	O	May be unserviceable for daylight operations.
P	5	Lights				
		(a) Landing Lights	2	1	1	Providing, for night operation, taxi lights are serviceable.
				O	O	May be unserviceable for daylight operation.
		(b) Taxi Lights	2	O	O	
		(c) Taxi/Turn-off Lights.	2	O	O	
	6	Anti-collision Lights	3	-	-	Subject to National Regulations
	7	Emergency Lighting System.	1	1	1	No Concession.
	8	Master Warning	1	1	1	No Concession.

(Unchanged)

NAVIGATION

ATA 34

	REF. NO.	ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	1	ADC	2	2	2	No concession
	2	Altimeter	2	2	2	Either Pilots Altimeter, Normal or Standby mode, may be inoperative if both ASIs and Machmeters are serviceable.
	2 A	Standby Altimeter	1	0	0	
	3	Flight Engineer's Altimeter	1	0	0	
	4	Main ASIs				
		(a) Vc indicator	2	2	2	(a) Captain's Standby may be inoperative OR (b) First Officer's ASI normal or Standby mode may be inoperative
		(b) V_{MO} indicator	2	1	1	** (m) May be inoperative provided "Over speed" warning is serviceable
	5	Standby ASI /Machmeter	1	1	1	
	6	Machmeter				
		(a) Mach indicator	3	2	2	Captain's or Flight Engineer's indicator may be inoperative
		(b) V_{MO}/M_{MO} indicator	2	1	1	
P		(c) Mach/CG Index	2	1	0	Supersonic flight permitted provided Captain's CG indication and bugs are serviceable.
	7	Vertical speed indicator	2	1	1	Captain's VSI must be serviceable Both required for cat 2 or 3 landing.

(Deletion)

NAVIGATION

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
8	Temperature indicator				
	(a) Total	3	2	2	
	(b) Static	2	1	1	
	(c) ISA	2	0	0	
9	Incidence and acceleration indicator				
	(a) Incidence indicator	2	1	1	**(m) One may be inoperative if one Wobbler and the Stick Shaker are serviceable
	(b) Acceleration indicator	2	0	0	
10	Sideslip indicator	2	1	1	Providing: bubbles are serviceable
11	ADI				
	(a) Attitude indicator	2	2	2	No concession
	(b) Bubble	2	1	1	
	(c) D. H. Light	2	-	-	As required to comply with item 23
	(d) Director bars	2	0	0	
	(e) Ground Roll Guidance	2	0	0	
	(f) ILS indicator	2	-	-	As required to comply with item 24
	(g) Pitch Index	2	-	-	One must be operative for a departure with special procedure
	(h) Radio altitude Indication	2	0	0	
	(i) Attitude comparison light	2	0	0	

(Unchanged)

	REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	12	Standby horizon	1	1	1	May be inoperative provided, - both ADIs and their normal attitude signals serviceable. - INS 3 serviceable in Attitude. - flight made in VMC day. Aircraft must not depart a station where repairs or replacement can be made.
	13	INS	3	-	-	(a) 3 fully serviceable C4ACs must be fitted ex LHR. (b) 2 fully serviceable C4ACs must be fitted to positions 1 & 2, plus a C4 of any sort, serviceable in ATTITUDE mode, in position 3 for a departure from any other station if a supersonic flight is intended. (c) 2 INS fully serviceable at start of acceleration. (d) 2 INS fully serviceable for a subsonic dispatch provided that a subsonic route is followed and that the standby horizon is serviceable.
P	14	Magnetic heading reference system	2	1	1	One may be inoperative providing forecast conditions at destination and alternate airport are in VMC. Both required for cat 3 landing.
	15	Standby magnetic compass	1	0	0	May be inoperative provided all 3 INS are serviceable, and 2 independent heading indicators are available including one RMI on each side. Aircraft must not depart a station where repairs or replacement can be made.
	16	HSI				
		(a) Compass card	2	1	1	One may be inoperative if the other magnetic heading readings are available.
		(b) HDG/TRK select index.	2	1	1	
		(c) Course/track deviation bar and Course/Desired Track pointer	2	1	1	
		(d) Glide Index	2	0	0	May be inoperative providing associated ADI Glide Index is serviceable.

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
		(e) Heading comparison Light	2	0	0	
		(f) Drift Index	2	0	0	
		(g) Ground Speed indicator	2	0	0	
		(h) "Distance to Go" indicator	2	0	0	
		(i) Annunciators		-	-	TRUE-MAG and RAD-INS should not be inoperative simultaneously.
	17	RMI and VOR system	2	-	-	) Two VOR, two ADF OR One VOR and) one ADF must be serviceable.
	18	RMI and ADF system	2	-	-	)
	19	DME	2	0	0	One must be operative if required by in-flight procedures.
P	20	Weather Radar	1	-	-	(a) Equipment partially duplicated Failure of a duplicated item is permissible or (b) Dispatch with total failure of the trace is permissible if forecast weather conditions for the route are favourable.
P	21	ATC Transponder	2	1	1	One must be serviceable NOTE 1: If the transponder is unserviceable, permission to proceed must be requested from ATC who may allow the flight to continue normally, For in-flight failure of transponders, refer to Navigation Manual. NOTE 2: Altitude Reporting Function is required in the following countries: Australia, Austria, Belgium, Denmark, France, W.Germany, Ireland, Italy, Libya, Switzerland, U.K. and USA.
	22	Marker	1	0	0	May be inoperative if not required on approach
	23	Radio Altimeter	2	1	1	** (o) Both required for Cat 3 landing.
	24	ILS Receiver	2	-	-	(a) Normal flight permitted with one inoperative. (b) Both may be inoperative if weather conditions at destination or alternate airport are favourable. (c) Both required for cat 3 landing.

(Unchanged)

NAVIGATION

ATA 34

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	25	Attitude data selector (ATT-INS)	2	2	2	) The five dual switching units) connected with these ten) selectors are identical and
•	26	NAV-DATA selector (RAD-INS)	2	2	2	) interchangeable with each other) and with the two dual switching) units of the two FD selectors
	27	NAV-INS selector	2	1	1	) (refer to MEL 05.02.06 Item 10))
	28	COMP selector	2	2	2	))
	29	DEV selector	2	1	1	)
	30	Inertial system comparator				Refer to MEL 05.02.06, Item 7.
	31	Ground Proximity Warning	1	O	O	May be unserviceable. Aircraft must not depart from a station where repairs or replacement can be made.

(Unchanged)

OXYGEN

ATA 35

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Crew Oxygen (Fixed)	3	3	3	** see 35.1 for minimum bottle pressure
2	Flight Crew Oxygen (Portable)	1		1	
3	Supernumerary Oxygen	2	-	-	Each supernumerary crew member must have fully serviceable oxygen supply and mask.
4	Passenger Oxygen Flight above 8,000 feet				**(o) see 35.4 for minimum minimum bottle pressure.
5	Therapeutic Oxygen Mask	6	-	-	Must have at least one for every 50 pax.
6	Cabin Crew Portable Oxygen (Bottles and full face masks).	-	-	-	One required for each cabin crew member.
7	Smoke Goggles	3	3	3	No Concession
8	Passenger Oxygen Mask. (For Demonstration)	2	1	1	Provided mask is demonstrated in forward and rear cabin.

RAM AIR TURBINE

ATA 49

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	1	Ram Air Turbine	1	1	1	No concession

(unchanged)

DOORS

ATA 52 & 56

REF. NO.	NORMAL COMPLEMENT — ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	ATA 52 **CABIN AND FREIGHT HOLD DOORS**				
1	Indication				Normal flight permitted if checks prove that the malfunction is in the warning system. Flight crew to check that door is 'Home' and handles in locked condition. If indicated fault is on cabin passenger/service door, check that top flap is fully closed. If indicated fault is Misc. hatches check all four hatches.
2	Locking and Hingeing				No Concession.
3	Doors - Emergency Exit Function	6	5	5	See MEL page 05.02.09.
	ATA 56 WINDOWS				
1	Cabin, Flight Deck and Visor Windows	-	-	-	**(m) Normal flight permitted if damage is within allowable limits. NOTE: Operation with any condition/damage permitted in the Despatch Deviation Procedure is subject to compliance with operating limitations as defined in the Abnormal Procedure, "FAILURE OF WINDOWS."

INTAKE CONTROL

REF. NO.		NORMAL COMPLEMENT / ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	1	Air Intake Control Units	8	7	4	Normal flight permitted with one 'Lane' inoperative (Supersonic) or at least one 'Lane' per intake (Subsonic). Providing that Ramp and Spill Manual inching facilities are available in any intake with a failed 'Lane'.
P	2	Spill door actuators and mechanism	4	4	3	**(o) Subsonic flight permitted provided that, - spill door can be set and maintained at subsonic position. - aux inlet is serviceable - spill door manual inching serviceable. - spill door indication serviceable.
P	3	Ramp actuator and mechanism	4	4	0	**(o) Subsonic flight only permitted. **(m) Providing ramp mechanism can be set for subsonic operation and retained in that position.
P	4	Secondary air door	4	4	0	(a) Failed Shut for Performance Limitation see Performance Manual Section 5.
			4	4	4	(b) Failed open. No concession
	5	Auxiliary inlet vane	4	4	4	No Concession
	6	α Vane signal to AICS	2	0	0	
	7	Intake pressure ratio error Indication System	4	3	0	Supersonic flight is permitted, provided two lanes of the intake are serviceable and their ramp and spill position indicators are serviceable.
	8	Ramp Indicator Spill Indicator	4 4	3 3	0 0	Failed indicator must not be associated with failed control channel and sensing. Both the ramp and spill indications may be inoperative provided they are on the same intake.

INTAKE CONTROL

ATA 71

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
9	Auxiliary inlet MI	4	0	0	**(m) Associated vane must be inspected before each flight
10	α Warning Light	1	0	0	Apply procedure INTAKE INCIDENCE SIGNAL FAILURE LIGHT ON
11	N_1 SIG Warning Light	4	3	0	Apply procedure INTAKE N_1 SIG LIGHT ON
12	Intake HYD Warning Light	4	3	3	Operate normally, provided associated Hydraulic system is serviceable
13	INT Warning Light	4	3	3	Normal flight permitted, provided associated Lane Warning Lights and Lane In Use lights are serviceable.
14	Lane Fail Warning Lights	8	7	7	Set the affected Lane Selector to the Auto position associated with the failed Lane light. NOTE: For items 9 and 11 to 14 inclusive, only one failed item in any one intake permitted.
15	System Pressure Switch (Manifold)	3	2	2	
16	Ramp & Spill Manual inching facility	4	3	3	Normal flight permitted providing all intake lanes are serviceable

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Engine Fuel Control System	4	4	4	No concession
2	Not used				
3	Fuel Filter	4	4	4	No concession
4	Fuel Heating System				
	Auto	4	0	0	**(o) Provided associated manual system is serviceable
	Manual	4	3	3	NOTE: If any fuel heater is totally inoperative flight is only permitted if the fuel contains an approved icing inhibitor. See Flying Manual 2A Limitations
5	Recirc. Valve	4	4	4	No Concession
6	Fuel Flow Indication	4	3	3	See 05.02.45.
7	HP Valve Indication System	4	0	0	
8	Engine Fuel Temperature Indication System	4	3	0	Acceptable sub-sonic provided System Fuel Temperature gauge is serviceable.
9	HP Valve	4	4	4	No concession
10	LP Overspeed Governor	4	4	4	No concession

IGNITION

ATA 74

REF. NO.		NORMAL COMPLEMENT ITEM	NORMAL COMPLEMENT	REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
		ENGINE				
P	1	Ignition System	8	4	4	Dry Runways and NO forecast of icing conditions
			8	7	7	Wet Runways or Forecast of icing conditions

(Unchanged)

REF. NO.		NORMAL COMPLEMENT / ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	1	Engine Anti-Ice	4	2	2	(a) Failed off. One per side may be unserviceable when weather reports and forecasts at the time of departure indicate that icing conditions are not likely to be met. (b) Failed on. **(o) Apply maintenance procedure. **(m) to close the valve. If this action is not practicable, one flight is permitted with the valve failed open. If the OAT at take-off is above +3°C, see Performance Manual section 5, for penalty.

(Unchanged)

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
	1	Engine Electronic Control System	8	7	7	** (o)
P	2	Contingency Rating Selection System	4	0	0	**The aircraft may be dispatched with the Contingency Rating selection system inoperative, for one or more engines.** See Performance Manual section 5 for Performance Penalty.

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REF. NO.	NORMAL COMPLEMENT — ITEM		REQUIRED FOR SUBSONIC FLIGHT	REQUIRED FOR SUPERSONIC FLIGHT	LIMITATION/PROCEDURE
1	Engine Instruments				
	(a) T/O Monitor Caption	4	-	-	**(o) Only one of the 12 inoperative provided all instruments in (b) are serviceable. All 12 instruments must be serviceable when dispatching from main base. The Operational Procedure defines the limitations applicable to this concession.
	Fuel Flow	4	-	-	
	P7	4	-	-	
	(b) N_1	4	-	-	**(o) Normal flight permitted with one inoperative instrument per engine provided that the inoperative instruments are not of the same type and all the instruments in (a) are serviceable. The Operational Procedure defines the limitations applicable to this concession.
	N_2	4	-	-	
	EGT	4	-	-	
	Area	4	-	-	
2	Turbine Cooling Air Warning System	4	4	4	No concession.
	Turbine Cooling Air Temperarure Indication	4	0	0	
3	Engine Overheat Warning System	4	4	4	No concession.
4	Vibration Indication System				**(m)
	Front	4	3	3	Normal flight permitted for eight flights only.
	Rear	4	0	0	Normal flight permitted for 25 flights only.
5	Reheat Fault Warning Light	4	0	0	Normal Flight permitted

REF. NO.		NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
P	1	Secondary Nozzles (Bucket Control)	4	3	3	(*) One may be inoperative providing there is no brake failure on the same side. ** (o) ** (m) The inoperative nozzle must be locked within the range 10° to 27°, preferrably at 10°. The nozzle must be locked at 10° if inoperative due removal of a failed ballscrew gearbox. Refer to Performance Manual section 5 for take-off performance and en-route fuel penalties.
	2	Primary Nozzles	4	4	4	No concession
	3	Jet Pipe	4	4	4	No concession
	4	Nozzle Angle Scheduling Unit (NASU)	2	1	1	** (o) ** (m) One NASU may be U/S. Must remain in rack and connected.
P	5	Reheat Fuel Control System	4	3	3	** (o) See Performance Manual section 5, ONE REHEAT INOPERATIVE, for performance limitations. ** (m) "Reheat off" signal to engine amplifiers & "Automatic Contingency" selection signal must be operative on the associated engine.
P	6	Reheat Ignition System	4	3	3	** (o) See Performance Manual section 5, ONE REHEAT INOPERATIVE, for performance limitations. ** (m) "Reheat off" signal to engine amplifiers & "Automatic Contingency" selection signal must be operative on the associated engine.

(Unchanged)

REF. NO.	NORMAL COMPLEMENT ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Oil storage and distribution System	4	4	4	No concession NOTE: In the event of a CSD input shaft oil seal failing, engine oil will appear from the seal interspace overboard drain. To prevent further loss of oil the drain pipe may be blanked in accordance with DDP 24.1 on page 05.03.05.
2	Oil System Indications				
	(a) Low oil pressure warning light	4	4	4	No concession
	(b) Pressure Indication	4	-	-	) Normal flight permitted with one
	(c) Oil Temperature	4	-	-	) unserviceable instrument per) engine provided the failed
	(d) Tank contents	4	-	-	) instruments are not of the same) type. NOTE: 1. Not more than 8 flights permitted with oil temperature indicator inoperative. 2. Normal flight is permitted with unserviceable tank contents indicator provided oil level is checked after flight and there is no evidence of abnormal consumption or leakage
	(e) Overfull Indication	4	0	0	Provided normal contents indication serviceable and level checked correct before flight.

STARTING

ATA 80

REF. NO.	NORMAL COMPLEMENT / ITEM		REQUIRED FOR SUPERSONIC FLIGHT	REQUIRED FOR SUBSONIC FLIGHT	LIMITATION/PROCEDURE
1	Starter Cut Out	4	0	0	Normal flight permitted if operated manually.
2	Start Valve	4	0	0	Normal flight permitted if operated manually.

(Unchanged)

AIR CONDITIONING

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
21.1 - <u>Air Conditioning Group</u> Switch the associated Conditioning Valve to Off. Set the associated temp control c/o switch to Failed. After engine start set the other 3 Conditioning Valves to Boost. If the fault is upstream of the Conditioning Valve, shut the Bleed Valve.	
21.2 - <u>Bleed and Pressure Control Valve</u> None	(b) Close mechanically (See Maintenance Manual 21-00-00) Page 301
21.4 - <u>Conditioning Valve</u> (a) <u>Failed Shut</u> Switch Conditioning Valve Off. Set the associated temp control c/o switch to Failed. After start set the other 3 Conditioning Valves to Boost.	(a) <u>Failed Shut</u> None
(b) <u>Failed Open</u> After engine start, - Bleed Valve open - Cond. Valve open - test selector to appropriate FLOW - test switch to TEST - observe mass flow reduces to zero - test switch and selector to OFF - observe flow re-established.	(b) <u>Failed Open</u> If the Mass Flow Valve fails to test, mechanically close the Conditioning Valve in accordance with Maintenance Manual instructions 21-00-00 Page 301.
21.8 - <u>Ram Air Valve</u> (b) <u>Failed Shut</u> If the Ram Air Valve cannot be opened mechanically, - switch the associated Conditioning Valve to Off - set the associated temp. control c/o switch to Failed - after engine start set the other 3 Conditioning Valves to Boost.	(b) As needed, open mechanically. (See Maintenance Manual 21-00-00) Page 301.
21.9 - <u>Fuel Throttle Valve</u> (failed shut) If the Fuel Throttle Valve cannot be opened mechanically, shut down the associated group as in 21.8.	(b) As needed, open mechanically (See Maintenance Manual 21-00-00 P301).

(Unchanged)

DESPATCH DEVIATION PROCEDURES

AIR CONDITIONING

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
21.10 -Temperature Control System If no control in Auto AND Standby, shut down the associated group as in 21.8	
21.12 -Cabin Inlet Safety Valve Shut down the associated group as in 21.8	
21.13 -Primary Exchanger, Secondary Exchanger & Duct warnings Shut down the associated group as in 21.8	
21.17 -C.A.U. Leak detection Shut down the associated group as in 21.8	
21.21 -Discharge Valve Position Indicator Before flight, select pressure control system which has position indicators serviceable.	None
21.22 -Cabin Altimeter To convert cabin differential pressure into cabin altitude use following table.	None
21.23 -Differential Pressure Indicator To convert cabin altitude into cabin differential pressure, use following table.	None

21.31 -Fwd Rack Extract Fans

1. Failure of one fan will result in a drop of 15% in air flow at the start and end of flight when cabin differential pressure is less than 2 p.s.i.

2. In order to restrict operation of racked equipment at temperatures above rated maximum continuous, ground running with only 2 forward extract fans operating must be limited to one hour if cabin temperature exceeds the following values:-

   33°C at airfield altitudes up to 2,000 feet.

   30°C at airfield altitudes between 2,000 feet and 4,500 feet.

   24°C at airfield altitudes between 4,500 feet and 8,500 feet.

   This procedure should be applied by flight crew or ground crew as appropriate.

(Deletion)

DESPATCH DEVIATION PROCEDURES

AIR CONDITIONING ATA 21

OPERATIONAL PROCEDURES				MAINTENANCE PROCEDURES
	ALTITUDE (feet)	PRESSURE (PSI)		
	- 1000	15.23		
	0	14.69		
	1000	14.17		
	2000	13.66		
	3000	13.17		
	4000	12.69		
	5000	12.22		
	6000	11.77		
	7000	11.33		
	8000	10.91		
	9000	10.50		
	10000	10.10		
Cabin Alt	11000	9.72		
	12000	9.34		
	13000	8.98		
	14000	8.63		
	15000	8.29		
	16000	7.96		
	17000	7.64		
	18000	7.33		
	19000	7.04	Cabin differential pressure	
	20000	6.75		
	21000	6.47		
	22000	6.20		
	23000	5.94	7PSI	
	24000	5.69		
	25000	5.45		
	26000	5.21		
	27000	4.99		
	28000	4.77		
	29000	4.56		
	30000	4.36		
	31000	4.16		
	32000	3.98		
	33000	3.80		
	34000	3.62		
	35000	3.45		
	36000	3.29		
	37000	3.14		
	38000	2.99		
	39000	2.85		
Aircraft Alt.	40000	2.72		
	42000	2.47		
	44000	2.24		
	46000	2.03		
	48000	1.85		
	50000	1.68		
	52000	1.52		
	54000	1.38		
	56000	1.26		
	58000	1.15		
	60000	1.04		
	62000	0.94		
	64000	0.85		

(Unchanged)

DESPATCH DEVIATION PROCEDURES

AUTOMATIC FLIGHT CONTROL

ATA 22

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
22.3 - Autostabilisation None	Check the Stick Shaker and remaining Wobbler as detailed on page 05-03-04A or 05-03-04B.
22.4 - Autothrottle (b) For landing limitations see Performance Manual Section 4.	None
22.7 - Inertial System Comparator In IFR conditions, aircraft must be handled by captain in manual or automatic mode. Captain to cross check normal and stand-by horizons.	None
22.11 - ITEM None.	Computer may be removed provided that dummy ITEM computer D92 1676 000 is fitted in its place. See Maintenance Manual 22-42-11.

22.3 & 27.2 27.11 34.9a - Check of the Stick Shaker & the No.1 Stick Wobbler (Flight Crew or Ground Crew).

Flying Controls & Intakes .... Verify Clear
ADC 1 .... ON
ADC 2 .... OFF
ADC 1 TEST sel .... TEST 1

WHEN TEST LIGHT ON
ADC 1 .... RESET
STICK SHAKER .... VERIFY ACTIVATED
STICK SHAKER C/B .... TRIP

CIRCUIT BREAKER	PANEL	GRID REF
STICK SHAKER SUP	1-213	P15

No.1 PITCH ARTIFICIAL FEEL .... ENGAGE
No.2 PITCH ARTIFICIAL FEEL .... DISENGAGE
No.1 ANTI STALL SYSTEM .... ON
No.2 ANTI STALL SYSTEM .... OFF
O & M and INNER ELEVONS .... MECHANICAL SIGNALLING
RUDDER .... MECHANICAL SIGNALLING
BLUE HYDRAULIC SYSTEM .... PRESSURISE
LH UC WEIGHT SW C/Bs .... TRIP

CIRCUIT BREAKER	PANEL	GRID REF
LH UC WEIGHT SW 'A' SYS SUP	1-213	M17
LH UC WEIGHT SW 'B' SYS SUP	3-213	B8

PULL BACK ON CONTROL COLUMN AND HOLD UNTIL STICK WOBBLER IS ACTIVATED (ABOUT 5 SECONDS)

GROUND HYD CHECK OUT PUMPS .... OFF
ADC 1 TEST sel .... NORMAL
STICK SHAKER CB .... RESET
LH UC WEIGHT SWITCH CBs .... RESET
ADC 2 .... ON
ADC 1 & ADC 2 .... RESET
No.2 ANTI STALL SYSTEM .... ON
No.1 & No.2 AUTO STAB .... ENGAGE
No.1 & No.2 ARTIFICIAL FEEL .... ENGAGE
No.1 & No.2 ELECTRIC TRIM .... ENGAGE
O & M and INNER ELEVONS SIGNALLING CHANNELS .... AS REQUIRED
RUDDER SIGNALLING CHANNEL .... AS REQUIRED

END//

22.3 & 27.2 27.11 34.9a - Check of the Stick Shaker & the No.2 Stick Wobbler (Flight Crew or Ground Crew)

Flying Controls & Intakes .... Verify Clear
ADC 2 .... ON
ADC 1 .... OFF
ADC 2 TEST sel .... TEST 1

WHEN TEST LIGHT ON
ADC 2 .... RESET
STICK SHAKER .... VERIFY ACTIVATED
STICK SHAKER C/B .... TRIP

CIRCUIT BREAKER	PANEL	GRID REF
STICK SHAKER SUP	1-213	P15

No.2 PITCH ARTIFICIAL FEEL .... ENGAGE
No.1 PITCH ARTIFICIAL FEEL .... DISENGAGE
No.2 ANTI STALL SYSTEM .... ON
No.1 ANTI STALL SYSTEM .... OFF
O & M and INNER ELEVONS .... MECHANICAL SIGNALLING
RUDDER .... MECHANICAL SIGNALLING
EMERG GEN sw .... ISOL
GREEN HYDRAULIC SYSTEM .... PRESSURISE
RH UC WEIGHT SW C/Bs .... TRIP

CIRCUIT BREAKER	PANEL	GRID REF
RH UC WEIGHT SW 'A' SYS SUP	1-213	M18
RH UC WEIGHT SW 'B' SYS SUP	3-213	B9

PULL BACK ON CONTROL COLUMN AND HOLD UNTIL STICK WOBBLER IS ACTIVATED (ABOUT 5 SECONDS)

GROUND HYD CHECK OUT PUMPS .... OFF
ADC 2 TEST sel .... NORMAL
STICK SHAKER CB .... RESET
RH UC WEIGHT SWITCH CBs .... RESET
ADC 1 .... ON
ADC 1 & ADC 2 .... RESET
No.1 ANTI STALL SYSTEM .... ON
No.1 & No.2 AUTO STAB .... ENGAGE
No.1 & No.2 ARTIFICIAL FEEL .... ENGAGE
No.1 & No.2 ELECTRIC TRIM .... ENGAGE
O & M and INNER ELEVONS SIGNALLING CHANNELS .... AS REQUIRED
RUDDER SIGNALLING CHANNEL .... AS REQUIRED
EMERG GEN sw .... NORM

END//

MAINTENANCE PROCEDURE

24.1 GENERATION CHANNEL including C.S.D.

In the event of a C.S.D. input shaft oil seal failing, engine oil will appear from the seal interspace overboard drain. To prevent further loss of oil - blank off the drain pipe as given below.

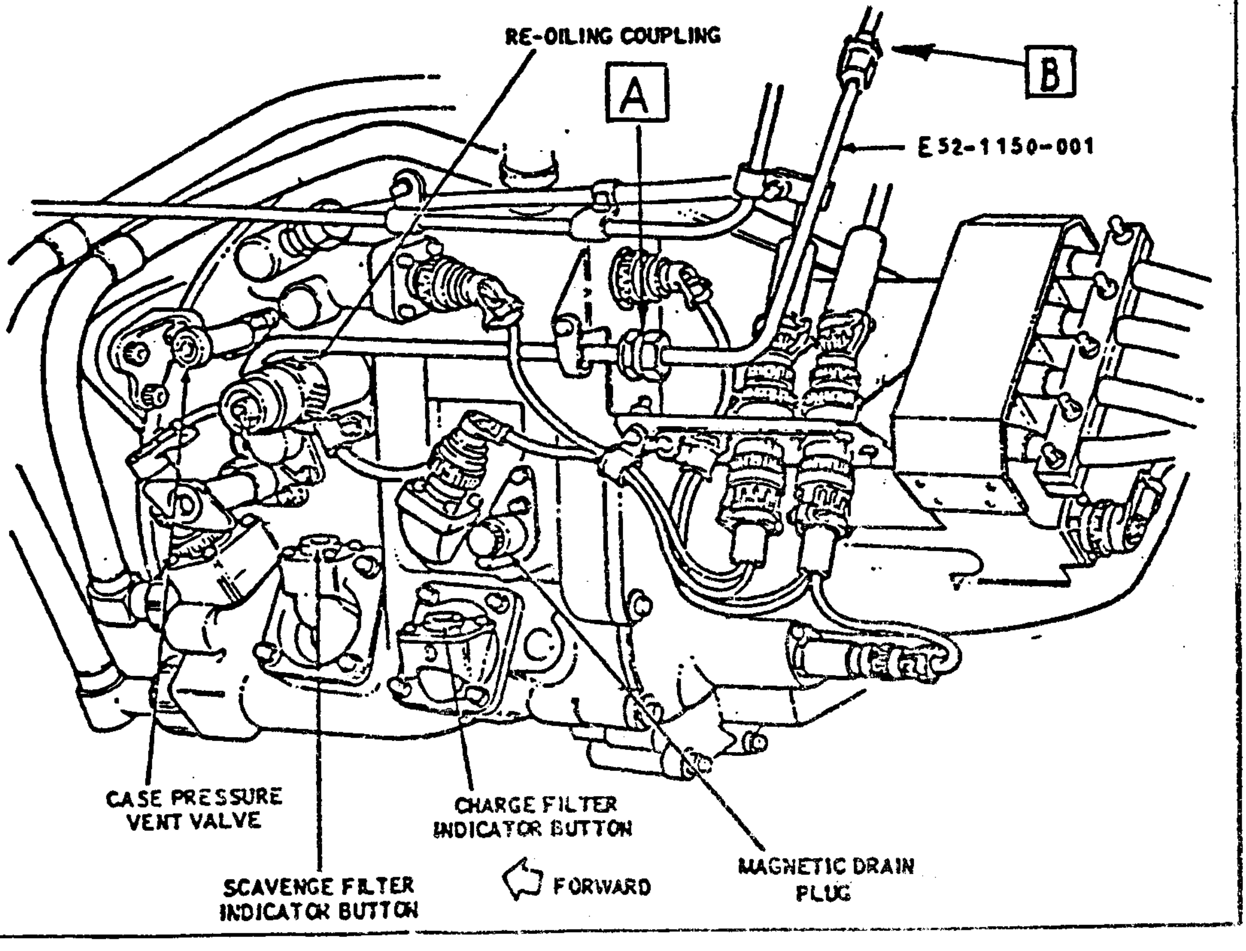
This practice has been accepted by BAe/Lucas/CAA, allowing two IDGs to be blanked per aircraft for a maximum period of 150 hours subject to an oil level check not exceeding 75 hours.

Should an oil loss be detected at this check then the IDG must be removed.

It is not permissible to add oil under these circumstances.

Blanking-off Procedure:

1. Remove pipe part No. E52-1150-001.
2. Fit blank (AS 15826) to IDG seal interspace drain pipe end at rear of generator ('A').
3. Fit union body (AS 27468) and blank (AS 15826) to drain block pipe end adjacent to pipe clip at engine bottom centre line ('B').
4. Stow pipe part No. E52-1150-001 for re-use.



OPERATIONAL PROCEDURES

25.3 - Doors - Emergency Exits, Escape Slides/Slide Rafts

One emergency exit OR one escape slide or slide/raft may be U/S provided that the following limitations are applied:

(1) For routes over land, 100 passengers may be carried.

(2) For routes over water if the unserviceability does not affect a slide raft or its associated exit, 100 passengers may be carried.

(3) For routes over water if the unserviceability renders a slide/raft unuseable:-

(a) If an additional 36-man liferaft is carried, the passenger load may be 98. In order to stow this raft the rear RH seat pair is moved forwards and the raft attached to the seat rails.

For loadsheet purposes the weight is 59 kg and IUs plus 1.2.

(b) If an additional liferaft is not carried, the total load (passengers plus crew) is restricted as shown below.

EXIT UNUSEABLE	MAX PERSONS ON BOARD (PASSENGERS PLUS CREW)
FWD LH	88
CENTRE LH	88
CENTRE RH	98

(4) All other passenger and service doors and associated slides must be serviceable.

MAINTENANCE PROCEDURES

If an emergency exit is inoperative it must have the words "Exit" or "Emergency Exit" covered and must be marked by a red disc at least 9 inches in diameter with a white horizonaal line across it bearing the words "No Exit" in red letters.

If an additional liferaft pack is to be stowed, move the rear RH seat pair forwards, reconnect it to the seat rails, then attach the pack to the seat rails behind the rear seat row.

The inoperative door, slide or emergency exit must be repaired at the next station possessing the appropriate repair facilities.

Continued....

(Unchang-

DESPATCH DEVIATION PROCEDURES

FLIGHT CONTROLS ATA 27

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
27.2 - Artificial Feel See Flying Manual Section 8, Loss of Artificial Feel.	Pitch Carry out check of the Stick Shaker and the remaining Pitch Feel/Wobbler system as detailed on page 05.03.04A or 05.03.04B of this section. Roll Carry out the following check, - select Test 1 on ADC front face - engage serviceable Feel lane - ensure elevons clear - pressurise appropriate hydraulic system - move control column in roll and observe increased feel force. Yaw Check (see Maintenance Manual 27-22-00 Page 501)
27.8 - Flight Control Position Indicator a) Elevon deflection to be read on the pitch trim control wheel when aircraft is trimmed in steady flight.	None
27.9 - Inner Elevon Warning Light During flight: 1) Before transonic acceleration check both inner elevons respond correctly to control column movement in pitch and roll. 2) Limit bank angles at 20° during transonic flight 3) Descent in transonic flight at 350 Kts	None
27.11 - SFC - Emergency Control System Trip affected circuit breakers:	Check the Stick Shaker and remaining Wobbler as detailed on page 05.03.04A or 05.03.04B of this section.

CIRCUIT	PANEL	GRID REF
SFC 1	1.213	S 20
	13.215	E 6
	13.215	F 6
SFC 2	5.213	D 17
	13.216	C 17
	13.216	C 16

DESPATCH DEVIATION PROCEDURES

FLIGHT CONTROLS ATA 27

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
<u>SFC - Anti-stall System</u>	Check the Stick Shaker and remaining Wobbler as detailed on page 05.03.04A or 05.03.04B of this section. All AFCS boxes must be left in racks connected and powered when failed; except that a failed SFC computer may be removed.
<u>CAT. 3 LANDING</u> Loss of one Anti-stall system involves loss of corresponding Pitch Auto-stab below 270 Kts. This logic is inhibited after localiser capture, permitting engagement of associated A/Stab and A/P; to restore land 3 capability use the following procedure - When LAND light ON: Affected pitch autostab .... ON Affected A/P .... ON Land 3 light .... CHECK <u>Removal</u> - A failed SFC may be removed providing following procedure applied during flight: Engage pitch autostab associated with missing SFC only after failure of opposite pitch autostab.	

MAINTENANCE PROCEDURE

27-19 DROOP NOSE AND VISOR

To check validity of signal to Nose Magnetic indicator:-

1. Remove Droop Nose and Visor indicator panel 2-212-6 and disconnect plug.

2. Select Droop Nose to 'DOWN'

   (a) Connect Voltmeter capable of reading 28V between Pin T(+) and Pin U(-).
   Check for zero Volts.
   Select Droop Nose 'UP'
   When Nose is checked visually to be in the 'UP' position, Voltmeter should read 28V (approx.).

   (b) Connect Voltmeter between pins T(+) and R(-).
   Check for zero Volts.
   Select Droop Nose 5°.
   When Nose is checked visually to be in the 5° position, Voltmeter should read 28V (approx.).

   (c) Connect Voltmeter between pins T(+) and P(-).
   Check for zero Volts.
   Select Droop Nose 'DOWN'
   When Nose is checked visually to be in the DOWN position, Voltmeter should read 28V (approx.).

DESPATCH DEVIATION PROCEDURES

FUEL

ATA 28

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
28.1 - Collector Tank Pumps - If tank 9 is full, open the affected tank jettison valve and switch on the same side tank 9 pump. When reheat has been switched off after take-off, switch off the tank 9 pump and shut the tank jettison valve. - If tank 9 is not full, reheat must not be used on the affected engine. See Performance Manual section 5, Dispatch with One Reheat U/S.	If a tank 9 pump is to be used to back up engine feed during next take-off, a water check must be carried out on tank 9.
28.8 - By-pass Valve None.	(a) Electrically isolate the by-pass valve by tripping the associated circuit breaker.

By-Pass Valve Supply.	Panel.	Grid Ref.
Engine 1.	15-215	F24
Engine 2.	15-216	E 5
Engine 3.	15-215	F25
Engine 4.	15-216	E 6

(b) Disconnect the electrical plug from the motor.

(c) Remove the four bolts securing the gearbox and motor and withdraw from the valve body.

(d) Ensure that the flap shaft turns freely in the valve unit, and the shaft in the gear box can be turned against the spring tension. If the failed gearbox and motor is in the open position, remove the motor and fit only the gearbox

(e) With the flap valve in the closed position fit the gearbox to the valve body so that the splined drive shaft and the gearbox joint ring engages in the valve body.

(f) Turn the gearbox so that the bolt holes are aligned and the torsion spring is tensioned to hold the valve flap in the closed position. Secure with the four bolts.

(g) Tape and stow the disconnected electrical plug by lashing to a suitable support.

(h) Ensure that the Circuit Breaker remains tripped.

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
28.9 - Fuel/Hyd. Heat Exchanger None	Make a visual check of the dry bay above the nacelles.
28.10 - Fuel/Air Heat Exchanger - switch the associated Bleed Valve to Shut - switch the associated Conditioning Valve to Off - set the associated temp control c/o switch to Failed. - after engine start set the other 3 Conditioning Valves to Boost.	Leak check in accordance with Maintenance Manual 21-12-33 Page 601.
28.16 - 5A & 7A Pumps Tank(s) with both pumps u/s must be empty. See Load & Balance Manual Section 6 and Refuel Book Section 2. If tank 5A or 7A remains empty with the other filled, all 3 CG computer outputs will be in error. Main CG will agree (subject to other lateral imbalance) with Standby CG of empty tank side; both will indicate approx. 0.3% forward of true CG. The Standby CG of the filled tank side will indicate approx. 0.3% aft of true CG. The difference (approx. 0.6%) can cause a discrepancy warning on the filled tank side Standby CG. Whilst the "filled" tank side contains fuel true CG will be an average of Standby 1 and Standby 2 CGs. The errors will reduce to zero as the filled tank is emptied.	See Refuel Book section 2, "Refuelling with 5A and/or 7A Remaining Empty".
28.18 - Transfer Control Valve Maintain affected collector tank(s) at correct level by selective use of Transfer pump(s)	None.
28.19 - Transfer Shut-off Valves (5A and 7A) As for 28.46 below See 28.16 above for CG advice.	None.
28.25 - Pump Low Pressure Indication Trip pumps circuit breakers: 14.216 B1 13.215 C19 Trip inlet valve circuit breaker 15.215 E22	None.

(Completely Revised)

FUEL

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
28.32 - Vent Shut-off Valve Trip valves circuit breakers: 1.213 K 16 3.213 D 7	None.
28.34 - Scavenge Pump and Sensor Trip Scavenge Pump Supply CB 14.216 E 4	None
28.38 - Scavenge Non Return Valve Trip Scavenge Pump Supply CB 14.216 E 4	None
28.46 - Tank 5A and/or 7A Empty Flight permitted with no fuel in tanks 5A and/or 7A. See Load & Balance Manual Section 6 and Refuel Book Section 2 See 28.16 above for CG advice.	See Refuel Book Section 2, "Refuelling with 5A and/or 7A Remaining Empty." To manually shut a failed open valve see page 05.03.15
28.47 - Refuelling Valves - Tanks 1,2,3,4,5,6,7,8, & 10.	To manually shut a failed open valve see page 05.03.15

(Completely Revised)

MAINTENANCE PROCEDURE

28.46 PROCEDURE FOR MANUALLY CLOSING REFUELLING VALVES IN TANKS 5A, 7A & 9

1. To manually shut a failed "open" valve carry out the following procedure:-

   (a) Electrically isolate the appropriate valve by tripping its circuit breaker.

VALVE	PANEL	GRID REF
5A	15-216	F4
7A	15-216	F5
9	15-216	F9

   (b) Disconnect the electrical plug from the motor.

   (c) Remove the four nuts securing the gearbox and motor and withdraw it from the valve body.

   (d) Using special tool FR.7903722 turn the valve (shut) to a position such that when the special tool is inverted it fits over the valve studs. Secure the special tool in this position with the four nuts. (This ensures the valve is locked in the shut position).

   (e) Cap and stow the elctrical plug and lead.

   (f) Ensure the circuit breaker remains tripped.

2. With valve 9 failed closed, Tank 9 may be replenished by refuelling Tank 10 in the normal manner, then after closing the RCUs , fuel may be transferred from Tank 10 to Tank 9 by selecting Tank 9 trim valves open and Tank 10 pumps 'ON'. Monitor quantity transferred using Tank 9 contents gauge on fuel management panel. When required quantity of fuel has been transferred, select Tank 10 pumps to 'OFF' and Tank 9 trim valves to Shut. Open RCUs and continue refuel procedure.

   Note:

   If tank 9 valve is manually shut and locked, tank 9 overfull indication will not be inhibited in flight.

28.47 PROCEDURE FOR MANUALLY CLOSING REFUELLING VALVES IN TANKS 1,2,3,4,5,6,7, 8 & 10

1. To manually shut a failed "open" valve carry out the following procedure:

   (a) Electrically isolate the appropriate valve by tripping its circuit breaker.

MAINTENANCE PROCEDURE

28.47 1. /Cont/d...

VALVE	PANEL	GRID REF
1	15-215	E23
2	15-216	F10
3	15-216	F3
4	15-215	E24
5	15-215	E25
6	15-215	F20
7	15-215	F21
8	15-215	F19
10	15-215	E22

(b)
(c)
(d) As procedure 28.46
(e)
(f)
(g) Placard the appropriate switch on the Flight Deck fuel management panel to show that the valve is inoperative and shut.

2. A tank with a failed "shut" valve may be refuelled as indicated in the table below. Monitor the quantity transferred, using relative tank contents gauge on fuel management panel.

Refuel Valves Failed Shut TANK	Refuel from TANK	Select: Main Transfer Pump, TANK	Select: Tank Interconnect Valve
1	5 or 6	5 or 6 ON	
2	5 or 6	5 or 6 ON	
3	7 or 8	7 or 8 ON	
4	7 or 8	7 or 8 ON	
5	8		5 to 8 Open
6	7		6 to 7 Open
7	6		6 to 7 Open
8	5		5 to 8 Open
10	-		

NOTE:

1. If the refuelling valve of either of tanks 1, 2, 3, 4, or 10 are manually shut, and locked, its magnetic indicator on the Flight Deck Management Panel will show cross-hatched.

2. If the refuelling valve of either of tanks 5 or 7 are manually shut, and locked, its overfull indication on the Flight Deck Management panel will not be inhibited in flight.

28-48)
28-49)
28-50) - DISPATCH WITH FAILED FUEL GAUGING CHANNEL

(1) DISPATCH WITH FAILED FUEL GAUGING IN TANK 1,2,3,4,5,5A,6,7,7A or 8

- Identify failed channel and paired channel. Channel pairings are:-

1	2	5	5A	6
4	3	7	7A	8

- Throughout flight, monitor the paired channel. Whenever the tank with the paired channel is not in use, monitor for any significant change in the contents indication.

  If paired channel is in a collector tank or a main transfer tank, when that tank is in use, monitor for any unexpected sudden change in contents indication.

  A failure of the paired channel will not be indicated by a comparator light, may not be indicated by an indicator failure flag and may result in false CG indication. If, as a result of monitoring, failure of the paired channel is suspected, apply procedure TOTAL LOSS OF CG DATA.

  Before engine start, recheck the paired channel.

  . read gauge and compare with refuelling sheet
  . press to test and observe correct movement
  . Recheck the main CG and valid standby CG indications are within 0.2% of each other and agree with the loadsheet take-off CG.

- The Total Contents indicators will be in error and must not be used.

(2) IDENTIFICATION OF FAILED CHANNEL IN TANK 9, 10 OR 11 WITH NO FAILURE LIGHTS ON

Fuelling completed or held at a known quantity in suspected tank.

Rotate the FQI test rty sel to MAX A.
Set and hold the FQI test sw to CANCEL
Observe direction of pointer movement on suspected FQI.

IF SUSPECT FQI POINTER FAILS TO MOVE

Release the FQI test sw
The indicator is mechanically jammed

The Main CG output will be suspect but STBY I and STBY 2 will be correct.

Take-off is not permitted.

END//

IF SUSPECT FQI POINTER MOVES TOWARDS THE KNOWN QUANTITY

When the pointer stops at the correct quantity
Release the FQI test sw
Rotate the FQI test rty sel to OFF.
Observe the indicator remains at the correct quantity and No.1 CG discrepancy light is on and the associated 9A,10A or 11A channel light is on.

The fault is in A gauging Channel
Apply procedure at (3) below

contd.

(Completely Revised)

OPERATIONAL PROCEDURE

(2) IDENTIFICATION OF FAILED CHANNEL IN TANK 9, 10 OR 11 WITH NO FAILURE LIGHTS ON (Contd.)

IF SUSPECT FQI POINTER MOVES AWAY FROM THE KNOWN QUANTITY

Rotate the FQI test rty sel to MAX B
Set and hold the FQI test sw to cancel
When the pointer stops at the correct quantity
Release the FQI test sw
Rotate the FQI test rty sel to OFF.
Observe the indicator remains at the correct quantity and No.2 CG discrepancy light is on and the associated 9B,10B or 11B channel light is on.

The fault is in B gauging Channel
Apply procedure at (3) below.

(3) DISPATCH WITH FAILED FUEL GAUGING CHANNEL IN TANK 9,10 OR 11

Before take-off

Calculate from the chart on Checklist page 07.02.16 the quantity to remain in Tank 9 at end of transfer to 55%.

Before start of rearward transfer:

Record Total Contents reading and Fuel Remaining reading and note discrepancy between them.

At end of first stage transfer (at indicated CG % Co = 55%)

Observe Tank 9 has reduced to predetermined value

Record Total Contents reading and Fuel Remaining reading.

Observe discrepancy between them has not changed by more than 1000 kg.

Before Deceleration

Calculate fuel to remain in tank 11 to acheive 57.5% and 55%.

IF ...... TANK 11 FUEL GAUGING CHANNEL FAILED
Verify TANK 5 AND TANK 7 PUMPS sw and sels off
Record contents of TANKS 9, 5 and 7.

During forward transfer calculate fuel remaining in tank 11 by amount of fuel transferred to tanks 9, 5 and 7.

Do not switch Pumps ON in Tanks 5 and 7 until forward transfer is completed if possible.

During Deceleration

During deceleration do not allow the contents of tank 11 to fall below the quantity calculated for a CG of 57.5% Co until speed less than M = 1.5 and the quantity calculated for a CG of 55% Co until the speed is less than M = 0.93.

(Completely revised)

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
28.59 - <u>CG Computer</u> For a subsonic flight without CG data:- - normal refuelling - PTOTR or PTOBO as per load-sheet instructions. - apply procedure TOTAL LOSS OF CG DATA.	None
28.60 - <u>FQI Control Panel</u> (a) None (b) The error on the CG indicator is negligible. Calculate landing weight by adding fuel on board to the loadsheet ZFW.	None

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OPERATING PROCEDURES	MAINTENANCE PROCEDURES
29.1 - Hydraulic Pump If a Green pump is U/S , -see Performance Manual Section 5 for limitations. -for take-off, select Yellow into Green at the Servo Control Panel. -when gear up and locked, select Yellow selector back to Normal. -before landing select Yellow into Green again.	Check clogging indicators of HP, case drain, and return filters. If any are protruding replace affected filter(s). If HP filter destroyed, flush affected hydraulic system. See Maintenance Manual 29.00.00 Page 301
29.7 - Reservoir De-Aeration None	Depressurise affected main system accumulator and fit blank on the de-aeration outlet. (See Maintenance Manual 29-00-00 Page 301).
29.9 - Hydraulic Contents Indicator None	Check level (See Maintenance Manual 12.12.29 Page 301) and pressure switch: with system unpressurised, the warning light HYD on the intake panel should be illuminated.
29.10 - Reservoir "Low Pressure" Indication None	Check the reservoir air pressure (See Maintenance Manual 29.31.00 Page 501).
29.12 - Overheat Warning Light If associated system pressure rises to 4500 psi, apply procedure HYDRAULIC FLUID OVERHEAT.	None
29.15 - Filters	If more than one filter in a system shows a "blocked" indicator, check all remaining filters in that system.

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
32.6 - Braking System	
(a) Brake Units See Performance Manual section 5 for performance penalty. The remaining 7 brake systems must be fully serviceable. If one brake and one thrust reverser are inoperative they must be on opposite sides of the aircraft and both performance penalties applied.	Disconnect the normal hydraulic supplies to the affected brake in accordance with Maintenance Manual 32.42.00 P.301. If one brake and one thrust reverser are inoperative they must be on opposite sides of the aircraft. If failure of brake involves locked wheel ('R' lt on and Overload MIs cloverleaf and white) remove the carbon discs of the affected brake and disconnect normal and emergency hydraulic supplies in accordance with Maintenance Manual 32-42-11 P.401.
(b) Anti-Skid Channels (i) 'R' lt continuously on. If the maintenance procedure establishes an indication fault, normal flight is permitted provided that the Overload MI shows black. If the maintenance procedure establishes a system fault see Performance Manual Section 5 for performance penalty. Since the maintenance procedure renders the associated brake inoperative, read also item (a) Brake Units.	To determine whether indication or system fault:- - ensure wheels chocked and all control surface and intake areas clear. - pressurise normal brakes - depress the brake pedals - observe brake piston movement at the affected brake unit - reset controls as required. If...piston movement observed, the fault is indication only. Confirm serviceability of associated Overload channel in accordance with Maintenance Manual 32-43-00 P.501, before each flight. If...there is no piston movement, disconnect the normal hydraulic supplies to the affected brake in accordance with Maintenance Manual 32-42-00 P.301.
(ii) 'R' lt continuously off If the maintenance procedure establishes an indication fault, normal flight is permitted provided that the Overload MI shows black. If the maintenance procedure establishes a system fault see Performance Manual section 5 for performance penalty. Since the maintenance procedure renders the associated brake inoperative, read also item (a) Brake Units	To determine whether indication or system fault:- - ensure wheels chocked and all control surface and intake areas clear. - pressurise normal brakes - depress the brake pedals - operate anti-skid test sel. - observe brake pistons release at the affected brake unit. - reset controls as required. If...brake release is observed, the fault is indication only. Confirm serviceability of associated Overload channel in accordance with Maintenance Manual 32-43-00 P.501, before each flight.

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
32.6 - Braking System (contd)	If...there is no brake release, disconnect the normal hydraulic supplies to the affected brake in accordance with Maintenance Manual 32-42-00 P.301.
(c) Overload Channels (Cloverleaf indication plus white MI). If the maintenance procedure establishes an indication fault, normal flight is permitted provided that no Release light is permanently on above 10 kts. If the maintenance procedure establishes a system fault, see Performance Manual section 5 for performance penalty. Since the maintenance procedure renders the associated brake inoperative, read also item (a) Brake Units.	To determine whether indication or system fault:- - ensure wheels chocked and all control surface and intake areas clear. - pressurise normal brakes - depress the brake pedals - observe brake piston movement at the affected brake unit. - reset controls as required. If...piston movement observed, the fault is indication only. No further maintenance action required provided that the associated anti-skid channel is verified not unserviceable before each flight. If...there is no piston movement, disconnect the normal hydraulic supplies to the affected brake in accordance with Maintenance Manual 32-42-00 P.301.
32.9 - Brake Accumulator Pressure Indicator None	Check the pressure (See Maintenance Manual 32-44-66 Page 301).
32.10 - Brake Temperature Sensor See Performance Manual section 5 "One Wheelbrake or Anti-skid inoperative" for performance limitations.	Disconnect normal and emergency hyd. supply to affected brake(s) and check that no carbon disc is broken. If any disc is broken, remove affected heat sink (See Maintenance Manual 32-42-11 Page 401) If Warning light permanently ON, disconnect affected warning light.
32.12 - Overheat Warning Check, at Flight Engineers Station, before take-off roll and before landing gear retraction that no brake temperature warning light is illuminated.	None

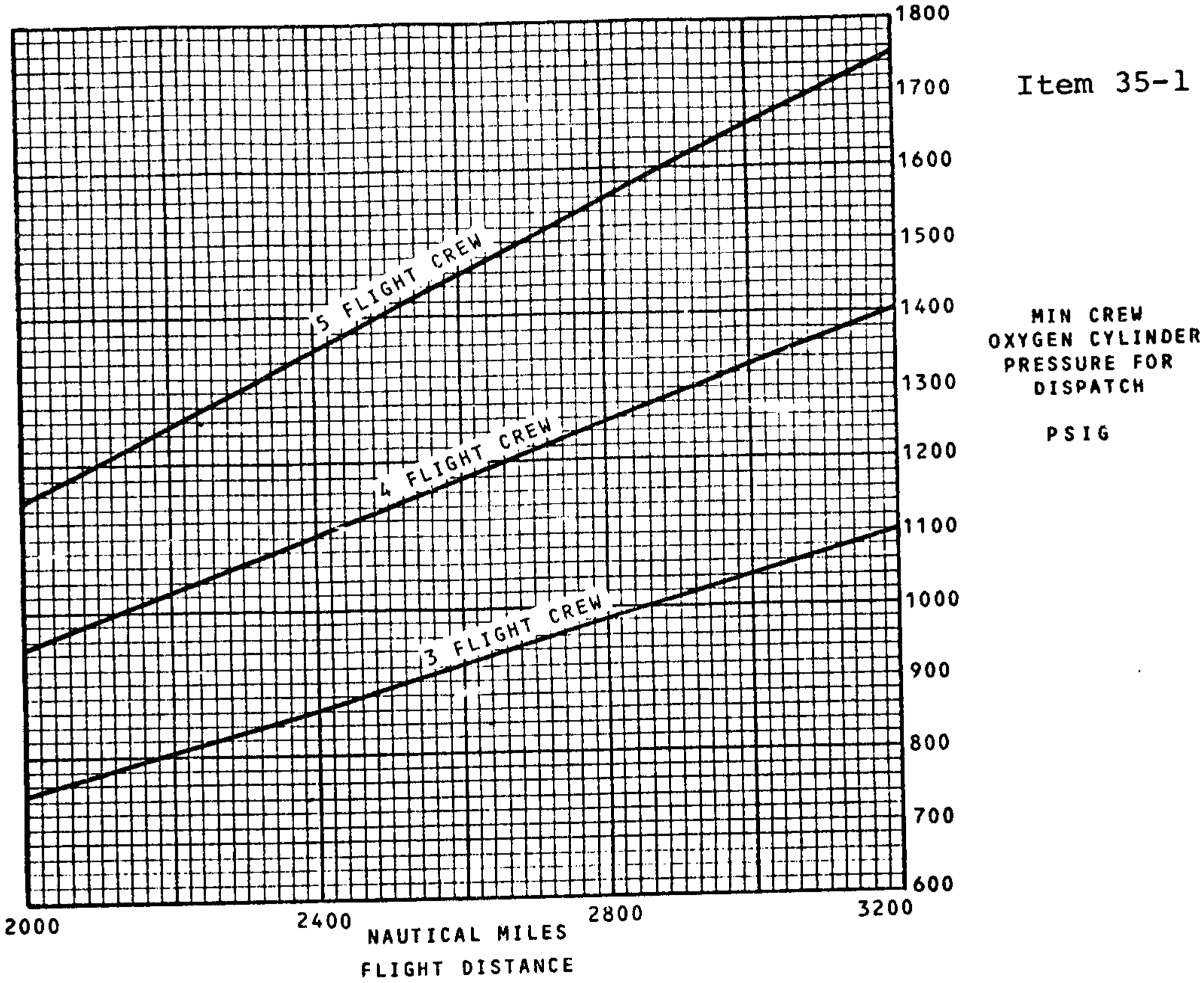
OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
32.14 - Brake Fan	
A. If the associated wheel is part no. AH53047 (6 fusible plugs)	
Apply performance penalties in accordance with Performance Manual section 5, "Dispatch with one wheelbrake or anti-skid inoperative".	Disconnect the normal and emergency hydraulic supply to the affected brake in accordance with Maintenance Manual 32-42-11. ONLY ONE BRAKE UNIT PER AIRCRAFT MAY BE ISOLATED.
B. If the associated wheel is part no. AHA1017 (14 fusible plugs)	
The aircraft may be dispatched without penalty.	No action.
32.18 - Water Anti-ingestion Deflector None	When a deflector is damaged, it must be partly or totally removed to avoid fouling of the structure. After damage to the nose wheel deflector at least the hinged part must be removed from affected side. (See Maintenance Manual 32-11-12 or 32-11-13 or 32-21-11 Page 401).

British airways

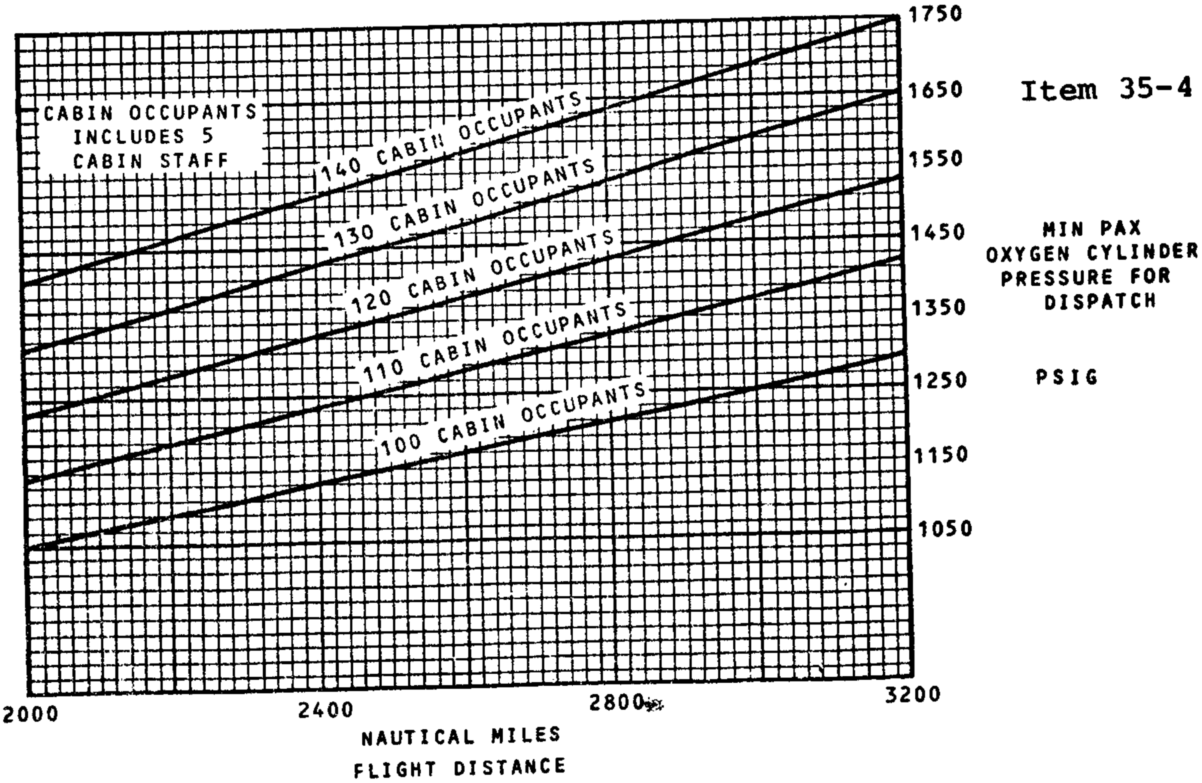
OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
34.4 - ASI	
b) V_{MO} Indication	
None	Check the overspeed alarm by self test No.2 on the ADC's (See Maintenance Manual 34-11-00 Page 501.)
34.9 - a) Incidence Indicator	
None	Check the Stick Shaker and one Stick Wobbler as detailed on page 05.03.04A or 05.03.04B of this section.
34.23 - Radio Altimeter	
No. 1 U/S, trip CB RAD ALT 1 SUP 2.213 D8 No. 2 U/S, trip CB RAD ALT 2 Sup 13-216 F19	None

OXYGEN

Item 35-1



Item 35-4



MAINTENANCE PROCEDURE

56.1 CABIN, FLIGHT DECK AND VISOR WINDOWS

General

Visually inspect the flight compartment windows, inside and outside, and the visor and passenger compartment windows from the outside, for allowable damage (Ref.Table No.1).

To inspect the transparent panels of the insulated covers fitted to each direct-vision window and side window, first release fasteners around the edge of the transparent panel, and then remove the panel.

The visor must be in the fully raised position before inspecting it, and in the lower position before inspecting the external surface of the windshield.

Extreme care must be taken at all times to prevent accidental damage and scratching of the glass panels.

Allowable Damage

A. Inspection

(1) Visually inspect all windows for, delamination, bubbles, cracks, chipping, scratches, peel splintering (these appear as a series of conchoidal chips radiating from a common centre) and discolouration. Reference Table No.1 and key for acceptable levels of these defects.

(2) Visually inspect the critical and secondary optical areas of the windshield (Ref.Fig.No.1) for vision impairment.

B. Check

(1) Check the windshield, direct vision, side-windows and the visor for electrical faults.

See Maintenance Manual 30.41.00

GLAZING / TYPE OF DAMAGE	WIND SHIELD PANEL	DV & SIDE WINDOWS		CABIN WINDOWS		VISOR WINDOWS
		HEAT SHIELD	PRESSURE PANEL	HEAT SHIELD	PRESSURE PANEL	
Delamination	1 abc&d	-	1(a) (b)	-	1(a) (b)	1 abc&d
Bubbles	2 ab &c	-	2(a)	-	2(a)	2 ab & c
Cracks	3(a)	3(a)	3(a)	3(b)	3(b)	3(c)
Chipping	4, 5	4	4	4	4	5, 6
Scratches	7,8,9	7, 8	7, 8	7, 8	7, 8	7, 8

TABLE ONE

MAINTENANCE PROCEDURE

56.1 Cont.

KEY TO TABLE ONE

1. DELAMINATION Delamination is acceptable if:

(a) Vision is acceptable, if delamination is within the limits shown in Fig.2 or Fig.3.

(b) Delamination has not resulted in surface peel splintering of glass.

(c) Arcing or severe local overheating does not occur when heating element is switched on.

(d) The heating element resistances are within their specified limits (See Maintenance Manual 30.41.00 page 501).

2. BUBBLES

Bubbles are acceptable if:

(a) Vision is acceptable.

(b) Arcing or severe local overheating does not occur when heating element is switched on.

(c) The heating element resistances are within their specified limits (See Maintenance Manual 30.41.00 Page 501).

3. CRACKS

(a) Replace panel before next flight

(b) Panel replacements in certain cases may be deferred, provided not more than three panels are affected, subject to Flight and Maintenance Limitations as follows:

Damage Case 1 - Crack in the outer pane of the pressure panel.

Action - Replace window not later than at first return to main base - not exceeding 6 flights.

Damage Case 2 - Crack in the inner pane of the pressure panel.

Action - Replace window not later than at first return to main base - not exceeding 6 flights.

Cont......

MAINTENANCE PROCEDURE

56.1

CRACKS 3(b) (Cont)

Damage Case 3 - Crack in both panes of the pressure panel.

Action - Replace window before further flight - not exceeding one positioning flight at less than or equal to 4 P.S.I.

Damage Case 4 - Crack in the heatshield pane.

Action - Replace window not later than at first return to main base - not exceeding 6 flights provided window remains intact. (i.e. no pieces missing). If window is not intact (i.e. pieces missing) replace window before further supersonic flight not later than at first return to main base - not exceeding 6 subsonic flights.

3. (c) Panel replacement in certain cases may be deferred, subject to Flight and Maintenance Limitations as follows:

Damage Case 1 - If visual inspection shows that only one visor panel is affected and the glass is still in place and the other ply is not cracked or damaged.

Action - Replace panel not later than first return to main base - not exceeding 3 flights. Trip the heater circuit breakers for the affected panel, ref. below:

VISOR	PANEL	GRID REF.
LH flat visor HTR sup.	14-215	G 5
RH flat visor HTR sup.	13-216	G13
LH flat visor HTR cont.	15-215	C11
RH flat visor HTR cont.	15-216	C15
LH curved visor HTR sup.	14-215	G 8
RH curved visor HTR sup.	13-216	G10
LH bottom and curved visor HTR cont.	15-215	G12
RH bottom and curved visor HTR cont.	15-216	C16
LH bottom visor HTR sup.	14-215	E 9
RH bottom visor HTR sup.	13-216	B10

MAINTENANCE PROCEDURE

56.1

CRACKS 3(c) (Cont)

Damage Case 2 - If visual inspection shows both plies cracked in any one panel.

Action - Replace panel before next flight.

Damage Case 3 - If more than one panel affected.

Action - It is permissible to leave one affected panel; this must comply with Case (1) above. All other affected panels must be changed before the next flight.

CHIPPING

4. Chipping of any ply, other than those as in item 5, and 6 below, is critical; panel must be replaced.

5. Edge chipping of an outer heated facing ply of the windshield or visor glazings is not critical if chips are less than 0.25 in (6.35 mm) long.

6. Edge chipping of a visor inner ply is not critical if the chips are less than 0.25 in (6.35 mm) long.

SCRATCHES

7. Light scratches are not critical provided vision is acceptable.

8. Deep scratches, exceeding 0.003 in (0.076 mm) in depth, in any window ply other than the windshield outer ply are critical; panel must be changed.

9. Deep scratches in the windshield outer ply up to 0.020 in. (0.508 mm) maximum are permitted (See Fig. 1).

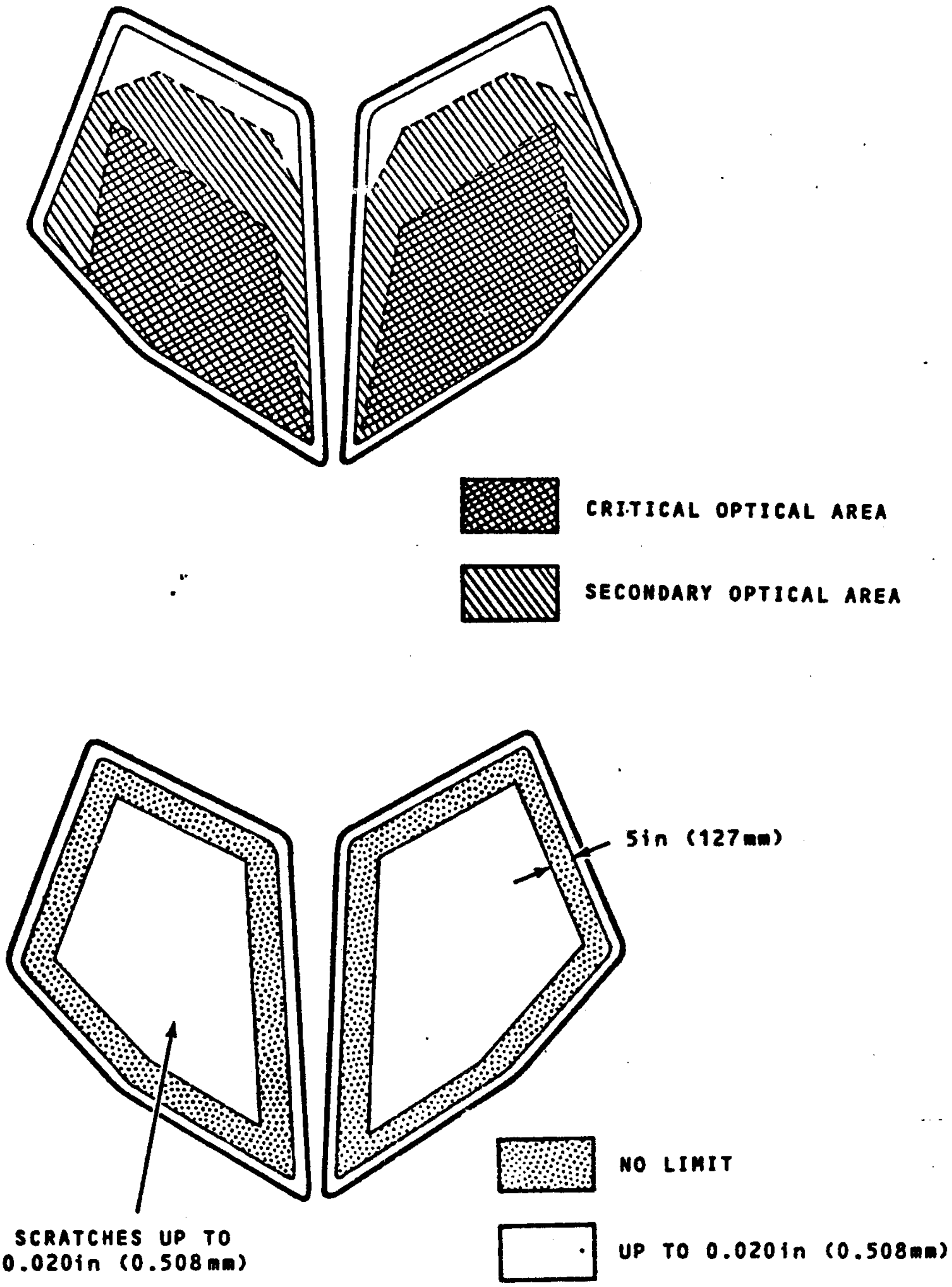
DISPATCH DEVIATION PROCEDURE

ATA 56

WINDOWS

MAINTENANCE PROCEDURE

ALLOWABLE DAMAGE - GLAZINGS



Windshield Optical Areas
FIG ONE

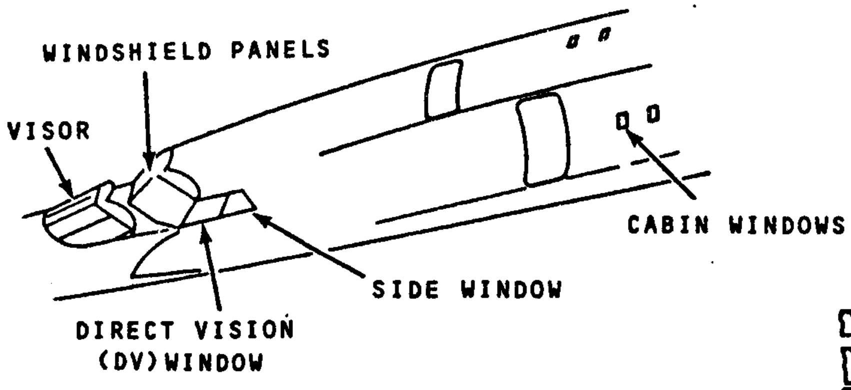
DISPATCH DEVIATION PROCEDURE

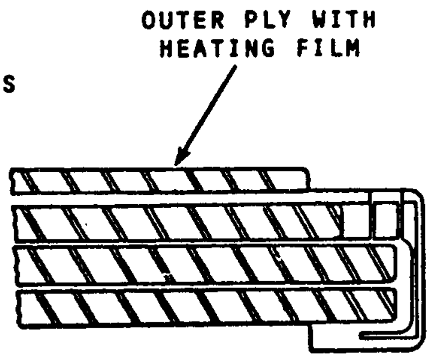
WINDOWS

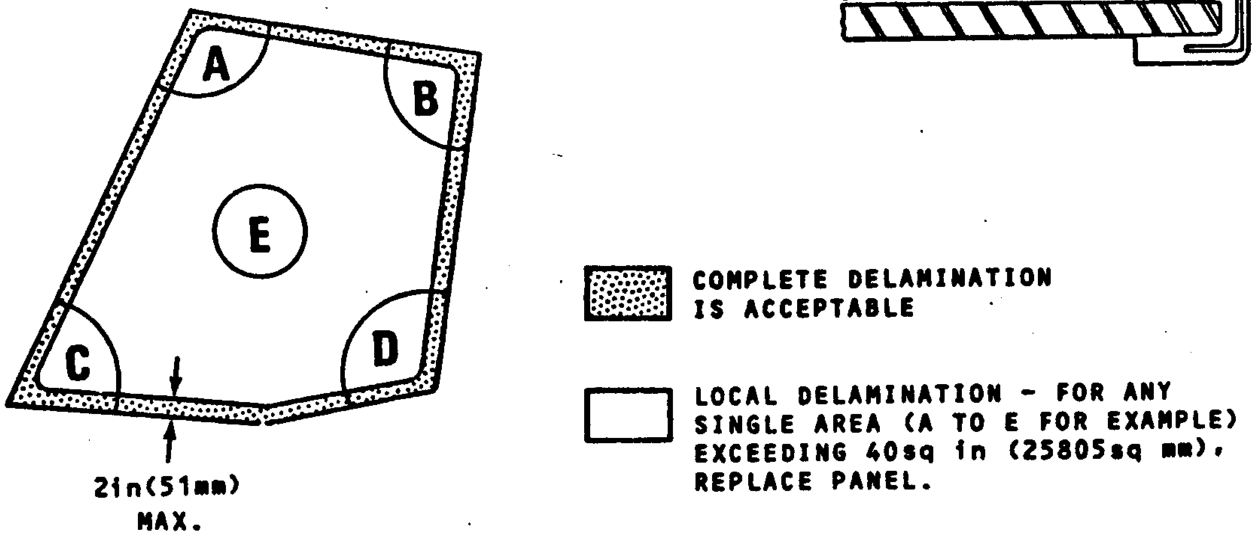
ATA 56

MAINTENANCE PROCEDURE

ALLOWABLE DAMAGE - GLAZINGS

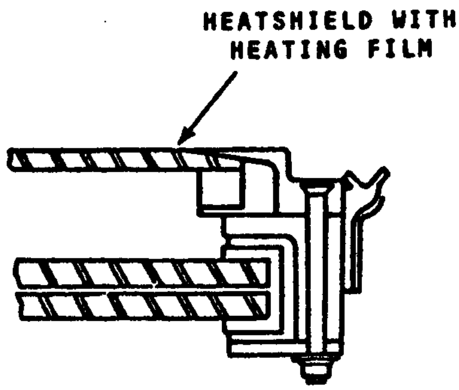






WINDSHIELD

PRESSURE PANELS
FOR SUM TOTAL OF DELAMINATION EXCEEDING 150sq in (96774sq mm) FOR THE DV WINDOW, AND 120sq in (77470sq mm) FOR THE SIDE WINDOW, REPLACE PANEL



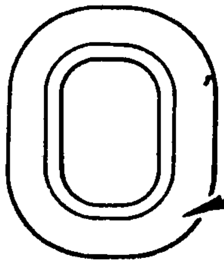
DV AND SIDE WINDOWS
(TYPICAL)

Windshield, DV and Side Windows

FIG TWO

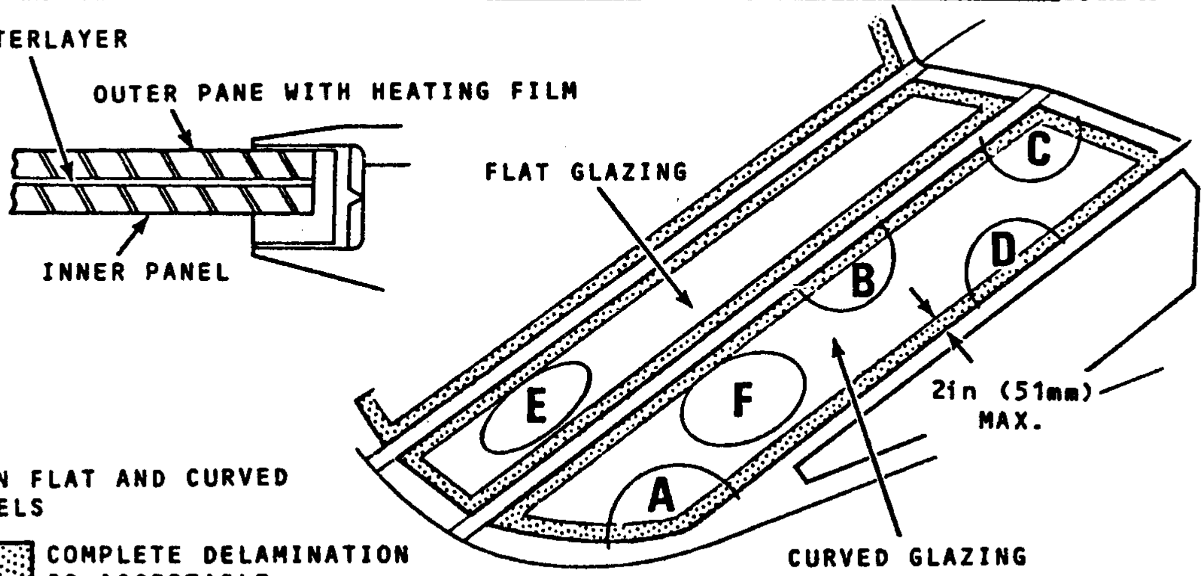
MAINTENANCE PROCEDURE

ALLOWABLE DAMAGE - GLAZINGS



IF THE SUM TOTAL AREA OF DELAMINATION EXCEEDS 15 sq in (9677 sq mm) ON ANY ONE PANEL, REPLACE THE PANEL.

PASSENGER COMPARTMENT WINDOWS

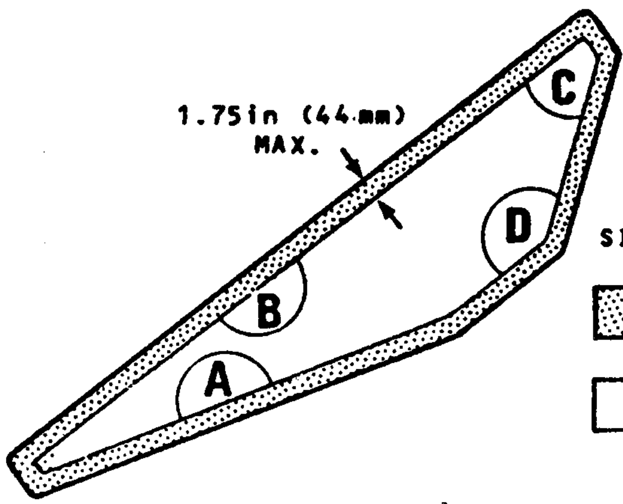


MAIN FLAT AND CURVED PANELS

COMPLETE DELAMINATION IS ACCEPTABLE.

LOCAL DELAMINATION - FOR ANY SINGLE AREA (A TO F FOR EXAMPLE) EXCEEDING 20sq in (13208sq mm) WITH IMPAIRED VISION - REPLACE PANEL.

VISOR PANELS



SIDE PANELS

COMPLETE DELAMINATION IS ACCEPTABLE.

LOCAL DELAMINATION - FOR ANY SINGLE AREA (A TO D TO EXAMPLE) EXCEEDING 15sq in (9677mm) WITH IMPAIRED VISION - REPLACE PANEL.

Visor and Passenger Windows

FIG THREE

LEFT BLANK INTENTIONALLY

DESPATCH DEVIATION PROCEDURES

INTAKE CONTROL

ATA 71

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
71.2 - <u>Door Actuators and Mechanism</u> Apply procedure INTAKE LIGHT ON, as required.	None
71.3 - <u>Ramp Actuator and Mechanism</u> Apply procedure INTAKE LIGHT ON, as required.	Inch or manually move to subsonic geometry
71.9 - <u>Auxiliary Vane Indicator</u> None	Physically operate vane to fully open and close before flight.

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FUEL AND ENGINE CONTROLS ATA 73

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
73.4 - <u>Fuel Heater System Manual</u> If the Fuel Temp. falls below +20°C, FUEL HEATER SW. ON When Fuel Temp. reaches +70°C FUEL HEATER OFF. If the fuel Filter light comes on, apply procedure "FUEL FILTER LIGHT ON".	None

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
75.1 - <u>Engine Anti-Ice</u> (b) <u>Failed On</u> If the OAT at take-off is above +3°C, see Performance Manual section 5, CONTINUOUS USE OF ENGINE ANTI-ICE, for performance penalty. Unrestricted engine operation is permitted but, with Total Temperature above 80°C and the associated engine(s) N_2 greater than 96%, damage may occur to the cable to the No.1 bearing vibration pick-up. In addition, carbon formation in the LP compressor front bearing chamber and scavenge pipe may occur, this <u>ultimately</u> leading to a total loss of engine oil and hence engine shut-down.	1. If the defect cannot be rectified and operational considerations allow the aircraft to be despatched with the system failed <u>off</u>, close the valve in accordance with Eng. Alert No.75 (RR SB OL 593 75 11). 2. If the aircraft is despatched with the system failed on and operates at a Total Temperature of greater than 80°C with the associated engine(s) N_2 at greater than 96%, then after the flight the following Maintenance actions must be applied:- (a) either the defective system must be repaired, or the failure mode must be reversed so that the system is failed off. See Maintenance Manual 71.00.22 Sheet 104 or Rolls-Royce Service Bulletin OL 593-75-11 or Eng. Alert No.75 (b) either the cable to the No.1 bearing vibration pick-up must be replaced (See Maintenance Manual 77.33.01 page 401) or the Aircraft may be operated to the requirements of the eight flight waiver on the vibration indication system (ATA 77, Item 4).

ATA 76

ENGINE CONTROL

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
76.1 <u>Engine Electronic Control System</u> <u>CAUTION:</u> If, after 100 Kt., the associated engine suffers a partial thrust loss and the take-off is abandoned, then if the engine has failed to respond to throttle lever movement when idle is selected, it should be shut down as soon as possible after selection of reverse thrust.	

77 - ENGINE INDICATION

77.1 - Engine Instruments

1 - TAKE-OFF MONITOR INOPERATIVE

(a) "Clear to Go" light failed On or OFF

If the Go light is failed On, it should be masked before departure. The following procedure then applies to Go light failed On or Off:-

Apply normal engine monitoring procedures, in particular observe that N_2 achieves minimum value for take-off and Area indication lies within the white sector on the subject engine.

The remaining three Go lights must be on at 100kts or the take-off abandoned.

(b) "CON" light failed OFF

Apply normal engine monitoring procedures, in particular observe that N_2 achieves minimum value for take-off and Area indication lies within the white sector on the subject engine.

The "One Go Light Off at 100kts", procedure may be applied on any one engine.

On the subject engine,
- during in-flight reverse, monitor Area and cancel its reverse selection if Area is greater than 15%
- during landing reverse do not increase its thrust above reverse idle until Area is less than 15%.

(c) "CON' light failed ON.

Mask the failed CON light before departure.

The associated Go light will be inoperative.

Apply normal engine monitoring procedures, in particular observe that N_2 achieves minimum value for take-off and Area indication lies within the white sector on the subject engine.

The remaining three Go lights must be on at 100kts or the take-off abandoned.

On the subject engine,
- during in-flight reverse, monitor Area and cancel its reverse selection if Area is greater than 15%
- during landing reverse do not increase its thurst above reverse idle until Area is less than 15%.

2 - FUEL FLOWRATE INOPERATIVE OR P7 INOPERATIVE

Set the Fuel Flowrate bug (or P7 bug) to the normal value. The associated Go light will thus be inoperative.

Apply normal engine monitoring procedures, in particular observe that N_2 achieves minimum value for take-off and Area indication lies within the white sector on the subject engine.

The remaining three Go lights must be on at 100kts or the take-off abandoned.

3 - N_1 INOPERATIVE

Apply normal engine monitoring procedures.

4 - N_2 INOPERATIVE

At speeds up to and including 100kts, failure of the N_2 instrument is covered by the general instrument "sensibly in line" scan which is normally carried out and by operation of the Go light.

At speeds above 100kts, engine failure will be indicated by N_1.

The take-off must be abandoned if the associated Go light fails to illuminate by 100kts. The "One Go Light Off at 100kts" procedure may be applied to any one of the other three engines.

5 - EGT INOPERATIVE

(a) Starting

The engine may only be started if the yellow EGT warning light is extinguished with the Throttle Master selector at MAIN or ALTERN.

(b) Take-Off

If the engine is controlled by an Engine Control Unit with part no. A6A16/24AL (AL amplifier) the following requirements must be observed:-

(i) The aircraft may be dispatched for no more than 3 consecutive flights with an EGT instrument inoperative.

(ii) A take-off performance penalty must be applied and the associated P7 and Fuel Flowrate bug settings reduced. See Performance Manual section 5.

(b) Take-Off

(iii) Manually throttle the engine to an N_2 of 1% lower than the other three engines.

(iv) The take-off must be abandoned if any Go light fails to illuminate by 100kts.

(v) If the engine is controlled by any other Standard of Engine Control Unit no restrictions or special procedures are required.

6 - AREA INOPERATIVE

Failure of an Area instrument is covered by the general instrument "sensibly in line" scan which is normally carried out, the CON light remaining off and the operation of the Go light.

The take-off must be abandoned if the associated Go light fails to illuminate by 100kts. The "One Go Light Off at 100kts" procedure may be applied to any one of the other engines.

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OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
77.4 - <u>Vibration Indication System</u> None.	<u>No.1 Bearing Vibration Indication System</u> Normal operation is permitted for up to eight flights provided the defect is proved to be in the indication system by carrying out checks detailed in Chapter 71.00.32 of the M.M. (TR No. 71-073 and 71-074) When the defect is confirmed to be in the indication system, inhibit the defective Vibration Warning Channel as follows:- (a) Disconnect the free electrical plug from fixed connector mounted on engine at 40^{o} approx. from bottom centre line by a bracket supported from I.G.V. - L.P. compressor casing joint. (b) Attach to the free plug a connector HTMA-O-E-10SL-3P181 suitably wired to short circuit pins 'a' and 'b'. (c) Support the free plug and its shorting connector by securing it to the loom or a convenient attachment point.

OPERATIONAL PROCEDURES

78.1 Secondary Nozzles

The inoperative nozzle is to be locked within the range of 10° to 27°. The preferred position, for overall performance reasons, is 10° and where practicable the ground-crew should be requested to wind the nozzle to 10° before the following operational procedures are applied:

Before Engine Start

Verify that the locked bucket position is between 10° and 27°.

Trip the associated BUCKET CONTROL UNIT SUPPLY CB.

CIRCUIT BREAKER	PANEL	GRID/REF
ENG 1 BUCKET CONT SUP	14-215	E12
ENG 2 BUCKET CONT SUP	13-215	G14
ENG 3 BUCKET CONT SUP	13-216	C6
ENG 4 BUCKET CONT SUP	14-216	C6

Notes: 1. Tripping the B.C.U. supply C/B enables the "GO" light to operate. irrespective ot secondary nozzle position.

2. Tripping the B.C.U. supply C/B immobilises electrically the secondary nozzle at the position it is in, but causes the associated secondary nozzle position indicator to read 0°.'

During Taxi Out

Omit the Reverse ASOV check on the associated bucket pair.

MAINTENANCE PROCEDURES

NOTES:

1. The aircraft may be despatched with an inoperative secondary nozzle provided it is locked within the range 10° to 27°. Wherever practicable, it is recommended that the nozzle is set to 10° (as described after these notes).
2. If the nozzle has failed outside the range 10° to 27° due to damage or jamming of a bucket ballscrew gearbox, it is permissible for the aircraft to be despatched with one gearbox missing subject to the following requirements:-

   a) the only gearbox which is allowed to be missing is the bottom right-hand unit as viewed from the rear of the aircraft looking forward. If the defective gearbox is not in that position, it should be removed and the gearbox from the bottom right-hand position substituted.

   b) the bottom right-hand gearbox flexible shaft must then be removed and the nozzle must then be wound to and mechanically locked at 10° as described below.

   c) the missing gearbox must be replaced when the aircraft next returns to main base.
3. Except as specified in Note (2) above, it is not mandatory (although it is desirable) to mechanically lock the nozzle at the desired position, since electrical locking is achieved when the aircrew trip the B.C.U. supply C/B.
4. Failure of the nozzle to schedule fully to 0° at speeds above M1.1 need not necessarily be regarded as a system fault that requires buckets to be locked. Provided that the nozzle achieves a position in the range 0° to 5° above M1.1 and schedules correctly below M1.1, its operation may be considered satisfactory and no performance penalties are incurred.

DISPATCH DEVIATION PROCEDURES

EXHAUST & REHEAT — ATA 78

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
	(1) Remove access panels, for drive unit and any one ballscrew gearbox, for appropriate bucket.

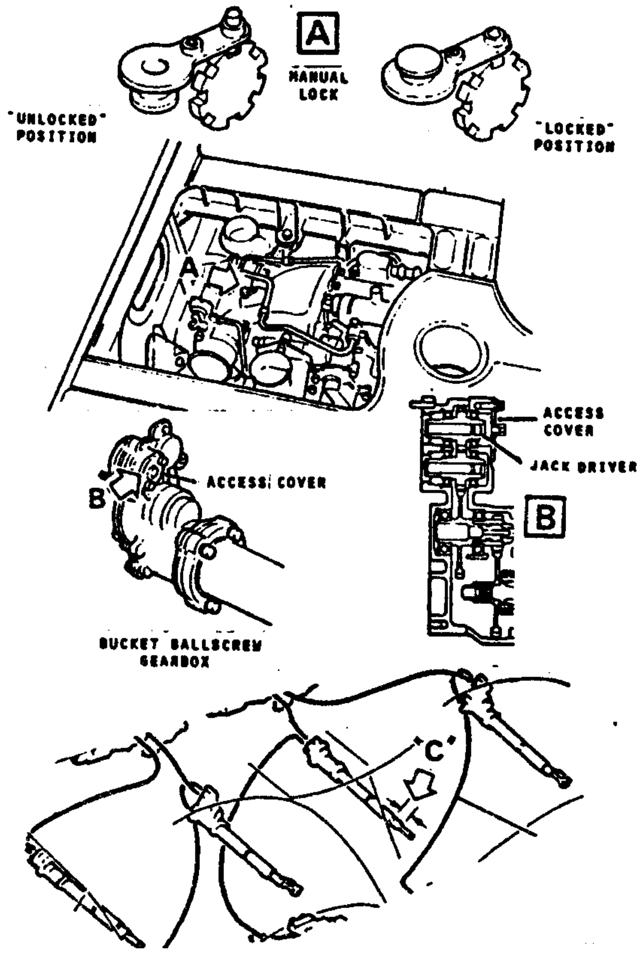
<u>Eng.1</u> <u>Eng.2</u> <u>Eng.3</u> <u>Eng.4</u>

Eng.1	Eng.2	Eng.3	Eng.4	
418AT	427AT	438AT	447AT	Drive Unit
417AT	428AT	437AT	448AT	Outer top gearbox (ref.)

(2) Remove access cover from appropriate bucket ballscrew gearbox B below.

(3) Insert .314" or 8mm A/F Hex Bar into jack driver and rotate either manually or with power tool, to set bucket angle to 10^{o} (10^{o} is equivalent to a movement of the jack of 37.6 mm measured at 'C'). See illustration.

(4) On Drive Unit remove socket headed retaining screw, lift and invert locking plate, replace. Ensuring pin is correctly located, refit socket headed retaining screw and tighten, See A.



FIRST ISSUE

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
78 - 4 One N.A.S.U. Inoperative After Engine Start Set NASU test sel in turn to Test 1 and Test 2. Observe that at one of the positions the Secondary Nozzles remain at 21° ("Failed" NASU selected) and at the other position that the Secondary Nozzles go to 0° (Operative NASU selected). Return NASU Test Sel to NORM and observe Secondary Nozzles return to 21°. Notes: 1. If the Nozzles light is on because of an internally detected fault on one NASU, powerplant operation is unaffected. 2. If the Nozzle light is on because of the loss of the AC power supply to one NASU the following effects/procedures should be noted. (a) The throttle control units supplied by the inoperative NASU will cause the CRUISE rating to operate at its highest (i.e. warm day) level. If cruising at static temperatures colder than -51°C either change throttle lanes on the affected engines or throttle the engines manually to the required value of N_1, N_2 and E.G.T. (b) The throttle control units supplied by the inoperative NASU will cause the engines to operate on the LO schedule if the ENGINE CONTROL SCHEDULE sels are set to AUTO and FLYOVER or AUTO and APPROACH. The desired schedules may be obtained by changing throttle lanes on the affected engines.	Maintenance to diagnose whether NASU failure is internal (Comparator) or due to loss of A.C. power supply and inform aircrew accordingly.

DESPATCH DEVIATION PROCEDURES

EXHAUST & REHEAT

ATA 78

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
3. NASU/THROTTLE CONTROL UNIT Interdependence.	

	THROTTLE CONTROL UNIT			
	ENG 1	ENG 2	ENG 3	ENG 4
NASU 1 SUPPLIES	MAIN	ALTERN	ALTERN	MAIN
NASU 2 SUPPLIES	ALTERN	MAIN	MAIN	ALTERN

4. There will be no indication of a subsequent failure of the remaining N.A.S.U. The Engine Control Schedule Lts should therefore be closely monitored for correct indication throughout the flight. If at any time, the Lts indicate incorrect E Schedule operation, apply procedure "NOZZLE LIGHT ON NOT ASSOCIATED WITH A.D.C. FAILURE".

FIRST ISSUE

DESPATCH DEVIATION PROCEDURES

EXHAUST & REHEAT ATA 78

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
78.5 - Reheat Fuel Control System One Reheat System inoperative BEFORE TAKE-OFF Secondary Air Door Switch ..Shut (Affected Engine) NOTE: Ensure that the fuel flow meter bugs for the affected engine are set at zero. The "REHEAT" selectors for all four engines must be operated in the normal manner. NOTE: An engine with inoperative reheat, selection of "CONTINGENCY" on the "REHEAT" selector will cause the "dry" engine to operate as its appropriate contingency thrust level. See Performance Manual Section 5 for limitations. AFTER TAKE-OFF At approximately 220Kts ENGINE CONTROL SCHEDULE LIGHTS (Affected engine) LO off HI on At start of Noise Abatement: ENGINE CONTROL SCHEDULE LIGHTS (Affected Engine) HI OFF F/O on when reheat selected OFF Above 250 Kts SECONDARY AIR DOOR sel. (Affected Engine .... AUTO NOTE: The requirement to keep the Secondary Air Doors shut below 250 knots is for dispatch with known reheat failure, it is not applicable if reheat failure occurs during take-off	Check that the "automatic contingency rating selection" signal for the affected engine is functioning, as follows. Electrical Power .... ON REHEAT SWS (all engines) . Verify OFF ENG.RATING MODE SWS (all engines) .... Verify TAKE-OFF T/O lt .... ON T/O MONITOR pb .... Push to ARM and latched REHEAT sel. (Affected Engine Only).... RHT T/O lt .... Remains On CTY. lt .... Flashing CAUTION: If the CTY light remains OFF. the "automatic contingency rating selection" signal is not functioning and dispatch is not permitted REHEAT Sel. (Affected Engine .... OFF CTY. lt .... OFF T/O MONITOR pb .... Pull to INHIBIT Check that the "reheat off" signal to the throttle control units for the affected engine is functioning, as follows: THROTTLE MASTER Sels. (all engines) .... Main or ALTERN. ENG. RATING MODE Sws (all engines) .... Verify TAKE-OFF ENGINE CONTROL SCHEDULE Sels .... NORMAL and HI ENGINE CONTROL SCHEDULE lts. (all engines) .... Verify LO REHEAT Sels (all engines). Verify OFF U.C. Weight sw c/bs ..... Trip (See Table below)

CIRCUIT BREAKER	PANEL	GRID REF
R.H.U.C. Weight Sw. 'A' Sys. Sup.	1.213	M18
L.H.U.C. Weight Sw. 'B' Sys. Sup	3.213	B8

FIRST ISSUE

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
78.5 contd.	ENGINE CONTROL SCHEDULE lts (all engines) . . . . HI CAUTION: If, for the affected engine, the HI lt remains off and the LO lt remains on the "reheat off" signal to the throttle control units is not functioning and dispatch is not permitted. U.C. Weight Sw. c/b's . . . . Reset If the "automatic contingency rating selection" signal and the "reheat off" signal are functioning as required, the following maintenance procedure to inhibit the affected reheat system must be carried out before the aircraft is dispatched. 1. Connect a voltmeter to measure 28 V.D.C. between pin W of the affected reheat electronic control units (R.E.C.U.) test plug and earth. 2. Advance throttle lever of affected engine to approximately mid-travel. 3. Select reheat switch of affected engine to RHT and check voltmeter reads approximately 28V. Select reheat switch to OFF. 4. At rear racking or underfloor relay panel as convenient, disconnect, tape and stow the appropriate cable for the affected reheat system (See following tables). Table 1 - Rear Racking

RECU	CABLE IDENT	SHELF	TERMINAL BLOCK	STUD
1	1K209 x K	7.243	UG2927	1
2	2K209 x H	7.243	UG2927	2
3	3K209 x H	7.244	UG2928	1
4	4K209 x H	7.244	UG2928	2

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
78.5 contd.	Table 2 - Underfloor relay panel - Disconnect cable from terminal A_1 tape and stow

RECU	PANEL	RELAY
1	19-123	1K 727
2	19-123	2K 727
3	20-123	3K 727
4	20-123	4K 727

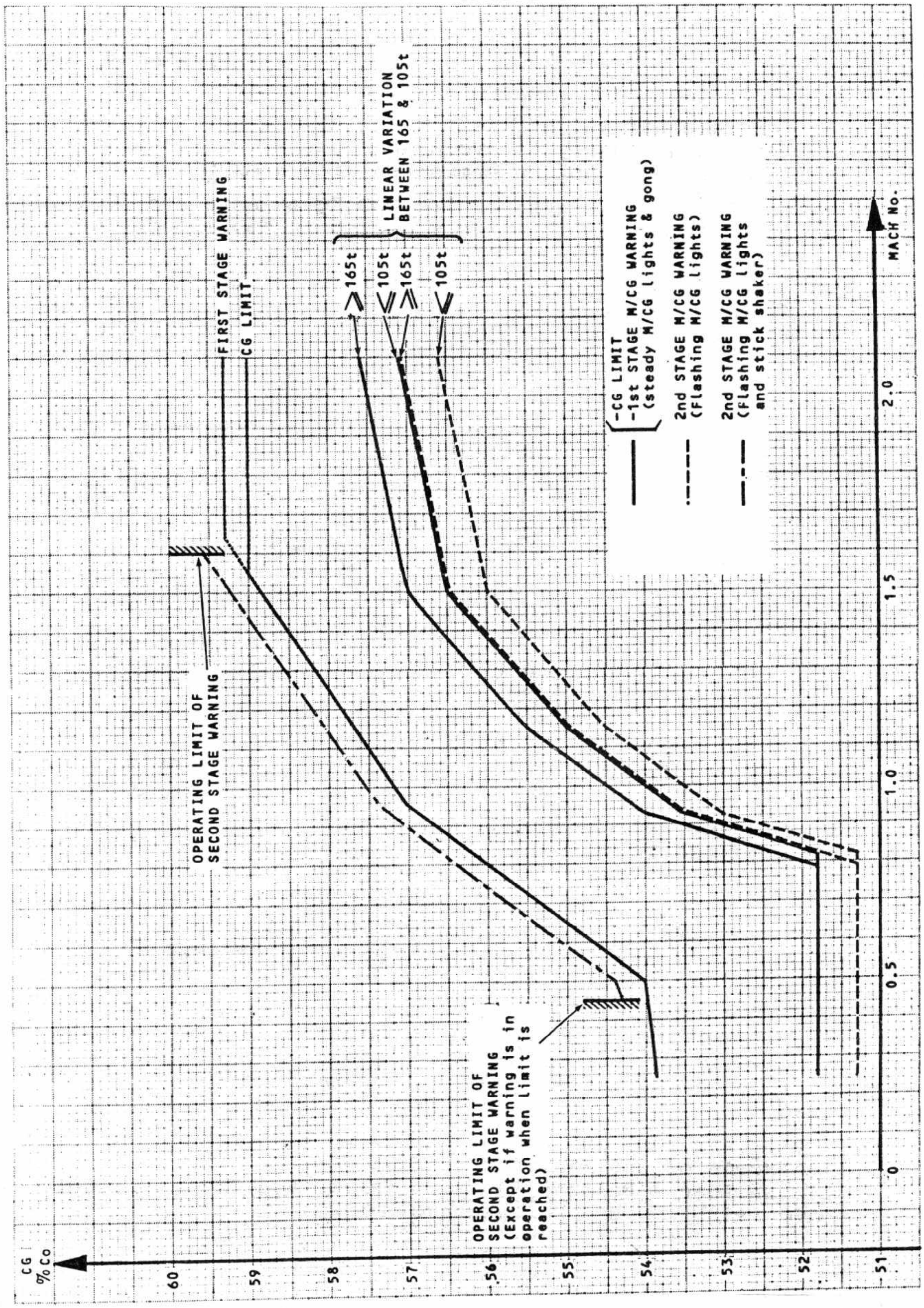
5. Select reheat switch of affected engine to RHT and check that Voltmeter remains at 0.

CAUTION: If there is still a 28V D.C. signal on pin W, dispatch is not permitted.

6. Select reheat switch of affected engine to OFF and disconnect Voltmeter.

OPERATIONAL PROCEDURES	MAINTENANCE PROCEDURES
78.6 - Reheat Ignition System One Reheat System Inoperative Same procedure as for 78.5	Same procedure as for 78.5

IN-FLIGHT CG LIMITS
(Except for Take-off and Landing Phases)



(Unchanged)

British airways
OVERSEAS DIVISION

Concorde

Flying Manual

Volume II (b)

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Copy No.....................

STATEMENT OF INITIAL CERTIFICATION.

This Manual is approved by British Airways Overseas Division in accordance with T.S.S Standard No.02.

This Publication forms part of the British Airways Overseas Division Approved Operations Manual.

Prepared by Technical Information Services.

British airways
OVERSEAS DIVISION

REVISION RECORD

Rev No	Date Entered	Initials	Rev No	Date Entered	Initials	Rev No	Date Entered	Initials

LETTER OF TRANSMITTAL NO. 26

AND

LIST OF EFFECTIVE PAGES

The contents of this permanent revision are approved by BA-OD in accordance with TSS Standard No. 0-2.

This manual consists of the following pages, listed to show the latest issue date of each enabling a complete check of all pages to be made.

1. INSERT and/or REMOVE pages as stated below.
2. REMOVE & DESTROY superseded pages.
3. Record this revision number on the Record Sheet.

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Revision Record		06.05.02	24 May 79
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		06.05.04	4 Sep.78
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TEMPORARY REVISION NO. 21

The contents of this temporary revision index are approved by BA-OD in accordance with TSS Standard No. O-2.

PROCEDURE:

1. Insert attached pages.
2. File this page immediately following Frontispiece/Revision Record.
3. Record this revision on the Temporary Revision Record Sheet.

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06.12	INSERT	02	4 Oct.79			
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British airways

TEMPORARY REVISION RECORD SHEET

Rev No	Date Entered	Initials	Rev No	Date Entered	Initials	Rev No	Date Fntered	Initials
18	21.3.79	[illegible]						
19	9.6.79	[illegible]						
20	16 8 79	M						
21	22.10.79	[illegible]						

British airways

TEMPORARY REVISION RECORD SHEET

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LIST OF CONTENTS

(Deletion)

NORMAL PROCEDURES

GENERAL

All items of a given procedure are intended to prepare the aircraft for the next phase of flight. They are listed in sequence to a standardised scan. This enables the crew to use the actual equipment, instruments, selectors and switches as a physical checklist.

In the Captain's, First Officer's and Flight Engineer's cockpit preparation sections the balloon reference numbers next to section titles show the scan numbers as they are given on the illustrations 06.01.02 to 04.

Where an action is considered to be a safety item or is performed out of scan it is repeated in the NORMAL CHECKLISTS.

The "safety checklist" and "preliminary cockpit checklist" are unilateral i.e. the relevant crew member uses the check list as a reference to verify that the prescribed actions have been carried out.

The remaining checklists are of the conventional challenge/ response type. The First Officer challenges on the "before start checklist", pushback checklist and "after start checklist" and the Flight Engineer challenges on the "taxy checklist" and all other checklists.

The responding crew member shall respond to the challenge only after having checked the existing configuration.

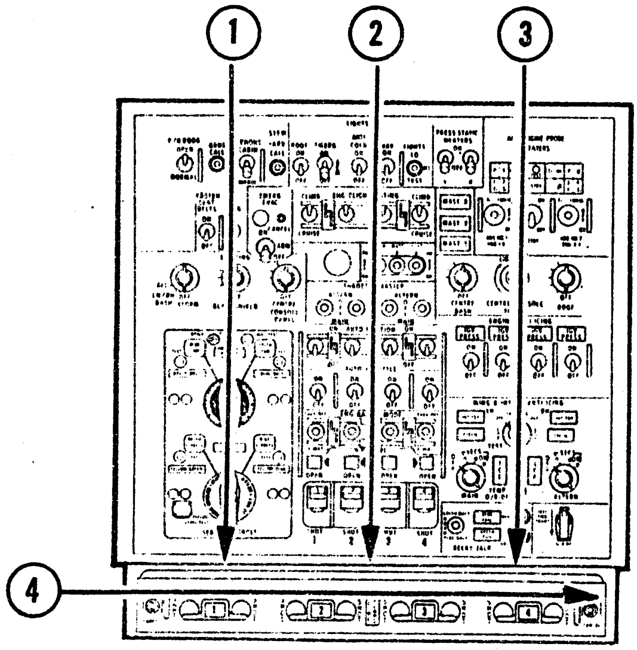
If the configuration is not in accordance with the written checklist response the responding crew member shall take corrective action before answering. If corrective action is not possible the response must be modified to reflect the actual situation.

The other crew members shall crosscheck whenever feasible the validity of the response. The challenger shall wait for the response before proceeding with the checklist.

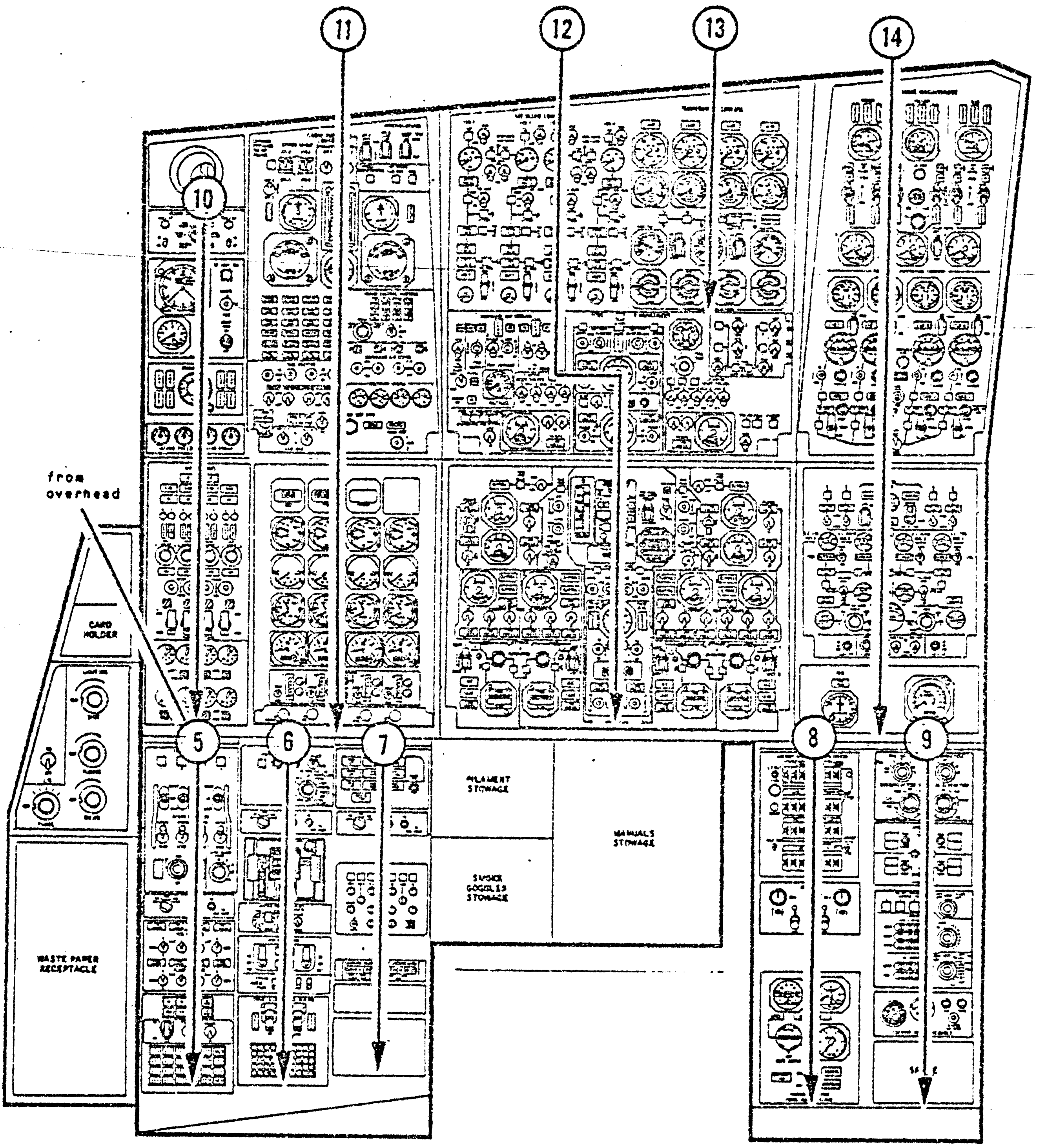
Boxed items need only be completed "EX BASE ONLY."

The statement "EX BASE ONLY" means out of London or where the aircraft transit has been greater than 4 hours.
The statement "INTO BASE ONLY" means into London or into a station where the planned transit is greater than 4 hours.

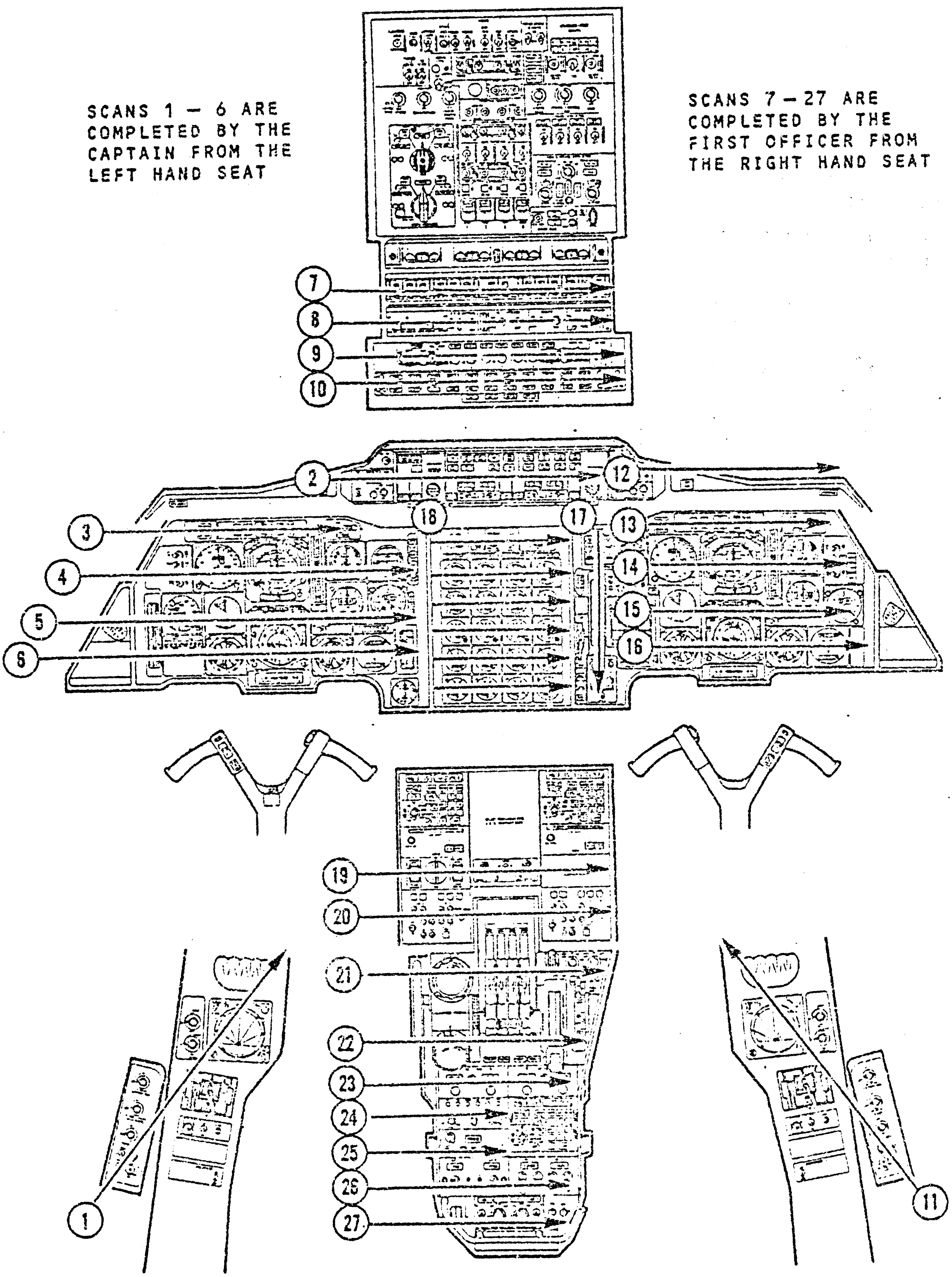
FLIGHT ENGINEER'S OVERHEAD SCAN SEQUENCE



FLIGHT ENGINEER'S PANEL SCAN SEQUENCE



PILOTS' PANEL SCAN SEQUENCE



EXTERNAL CHECK

This inspection is to be performed prior to each flight. Its completion ensures that the aircraft and/or surroundings are not obviously unsafe for operations.

Observe left static vent plates (2) are not damaged and vents (3) are clear.

Observe yaw vanes (2) covers removed and vanes not damaged.

NOTE
The yaw vanes are normally aligned with the longitudinal axis of the aircraft but may at this time be offset by crosswinds.

Observe crew oxygen vent disc intact.

Observe nosewheel free fall dump valve vent clear, and no hydraulic fluid leakage from vent.

Observe nose gear doors (2) are shut.

Observe land/taxi lights (2) are retracted and light not damaged.

Observe left anti-collision light fairing secure and light transparency clear and not damaged.

Observe left main landing light is retracted and light not damaged.

Observe nose wheel chocks in position.

Observe nose gear for condition.

NOTE
The general observation of nose gear should include:
- the doors attached to the gear are secure.
- the retraction jacks (2) are not damaged or leaking oil
- the steering unit is not damaged or leaking oil
- the torque links are connected and not damaged
- the oleo extension appears normal
- the tyres are not damaged and pressure normal
- hydraulic lines are not damaged or leaking oil

Observe nose gear door key in flight position and cap fitted.

Verify nose gear ground lock pin removed and locking plunger visible in hole.

Verify steering pin is correctly positioned for the ensueing departure.

EXTERNAL CHECK

NOTE

The nosewheel steering must be inhibited for a pull or push back departure.

Observe air conditioning discharge valve outlets clear and thrust recuperator open.

NOTE

The thrust recuperator is fitted to No.1 system discharge valve. It is open when the cabin differential pressure is less than 3 psi.

Observe left forward fuel vent clear.

Observe left wing de-icing mats for damage.

Observe underside of left wing.

NOTE

The general observation of the underside of the wing should include
- all panels secure
- no damage to wing surface
- no fuel leaks

Observe left navigation light glass clean and not damaged.

Observe movement area for elevons clear.

Observe left, mid and outer elevons for condition.

NOTE

The general observation of the elevons should include
- any signs of damage
- the jack fairings are secure with no hydraulic leaks
- static wicks (8) are serviceable

Observe No.1 engine hot and cold vents clear.

Observe No.1 nacelle aft bay door secure and lock pins (5) flush.

Observe No.1 nacelle access panels secure.

Observe left dry bay drain clear and no fluid leakage.

Observe No.1 engine fuel heater outlet clear

NOTE

Care should be excercised if the fuel heater is in use as the discharging air is extremely hot.

Observe No.1 engine oil tank vent clear.

EXTERNAL CHECK

Check No.1 engine bay ventilating door for free movement and open.

NOTE
The engine bay ventilating door is spring loaded to open.

Observe No.1 nacelle air conditioning heat exchanger flap inlet clear.

Observe No. 1 nacelle front bay door secure and pins (5) flush.

Observe ground under left hand intake spill doors is clear of stands and servicing equipment,
the spill doors are shut,
the auxiliary vanes for position,
the perforated bleed under No.2 intake is clear.

Observe No.1 air intake blanks removed,
air intake de-icing mats for damage,
air intake ramps are up.

Observe No.2 air intake blanks removed,
air intake de-icing mats for damage
air intake ramps are up.

NOTE
The air intake ramps front and rear are up when their inboard corners are aligned with markings on centre wall.

Observe left gear for condition.

NOTE
The general observation of the gear should include
- doors attached to leg secure
- main gear door shut
- retraction system not damaged
- the hydraulic lines are not damaged or leaking oil
- pitch dampers not damaged
- the torque links are connected and not damaged
- shortening lock jack not damaged or leaking oil
- the oleo extension appears normal
- the tyres are not damaged and pressure normal

Observe left gear ground lock pin removed.

Observe shortening lock jack pin removed.

Observe left main gear door key in flight position and cap fitted.

EXTERNAL CHECK

Observe left gear free fall dump valve vent clear and no hydraulic leakage from vent.

Observe No. 2 nacelle front bay door secure and pins (5) flush.

Observe No. 2 nacelle air conditioning heat exchanger flap inlet clear.

Observe No.2 nacelle access panels secure.

Check No.2 engine bay ventilating door for free movement and open

Observe No. 2 engine oil tank vent clear.

Observe No.2 engine fuel heater outlet clear.

Observe No.2 nacelle aft bay door secure and lock pins (5) flush.

Observe No.2 engine hot and cold vents clear.

Observe No.2 engine secondary nozzle buckets condition. No.2 engine primary nozzle blanks are removed.

Observe No.1 engine secondary nozzle buckets condition No. 1 engine primary nozzle blanks are removed.

Observe left inner elevon for condition.

NOTE

The general observation of the elevon should include
- any signs of damage
- the jack fairing is secure with no hydraulic leaks
- the ram air turbine door is secure

Observe hydraulic bay ventilating fan intake clear.

Observe air conditioning discharge valve outlets clear.

Observe fuel overflow/relief/overpressure valve outlet clear and no fuel leakage.

Observe hydraulic-driven fuel transfer pump drains clear and no fluid leakage.

Observe left side of fin and rudder for condition

EXTERNAL CHECK

NOTE

The general observation of the fin and rudder should include
- lower jack fairing secure and no hydraulic leaks
- fuel tank pressure inlets clear
- static wicks (8) are serviceable
- antenna secure

Observe tail gear for condition.

NOTE

The general observation of the tail gear should include
- doors secure
- no hydraulic leaks
- tail gear maintenance lock removed

Observe fuel tank pressurization static vent clear.

Observe fuel tank vents clear.

Observe fuel jettison outlet clear.

Observe rear navigation and anti-collision light glass clean and not damaged.

Observe movement for rudder clear.

Observe right side of fin and rudder for condition.

NOTE

The general observation of fin and rudder should include
- upper jack fairing secure and no hydraulic leaks

Observe right inner elevon for condition

NOTE

The general observation of the elevon should include
- any signs of damage
- the jack fairing is secure with no leaks

Observe No.3 engine secondary nozzle buckets condition, No.3 engine primary nozzle blanks are removed.

Observe No.4 engine secondary nozzle buckets condition; No. 4 engine primary nozzle blanks are removed.

Observe right dry bay drain clear and no fluid leakage.

Observe No. 3 nacelle aft bay door secure and lock pins (5) flush.

Observe No. 3 nacelle air conditioning heat exchanger flap

EXTERNAL CHECK

inlet clear

Observe No.3 access panels secure.

Observe No.3 engine hot and cold vents clear.

Check No.3 engine bay ventilating door for free movement and open.

Observe No.3 engine fuel heater outlet clear.

Observe No.3 engine oil tank vent clear.

Observe No.3 nacelle front bay door secure and pins (5) flush.

Observe ground under left hand intake spill doors is clear of stands and servicing equipment.
the spill doors are shut,
the auxiliary vanes for position,
the perforated bleed under No.3 intake is clear.

Observe No.3 air intake blanks removed,
air intake de-icing mats for damage,
air intake ramps are up.

Observe No.4 air intake blanks removed,
air intake de-icing mats for damage,
air intake ramps are up.

Observe right main gear for condition.

NOTE

The general observation of the gear should include.
- doors attached to leg secure
- main gear door shut
- retraction system not damaged
- the hydraulic lines are not damaged or leaking oil
- pitch dampers not damaged
- the torque links are connected and not damaged
- shortening lock jack not damaged or leaking oil
- the oleo entension appears normal
- the tyres are not damaged and pressure normal

Observe right gear ground lock pin removed

Observe shortening lock jack pin removed.

Observe right gear free fall dump valve vent clear and no hydraulic leakage from vent

Observe No.4 nacelle air conditioning heat exchanger flap inlet clear

Observe No.4 nacelle front bay door secure and pins (5) flush

Observe No.4 nacelle access panels secure

Observe No.4 engine hot and cold vents clear

Check No.4 engine bay ventilating door for freedom of movement and open.

Observe No.4 engine fuel heater outlet clear.

Observe No.4 engine oil tank vent clear.

Observe No.4 nacelle aft bay door secure and lock pins (5) flush.

Observe movement area for elevons is clear.

Observe right, mid and outer elevons for condition.

NOTE

The general observation of the elevons should include
- any signs of damage
- the jack fairings are secure with no hydraulic leaks
- static wicks (8) are serviceable

Observe right navigation light glass clean and not damaged.

Observe underside of right wing

NOTE

The general observation of the underside of the wing should include
- all panels secure
- no damage to wing surface
- no fuel leaks.

Observe right wing de-icing mats for damage.

Observe right forward fuel vent clear.

Observe right anti-collision light fairing secure and light transparency clear and not damaged.

Observe right main landing light is retracted and light not damaged.

Observe right and left ice detectors (2) not damaged and covers removed.

Observe temperature probes (2) are not damaged.

Observe forward servicing hatches secure.

EXTERNAL CHECK

Observe taxi-turn light not damaged.

Observe nose/visor hatches secure.

Observe right static vent plates (2) are not damaged and vents (3) are clear.

Observe incidence probes (2) not damaged and covers removed.

Observe pitot probes (2) not damaged and covers removed.

Observe radome secure and not damaged.

Observe nose pitot probe not damaged and cover removed.

Observe droop nose area is clear.

Observe ground supplies are properly parked and connected.

COCKPIT SAFETY CHECK

This check must be performed "EX BASE" upon entering the cockpit.
Its completion ensures that there will be no danger to the aircraft and/or personnel when powering the systems.

GROUND SERVICE sw ....ON

Set GROUND SERVICE sw to ON.
Observe vestibule fluorescent lights are on.

BOARDING, RACKING AREA and ROOF lts ....ON

Set BOARDING lts and RACKING AREA roof lt sws to ON.
Observe forward vestibule boarding lts and racking area roof lts are on.
Set ROOF lts sw to ON or OFF as required.
Observe lts are as selected.

L/gear STANDBY LOWERING lever ....GUARDED

Observe L/Gear STANDBY LOWERING lever at NEUTRAL and guarded.

Transponder ....STBY

Verify ATC mode sel at STBY

Radar ....OFF

Verify radar OFF pb is engaged.

NOTE

The radar OFF push button light (white) comes on as soon as the aircraft busbars are supplied.

EMERGENCY NOSE/VISOR UPLOCK RELEASE ....DOWN/PIN ENGAGED

Verify EMERGENCY NOSE/VISOR UPLOCK RELEASE is down, with pin engaged.

NOSE AND VISOR STBY control ....OFF/GUARDED

Verify NOSE and VISOR STBY control is OFF and guarded.

L/GEAR normal lever ....DOWN

Verify L/GEAR lever at DOWN.

GEAR O/RIDE ....GUARDED

Verify GEAR O/RIDE guarded.

VISOR/NOSE lever ....AS CONFIGURATION

Verify that VISOR/NOSE lever position coincides with

COCKPIT SAFETY CHECK

visor/nose configuration.

This check prevents any uncontrolled movement of the droop nose and visor when the green hydraulic system is pressurized.

AUTO IGNITION sws .... OFF

Verify AUTO IGNITION sws (4) at OFF

NOTE

This prevents,

1. Operation of the start pump and engine igniters should the throttle master sel be at MAIN or ALTERN and the HP VALVE sw be at OPEN.
2. Operation of the start pump and opening of the start valve when the debow switch is at debow and LH or BOTH igniters selected.

ADS/ENGINE PROBE HEATERS ....OFF

Verify ADS 1, and ADS 2, sels at OFF and STBY sw at OFF.

WING & INTAKE ANTI-ICING test ....OFF

Verify WING & INTAKE ANTI-ICING TEST rty sel at OFF

FUEL FWD TRANS sw ....GUARDED

Verify FUEL FWD TRANS sw is guarded.

TRIM TRANS AUTO MASTER sel ....OFF/GUARDED

Verify TRIM TRANS AUTO MASTER sel set at OFF and guarded.

TANK 11 INLET VALVES sels ....AUTO/OFF

Verify tank 11 INLET VALVES, MAIN sels at AUTO AND OVERRIDE sels at OFF.

STANDBY INLET VALVES sws ....SHUT

Verify STANDBY INLET VALVES sws are at SHUT.

This prevents any inadvertent transfer of fuel when electrical power is supplied.

(Deletion)

TRIM PIPE DRAIN sw ....SHUT

Verify TRIM PIPE DRAIN sw at SHUT.

Jettison panel cover ....CLOSED

Verify the jettison panel transparent covers are closed.

COCKPIT SAFETY CHECK

NOTE: This prevents any accidental discharge of fuel when electrical power is supplied.

RAM AIR TURBINE SELS ....GUARDED

Verify the RAM AIR TURBINE sels (2) are at OFF and guarded.

W/SHIELD EMERG DE-ICE sws ....OFF/GUARDED

Verify the W/SHIELD EMERG DE-ICE sws (2) are at OFF, guarded and fuse wire locked.

Circuit breakers ....SET

Verify all flight deck C/B's are set, unless collared.

NOTE: It is assumed, that after the initial circuit breakers check only one reset may be performed on any C/B.

TECHNICAL LOG .... CHECK

Examine the technical log. Observe that any items not required for dispatch are placarded appropriately.

GROUND POWER .... ON

Observe GRND PWR AVAILABLE lt (white) on.
Set ground power sw to CLOSE and release.
Observe general lighting up of panels.

NOTE

The SSB connects the left hand main a.c. system to the right hand main a.c. system. If the SSB is OPEN the ground supply is isolated from all except ground supply busbars.

Push MWS CANCEL pb and observe MWS lts go off.
Observe AC MAIN BUS lts are off.

Observe AC ESS BUS lts are off.

Observe DC MAIN BUS lt off and DC ESS BUS lts off.

Verify battery sels at BATT OFF
Observe battery MIs crossline and BATT ISOLATE lts (amber) on.
Observe DC ESS/MAIN split MIs inline.

EQUIPMENT BAY COOLING PANEL ....CHECK/SET

Observe FLOW lts are off.
Verify Fan 2 sel and Fans 1 and 3 sel at AUTO.
Observe Forward Extract Ml reads ON.

Verify Forward Supply Fans sel at NORM.
Observe LH and RH Supply Fan MIs read ON.

Verify Rear Extract LH and RH Fans sws at ON and Standby Fan sw at OFF.
Observe LH and RH Rear Extract Fan MIs read ON.

Verify Forward Emergency Relief Valve sw at SHUT and MI reads SHUT.
Observe Forward Flow Indicator reads 0.85 to 1.1 kgs/sec.
Observe Hydrualic Bay Fan MI reads ON.

(Completely Revised)

On the FORWARD EXTRACT panel

Set Fan 2 sel to OFF
Observe - Forward Extract MI reads OFF
- Flow lts remain OFF
- Flow Indicator reads 0.7 to 0.85 kgs/sec

Set Fans 1 and 3 sel to OFF
Observe - Flow lts on
- MWS AIR (amber) ON
- Flow Indicator reads zero

Set Fan 2 sel to AUTO
Observe - Flow Indicator reads 0.4 to 0.55
The Flow lts and MWS AIR may be on or off

Set fans 1 and 3 sel to AUTO
Observe - Forward Extract MI reads ON
- Flow lts OFF
- MWS AIR OFF

On the REAR EXTRACT panel
Set LH and RH fans to OFF
Observe - LH and RH MIs read OFF
- Flow lt ON
- MWS AIR (amber) ON

Set STANDBY fan to ON
Observe - Flow lt OFF
Set LH and RH fans to ON
Observe LH and RH MIs read ON
Set STANDBY fan to OFF

On the FORWARD EXTRACT panel
Set the FORWARD EMERGENCY RELIEF valve to OPEN
and observe MI reads OPEN
Set the FORWARD EMERGENCY RELIEF valve to SHUT
and observe MI reads SHUT

OXYGEN PANEL ....CHECK/SET

Observe THERAPEUT OPEN, EMERG and NORMAL lts off.
Observe PASSENGER SYSTEM EMERG MANUAL O/RIDE sw at
OFF and guarded.
Observe the dual pressure indicator pointers show
sufficient for flight plan and no failure flag visible.

NOTE
For minimum pressure required for the number
of passengers and flight time
See MEL 05-03-19

Observe PASSENGER supply pressure indicator pointer shows
approx. 40 psi and no failure flag visible.
Press and turn CREW SUPPLY rty sel to inline.
Observe CREW delivery pressure gauge pointer in green
arc.

(Completely Revised)

DRAIN MAST HEATERS .... CHECK/SET

Verify DRAIN MAST HTRS sels off.
Observe MAST 1 MAST 2 and MAST 3 lts. off.

Press and release MAST 1, MAST 2 and MAST 3 lts in turn.
Observe lts on while pressed.
Set DRAIN MAST HTRS sel 1 to the top ON position.
Observe MAST 1 lt off.
Press and release MAST 1 lt.
Observe lt remains off.
Repeat the lt off check for DRAIN MAST HTRS sel 1 at bottom ON position.
Repeat the actions for drain MAST HTRS sel 2.
Repeat the actions for DRAIN MAST HTRS sel 3.

Observe total air temperature

IF ... total air temperature above 0 deg C.
Set DRAIN MAST HTRS sels to OFF.

IF ... total air temperature below 0 deg C
Set DRAIN MAST HTRS sels to ON.

INS 1, 2 & 3 .... SELECT ALIGN, TEST & PRESENT POSITION

Set the mode rty sel on MSU 1, 2 and 3 to ALIGN.

NOTES

This portion of the pre-flight check may be done by one of the pilots to expedite the alignment process.

The airplane must not be towed or taxied during INS alignment.

Adjust DIM switch on INS data selector switch to desired intensity; check that INSERT switch is illuminated and FROM-TO indicates 01 on each module.

Test INS circuits status:

Press TEST switch; check that all INS lamps (except keyboard and clear lamps) illuminate, figure eight (8) appears in all digit positions of both data displays, directional letters (NS) appear in the left display, directional letters (EW) appear in the right display, and FROM-TO indicates 88. Also check that INS READY NAV and BAT lights on their respective INS mode selector modules illuminate.

Repeat test on each module.

(Completely Revised)

Check INS malfunctions:

Warn light on each control display module and BAT light on each mode selector module should be extinguished. Illumination of the BAT light (amber) on the control display modules during align mode indicated that battery power is operating normally.

Load INS Field Position Data:

Position data selector switch to POS.
Press keyboard switch for north (N2) or south (8S) latitude as required.
Press keyboard switches in sequence for present position latitude and observe correct latitude in left data display.
Press INSERT switch and observe loaded LAT ± 0.1' in left data display.
Press keyboard switch for east (6E) or west (W4) longitude as required.
Press keyboard switches in sequence for present position longitude and observe correct longitude in right data display. Press INSERT switch and observe insert light extinguish and new present position data, latitude and longitude, ± 0.1' appear in left and right data displays. Repeat for each INS module.

Record INS 3 displayed present position on flight engineer's flight log. Cross check recorded position with listed ramp position in the Aerodrome Folder.

AIR DATA COMPUTERS .... ON

Set ADC 1 sw to ON and verify ADC 1 rty sel at NORM.
Set ADC 2 sw to ON and verify ADC 2 rty sel at NORM.

IF ...the ADC 1 and/or ADC 2 lts (amber) on, when the flight instruments stabilise press to reset. Observe the ADC 1 and ADC 2 lts off.

COCKPIT EMERGENCY EQUIPMENT ....CHECK

Verify fire axe stowed and secure, and asbestos gloves, portable oxygen mask, portable oxygen pack, life jackets (5) and eyewash kit stowed.
Verify fire extinguisher stowed and secure.
Verify smoke goggles (3), safety torch and escape ropes (2) stowed.

FLIGHT ENGINEERS DOCUMENTATION STOWAGES ....CHECKED

Check the contents as the Flight Equipment Check List (Navigation Manual Sect 8.).

(Completely Revised)

FLIGHT ENGINEER'S COCKPIT PREPARATION (1)

Miscellaneous switches ....AS REQUIRED

Set F/D DOOR sw to OPEN.
Observe GRND CALL pb lt is off.
Set I/PHONE sw to NORMAL.
Observe STEWARD CALL lt is off.

Cabin signs Fasten seat belts/No smoking ....ON

Set FASTEN SEAT BELTS sw to ON. Verify NO SMKG sw to ON.

Emergency evacuation warning ....CHECK/ARM

Announce on PA that an evacuation test signal is being actuated and request the cabin crew to report the signal operation. Set EMERG EVAC sel to ON. Observe EMERG.EVAC. lt (red) flashing and audio (bleeper) Press the EMERG EVAC CANCEL pb. Observe the audio off.

Set the EMERG EVAC sel to ARM.

Lighting ....AS REQUIRED

Rotate the LIGHTING STORM, LIGHTING GLARESHIELD and LIGHTING CENTRE CONSOLE PANEL rty sel to the required position. Observe lighting as selected.

Servo Control Panel .... CHECK/SET

Observe - Black and Yellow rty sels are at NORMAL
- Blue Jam and Green Jam lights off.

Press the Blue Jam Test pb light.
Observe Blue Jam light (red) and MWS PFC (red) on.
Repeat, using Green Jam Test pb light.

Observe Green Low Pressure light (red) and Blue Low Pressure light (red) on.
Pull and rotate the Yellow rty sel towards the Blue Low Pressure light.
Observe - Yellow Blue pea lights (green) on.
- Green Only pea lights (green) on
- Green Low Pressure and Blue Low Pressure lights remain on.

Lift the guard and press the Yellow Level Test pb
Observe - Yellow Blue pea lights off
- Yellow Green pea lights (green) on

Pressing the Yellow Level Test pb with the Yellow rty sel away from Normal checks the first low level cut off of yellow supply to the selected system and the autochange to the non-selected system when low pressure exists in that system.

Release the Yellow Level Test pb
Observe - Yellow Blue pea lights (green) on
- Yellow Green pea lights off.

Pull and rotate the Yellow rty sel to Normal.
Observe - Yellow Blue pea lights off
- Green Only pea lights off.

Pull and rotate the Yellow rty sel towards the Green Low Pressure light
Observe - Yellow Green pea lights (green) on
- Blue Only pea lights (green) on.

Lift the guard and press the Yellow Level Test pb.
Observe - Yellow Green pea lights off
- Yellow Blue pea lights (green) on.

Release the Yellow Level Test pb.
Observe - Yellow Green pea lights (green) on
- Yellow Blue pea lights off.

Pull and rotate the Yellow rty sel to Normal.
Observe - Yellow Green pea lights off.
- Blue Only pea lights off.

(Completely Revised)

FLIGHT ENGINEER'S COCKPIT PREPARATION (2)

Lights .... AS REQUIRED

Set ROOF LIGHTS sw as required.
Set EMERG LIGHTS sel to ARM.
Observe flight deck Emergency Lights and EMERG LIGHTS sel light off.

IF ... flight deck Emergency Lights on, verify forward stewards panel EMERG LIGHTS sw at NORMAL.

Verify ANTI-COLLISION LIGHTS sw at OFF.
Set NAV LIGHTS as required.
Select and hold LIGHTS TEST sel to TEST.
Observe - on F/E's scan line (1), no lights illuminate.
- on F/E's scan line (2), Throttle Master sels lights on.
- on F/E's scan line (3), all lights on except Relay Jack lts.
- on F/E's scan line (4), only Fire Flaps light on.
- Transparency De-ice/Demist and Landing Lights Extended lts on.

Release LIGHTS TEST sel to HI or set to LO as required.
Observe lights return to system status.

Engine flight rating ....CLIMB

Verify ENG FLIGHT RATING sws at CLIMB.

Drain Mast heaters ....AS REQUIRED

Confirm DRAIN MAST HTRS sels as required.

Throttle masters..ON

Verify THROTTLE MASTER sels at MAIN or ALTERN
Observe sel lts off, THROT lts off.

NOTE

An intake mounted T1 (engine probe) supplies temperature information to the Main throttle control system of its own engine and to the Alternate throttle control system of the adjacent engine. Therefore it is recommended that the Main throttle control system is used for engine starting whenever all the engine temperatures are not the same.

Auto-ignition ....OFF

Verify AUTO IGNITION sws at OFF

Autothrottle ....ON

Verify AUTO THROTTLE sws at ON.

Engine rating mode ....TAKE OFF

Observe ENG RATING MODE sws at TAKE-OFF. T/O lt (white) on.

HP valves ....SHUT

Verify HP VALVE sws at SHUT and MIs read SHUT

Pressurisation static heaters ....OFF

Verify PRESS STATIC HEATERS sw 1 and sw 2 at OFF.

ADS/ENGINE PROBE HEATERS ....CHECK

Confirm ADS 1, and ADS 2, sels at OFF and STBY sw at OFF.

Observe all ADS/ENGINE PROBE HEATERS lts (yellow) on.

Lighting ....AS REQUIRED

Set LIGHTING CENTRE DASH, LIGHTING CENTRE CONSOLE FLOOD and LIGHTING ROOF rty sels as required and observe lighting as selected.

Engine anti-icing ....OFF

Verify ENGINE ANTI-ICING sws OFF and IGV PRESS lts off

Wing and intake anti-icing .... OFF

Verify WING & INTAKE ANTI-ICING rty sel MAIN OFF and ALTERN OFF.

Relay jack panel ....CHECK/TEST

Verify RELAY JACK sel at NORM.
Observe RELAY JACK BLUE lt and GREEN lt off.

Press to test BLUE TEST pb and observe BLUE JAM lt (red), and MWS PFC (red) on. Repeat test using GREEN TEST pb.

FUEL FWD TRANS sw ....GUARDED

Confirm FUEL FWD TRANS sw guarded.

Engine shut-down/fire controls ....CHECK

Observe engine shut-down handles fully in.
Observe SHOT 1 and SHOT 2 frangible discs intact.
Observe engine shut-down handles filaments off.

Observe FIRE FLAPS lt off.

NO.1 AUTOSTABS ....CHECK

Verify that the No. 1 Autostabs will latch at the engage position. This confirms that the EMERGENCY CONTROLS pb is not in the engaged position.

FLIGHT ENGINEER'S COCKPIT PREPARATION 5 6

Engine Starting Panel .... SET

Verify START/RELIGHT sels at OFF.
Observe START VALVE MIs read SHUT.
Verify ENGINE DEBOW sws at NORMAL
Observe DEBOW sw lts off.
Verify ignition rty sel at BOTH or LH or RH.
Observe LH IGN and RH IGN lts off.
Verify EMERG RELIGHT BUSBARS rty sel at OFF.

INS 1 MSU ....ALIGN

Observe INS 1 MSU rty sel at ALIGN, BAT lt off and READY NAV lt off unless status 5 reached on INS 1.

Fire sensors/Flame sensors ....BOTH

Verify FIRE SENSORS sels at BOTH and FIRE SENSOR lts off

Verify FLAME SENSOR sels at BOTH. and FLAME SENSOR lts off.

Intake diagnosis ....CHECK

Verify the INTAKE TEST master sw guarded at OFF

Hold the INTAKE TEST RESET sw at RESET momentarily then release
Observe intake test lights, ON,GO, N1 REQD, G/Y REQD,HOLD, FAIL, and B/Y REQD off.
Observe the fault identification lts N11, N12, N13 and N14 (yellow) on.

NOTE

The fault identification lights are used to identify line replacement units (LRU) in the air intake control systems when they have failed. The lights indicate failure during test or normal operation of the intakes. When electrical power is removed from the air intake systems random indications of failure may be latched on. When electrical power is re-established, momentarily selecting RESET resets the system and removes false warnings from the panel.

CAUTION

The intake test master switch must not be moved from its guarded OFF position in flight.

Fuel vent ....TEST

Observe FUEL VENT ignition protection MI reads FULL.
Press and hold FUEL VENT TEST pb
Observe MI reads DIS.
Release FUEL VENT TEST pb
Observe MI reads FULL.

(Unchanged)

LIMIT RESET pb ....PRESS

Press the LIMIT RESET pb
Observe the N2, N1, and fuel tank pressure pointers are reset.

Air cond. test ....OFF

Verify AIR COND TEST sw and AIR COND TEST rty sel both at OFF.

INS 3 MSU ....ALIGN

Observe INS 3 MSU rty sel at ALIGN, BAT lt OFF and READY NAV lt off unless status 5 reached on INS 3.

Oxygen (mask) ....CHECK

On the associated audio selector panel set RT/INT sw to INT.
Press INT pb lt.
Observe INT pb lt (white) on.
Rotate BOOM/MASK rty sel to MASK and don headset.
On mask stowage panel;
Observe blinker indicator shows black.
Push down and hold RESET/TEST slide control at TEST.
Observe blinker indicator shows yellow cross, then shows black.
With RESET/TEST slide control still held at TEST, squeeze the red levers.
Observe blinker indicator shows yellow cross, then shows black.
With RESET/TEST slide control still held at TEST, verify N/100% sw at 100%.
Press, momentarily, TEST pb
Observe the sound of oxygen flowing over the mask microphone.
Release RESET/TEST slide control and verify white area not visible
Observe blinker indicator shows black.
On the associated audio selector panel, rotate BOOM/MASK rty sel to BOOM. Remove headset.

Artificial feel ....CHECK

Set the ARTIFICIAL FEEL No 1 PITCH, ROLL and YAW sws to engage.
Move the guard and press to test the ARTIFICIAL FEEL TEST 1 pb. Observe ARTIFICIAL FEEL No. 1 PITCH, ROLL and YAW sws drop to OFF, MWS FEEL lt (red) on.

Repeat the test for ARTIFICIAL FEEL No. 2.

INTERPHONE ....FLIGHT

Verify SERVICE I/PHONE sw at FLIGHT

RAT ....CHECK/TEST

Observe RAT lt off.
Verify RAM AIR TURBINE sels (2) at OFF, guarded and wire locked.

Set and hold left hand RAM AIR TURBINE sel to TEST and observe TEST lt (blue) on.

Release left hand RAM AIR TURBINE sel.
Observe TEST lt is off.

Repeat the last two actions, using the right hand RAM AIR TURBINE sel.

A.I.C.S. GROUND/FLIGHT sws (4) ....FLIGHT

Verify AICS GROUND/FLIGHT sws (4) at FLIGHT and guarded.

Cyclic and continuous icing ....CHECK

Observe CYCLIC lts (2) off, digital indicators LEFT and RIGHT read 00, indicators 1 through 20 left hand are off and indicators 1 through 20 right hand are off.

Door warning lights ....CHECK

Observe DOOR SW FAULT lt is off.

INS 2 MSU ....ALIGN

Observe INS 2 MSU rty sel at ALIGN, BAT lt off and READY NAV lt off unless status 5 is reached in INS 2.

Audio selector panel ....SET

Verify BOOM SET is connected on the flight engineer's JACK BOX.
On the flight engineer's audio panel, press INT pb lt.
Observe INT pb lt (white) on.
Verify BOOM/MASK sw set at BOOM; set RT/INT sel to OFF.

(Unchar

L/G Fault annunciator ....CHECK

Observe LANDING GEAR FAULT ANNUNCIATOR lts off.

NOTE

The landing gear fault annunciator lights are not energized when the L/GEAR lever is set to DOWN.

FLIGHT ENGINEER'S COCKPIT PREPARATION (8)

Jack box ....CHECK

Observe condition.

AIDS ....CHECKED/SET

Observe FAULT light on
Confirm Fault Ident Selector at SYS
Hold the Test switch to ON, then release:-

Observe - FAULT light off and Flight Data Recorder MI black
- on release, FAULT light on and MI yellow.

IF......FAULT light remains illuminated on test,
- hold the Test switch at ON
- rotate the Fault Ident selector to each position in turn

When each unit is tested, the FAULT light will be on if a fault is detected or off if the unit is serviceable.

Press the CLEAR MEMORY key to clear any previously recorded exceedances.

Set the date code and date into the memory as follows:-

- clear the displays by pressing the CLEAR Key
- key in the date code 1001
- key in the day and month, e.g. 1606 for 16th June
- observe code and date in LH and RH displays respectively
- press the INSERT key

The data will be transferred from the memory to the tape when the recorder runs.

Compass ....SET

Verify No.1 and No.2 DG MAG mode sels set at MAG.
Observe monitor lts off, annunciators centred.

Oxygen panel ....CHECK

Confirm CREW SUPPLY rty sel at inline.

Contued ....

NOZ. AIR SOV & WIND DOWN TEST ....CHECK/OFF

Verify ENG 1 & 4 and ENG 2 & 3 NOZ AIR SOV & WIND DOWN TEST rty sels at OFF.

Observe REV lts (4) off and WIND DOWN lts (4) off
Advance the throttle levers (4) to their mid-travel position
Attempt to raise the reverse thrust levers (4).

NOTE
With the throttle levers away from the idle position it should not be possible to raise the reverse thrust levers because of a mechanical interlock.

Rotate ENG 1 & 4 and ENG 2 & 3 rty sels to A
Observe REV lts (4)(blue) on and WIND DOWN lts (4) off.

Rotate ENG 1 & 4 and ENG 2 & 3 rty sels to B
Observe REV lts (4)(blue) on and WIND DOWN lts (4)(yellow) on

Rotate ENG 1 & 4 and ENG 2 & 3 rty sels to C
Observe REV lts (4)(blue) flash and WIND DOWN lts (4) off

Retard the throttle levers (4) to idle
Rotate ENG 1 & 4 and ENG 2 & 3 rty sels to B
Observe REV lts (4)(blue) on and WIND DOWN lts (4) off

Lift the reverse thrust levers (4) to their mid travel position
Rotate ENG 1 & 4 and ENG 2 & 3 rty sels to OFF
Observe REV lts (4) off WIND DOWN lts (4) (yellow) on.

Push the reverse thrust levers (4) fully down.
Observe WIND DOWN lts (4) off.

Eng O/heat ....TEST

Rotate ENG O/HEAT TEST rty sel to F1.
Observe ENGINE O/HEAT lts (4)(red) and MWS ENG lts (4)(red) and (4)(amber) on and audio (gong).

NOTE
Whenever the ENG O/HEAT rty sel is moved to or from a "flame" position the FLAME SENSOR lights will flash momentarily.

Rotate ENG O/HEAT TEST rty sel to position between F1 and F2.
Observe, after 5 seconds, ENGINE O/HEAT lts (4) and MWS ENG lts (8) off.

Rotate ENG O/HEAT TEST rty sel to F2.
Observe ENGINE O/HEAT lts (4)(red) and MWS ENG lts (4) (red) and (4)(amber) on and audio (gong).

(Unchanged)

Rotate ENG O/HEAT TEST rty sel to position between F2 and F3.
Observe, after 5 seconds, ENGINE O/HEAT lts (4) and MWS ENG lts (8) off.

Rotate ENG O/HEAT TEST rty sel to F3.
Observe ENGINE O/HEAT lt (4) (red) and MWS ENG red (4) and amber (4) on.

Rotate ENG O/HEAT rty sel to reset.
Observe ENGINE O/HEAT lts (4) and MWS ENG lts (8) off.

Rotate ENG O/HEAT rty sel to OFF.

Fire and nac. o/heat ....TEST

Rotate FIRE & NAC O/HEAT TEST rty sel to O/HEAT.
Observe NAC/WING lt (4)(amber) and MWS ENG amber (4) on.

NOTE
There is no means of testing the wing overheat detection systems.

Rotate FIRE & NAC O/HEAT TEST rty sel to FAULT A.
Observe FIRE SENSOR lts (4)(amber) and MWS ENG amber (4) on

Set FIRE SENSORS sels (4) to B.
Observe FIRE SENSOR lts (4) and MWS ENG lts (4) off.

Rotate FIRE & NAC O/HEAT TEST rty sel to FAULT B.
Observe FIRE SENSOR lts (4)(amber) and MWS ENG amber (4) on

Set FIRE SENSORS sels (4) to A.
Observe FIRE SENSOR lts (4) and MWS ENG lts (4) off.

Set FIRE SENSORS sels (4) to BOTH.
Observe FIRE SENSOR lts (4)(amber) and MWS ENG amber (4) on

(Deletion)

Rotate FIRE & NAC O/HEAT TEST rty sel to FIRE 1
Observe FIRE SENSOR lts off, No.1 engine shut down handle lts (2)(red) flashing, MWS ENG 1 (red) on, and distinctive fire audio (bell).

Rotate FIRE & NAC O/HEAT TEST rty sel to FIRE 2.

Observe FIRE SENSOR lts off, No.2 engine shut down handle lts (2)(red) flashing, MWS ENG 2 (red) on and distinctive fire audio (bell); No. 1 engine shut down lts (2) and MWS ENG 1 off.

Repeat the last test to test FIRE 3 and FIRE 4.

Rotate FIRE & NAC O/HEAT TEST rty sel to OFF.
Observe No.4 engine shut down handle lts (2) and MWS ENG 4 off.

AFCS ....CHECK

Verify IFM/OFF/TEST sels 1 and 2 set at OFF.

Set IFM/OFF/TEST sels 1 and 2 to IFM.
Observe that after 40 secs all indicators show blank.

Verify FLIGHT/TEST ALL/TEST UNIT sel at FLIGHT.

NOTE

ITEM will display any AFCS failures detected but will memorise them only if they occur after take-off. If a failure occurs before take-off and the crew wish it to be memorised the TEST IFM INDICATOR pb lts (2) must be pressed. ITEM will then memorise the displayed fault and any subsequent faults.

Fire ext. pressure cartridge ....CHECK

Verify FIRE EXT PRESSURE CARTRIDGE TEST rty sel at NORM.
Observe MIs (4) read FULL.
Rotate rty sel to FIRST SHOT.
Observe MIs (4) read DIS.
Rotate rty sel to NORM.
Observe MIs (4) read FULL.
Rotate rty sel to SECOND SHOT.
Observe MIs (4) read DIS.
Rotate rty sel to NORM.
Observe MIs (4) read FULL.

Smoke detection ....CHECK

Verify SMOKE CABIN AND FREIGHT HOLD rty sel at NORM
Observe SMOKE A,B,C,D,E,F,G,H,J and K lts off.
Verify AIR GENERATION rty sel at NORM
Observe SMOKE 1,2,3 and 4 lts off
FAULT 1,2,3 and 4 lts off
MWS SMOKE lt off.

(Deletion)

Cockpit voice recorder ....CHECK

Press the TEST pb
Observe indicator needle deflects into the green band.

Ground hydraulic check-out panel .... OFF/YELLOW YELLOW

Verify PUMP 1 G-Y and PUMP 2 B-Y sws at off.
Verify rty sel is set to YELLOW YELLOW.

Clock .... SET

To adjust the GMT display,
- set the Timer/Chro switch to CHRO
- set the GMT sel. to FAST or SLOW as required.
When the correct time is established,
- set the GMT sel. to RUN.

To set a countdown time in the Chrono display,
- set the Timer/Chro switch to TIMER
- set the GMT sel. to FAST or SLOW as required.
When the countdown time in mins & secs is established,
- set the GMT sel. to RUN.

Verify correct GMT set.
Verify Timer/Chro sw at CHRO.
The Flight Engineer's clock is used as a conventional stop clock for take-off in order to time Contingency, Take-off and reheated Climb ratings.

Flight data recorder .... CHECK

Observe FLT DATA REC MI shows yellow.

Fwd Lights .... TEST

Select and hold the Fwd Lights sel to TEST. Observe on the forward section of the Flight Engineers panel, all warning lights on. Release to HI or LO.

Brakes accumulator .... AS REQUIRED

Observe brakes accumulator pressure gauge reading 3000 PSI minimum and no flag visible.

Brakes overload .... CHECK

Observe BRAKES OVERLOAD MI shows black.

Brake fans .... AS REQUIRED

Verify BRAKE FANS sw as required.

Brakes temperature .... TEST

Press and hold BRAKES TEMP TEST pb.
Observe BRAKES TEMP gauge reads approx 270 deg C, 1,2,3, and 4 FWD and REAR lts (red) on and WHEELS O/HEAT lt (red) on.
Release BRAKES TEMP TEST pb.

Intake pressure ratio error ....CHECK

Observe INTAKE PRESSURE RATIO ERROR instruments pointers vertical between amber bands.

Intake panel ....SET

Verify the RAMP/SPILL MASTER sws at MAN
Observe INTAKE lts (red) on and all other AIR INTAKES panel lts off.
Verify LANE rty sels at AUTO A or AUTO B position as required for the flight.
Verify HYD sels at AUTO.
Observe AUX INLET MIs agree with the position of the auxiliary inlet vane observed during the external check.
Observe RAMP indicators pointers at 0%, RAMP inching sws at centre position, SPILL indicators pointers at 0% and SPILL inching sws at centre position.

Cabin pressure control ....CHECK/TEST

Verify GROUND PRESSURE RELIEF VALVE sel at AUTO
Observe GROUND PRESSURE VALVE MI reads OPEN.
Verify SYSTEM SELECT sws as required, DISCHARGE VALVES SYS 1 and SYS 2 sels at NORM, DITCHING VALVES SYS 1 AND SYS 2 sws at NORM and guarded and EMERGY DEPRESS sel at NORM and guarded.

Observe THRUST RECUPERATOR MI reads OFF, and AIR VENTS HYD MI reads OPEN.

Press to test EXCESS ALT lt.
Observe EXCESS ALT lt (red) on, MWS PRESS (red) on and intermittent horn.

Observe cabin altitude indicator pointer indicates correct airfield pressure altitude.
Observe cabin differential indicator pointer indicates 0.
Press to test O/PRESS lt.
Observe O/PRESS lt (red) on, MWS PRESS (red) on.

On system 1 cabin alt sel, rotate knob B to set cursor at 1013 mb and rotate knob A to set cabin altitude to that required. Verify altitude shown in lower window is higher than the highest flight level planned for the cruise.
Rotate knob R to set cabin rate of climb; white dot is approx 400 ft/min.
Repeat action, using system 2 cabin alt sel.

(Deletion)

Observe SYS 1 and SYS 2 discharge valves position indicators FWD and AFT at open.
Set DISCHARGE VALVES SYS 1 and SYS 2 sels to FWD SHUT.
Observe SYS 1 and SYS 2 FWD discharge valves position indicators move towards SHUT.
Set DISCHARGE VALVES SYS 1 and SYS 2 sels to NORM.
Observe SYS 1 and SYS 2 discharge valves position indicators FWD and AFT at OPEN.
Repeat actions with DISCHARGE VALVES SYS 1 and SYS 2 at AFT SHUT.

Observe cabin rate of climb indicator reads 0.

Engine warning lights .... TEST

Observe ENGINE O/HEAT lts (4), START PUMP lts (4), WIND DOWN lts (4), REHEAT lts (4) and NAC/WING O/HEAT lts (4) off.
Press to test FUEL FILTER lts (4), one at a time
Observe FUEL FILTER lts (amber) on, MWS ENG (amber) on.

Fuel heaters .... AUTO

Verify FUEL HEATERS sels (4) at AUTO.

Engine recirculation valves .... SHUT

Verify ENGINE RECIRCULATION VALVES sws (4) at SHUT.

Take-off CG sw .... NORMAL

Verify that the Take-Off CG sw is at NORMAL and is guarded.

ENG 4 T/O N1 limiter sw .... NORMAL

Set the ENG 4 T/O N1 LIMITER sw to NORMAL

GRD IDLE sws .... HI

Set the ENG 1 & 4 and ENG 2 & 3 sws to HI

Engine control schedule .... SET

Set the ENGINE CONTROL SCHEDULE sel to AUTO and the rty sel to FLYOVER (F/O) or NORMAL.
Observe the ENGINE CONTROL SCHEDULE LO lts (4) (green) on.

NOTE
FLYOVER (F/O) is selected for noise abatement take-off and NORM if noise abatement is not required.

Secondary air doors .... SHUT

Verify SECONDARY AIR DOORS sels (4) at SHUT.
Observe secondary air door MIs (4) read SHUT.

(Unchanged)

Secondary nozzle .... CHECK

Observe SECONDARY NOZZLE instruments (4) for condition.

Flight rev arm .... OFF

Observe FLIGHT ARM OPEN lt off.

Nozzle angle scheduling unit test sel .... NORMAL

Verify NASU test sel at NORMAL.
Observe NOZZLE light off.

Flight instruments .... CHECK

Observe for correct repetition of readings on pilots panels.

Engine instruments .... CHECK

Observe TCA TEMP pointers (4) at sensible values and high TCA TEMP lts (4) off.
Observe FUEL TEMP pointers indicate sensible values and high FUEL TEMP Lts (4) off.
Observe OIL ENG pointers (4) indicate 0 psi and low OIL ENG lts (4) (red) on.
Observe OIL TEMP pointers (4) show sensible values and high OIL TEMP lts (4) off.
Observe OIL CONT pointers (4) show sensible values and high OIL CONT lts (4) off.
Observe P7 pointers show sensible values and agree with their lower digital counters. No warning flag visible across lower digital counters.

Engine vibration .... ON/TEST

Press and release MWS CANCEL pb.
Observe MWS warning lts off.
Verify ENGINE VIBRATION sel at SUPPLY 1 and FRONT/REAR sws (4) at FRONT.
Observe ENGINE VIBRATION lts (8) off and ENGINE VIBRATION instrument pointers at 0.

PRESS VIBRATION INDICATOR TEST pb.
Hold ENGINE VIBRATION TEST sel at Test.
Observe - engine vibration lts (4) (white) and (4) (amber) on.
- engine vibration instrument pointers (4) move to top of scale
- MWS ENG (4) (amber) on.

Release VIBRATION INDICATOR TEST pb.
Set ENGINE VIBRATION TEST sel to RESET and release.
Observe - engine vibration lts (8) off
- engine vibration instrument pointers (4) at 0
- MWS ENG (4) off

The above procedure tests both the 5 ins/sec and the 10 ins/sec warnings

Set ENGINE VIBRATION sel to SUPPLY 2
SET FRONT/REAR sws (4) to REAR
Press VIBRATION INDICATOR TEST pb
Hold ENGINE VIBRATION TEST sel at TEST
Observe - engine vibration lts (4) (amber) on
- engine vibration instrument pointers (4) above 4 ins/sec
- MWS ENG (4) (amber) on.

Release VIBRATION INDICATOR TEST pb.
Set ENGINE VIBRATION TEST sel to RESET and release
Observe - engine vibration lts (4) off
- engine vibration instrument pointers (4) at 0
- MWS ENG (4) off.
Set FRONT/REAR sws (4) to FRONT.

The FRONT/REAR sws should be set to the FRONT position except when specifically checking rear vibration levels.

The appropriate front bearing or jetpipe warning light will always appear whenever the associated level of vibration is exceeded irrespective of the FRONT/REAR switch setting.

A front vibration level between 2.5 and 5 ins/sec or a front vibration showing a sustained increase of more than 1 in/sec must be reported.

Warning test (engine instruments) .... CHECK

Press to test OIL TEMP WARNING TEST pb.
Observe OIL TEMP instruments warning lt (amber) on and MWS ENG ambers on.

Press to test FUEL TEMP WARNING TEST pb.
Observe FUEL TEMP instruments warning lts (amber) on, and MWS ENG ambers on.

Air bleed control panel ....CHECK/SET

Observe DUCT lts, FUEL EXCH lts, SEC EXCH lts, PRIM EXCH lts and OVER PRESS lts off.

Set BLEED VALVES sws to OPEN. Press to test the OVER PRESS lts in turn.
Observe OVER PRESS lt (amber) on, MWS AIR lt (amber) on.

Observe BLEED VALVES MIs (4) show crossline.
Observe bleed pressure gauges (4) read 0 approx.
Set BLEED VALVES sws to SHUT.

Set 2 and 3 CROSS BLEED Sws. to OPEN.
Verify 1 and 4 CROSS BLEED sws. at SHUT.
Verify CROSS BLEED MIs show crossline
Verify COND VALVE sels at OFF.
Observe COND VALVE MIs show crossline.

Observe JET PUMP MIs show crossline and RAM AIR MIs show inline.

Observe FUEL VALVE sels are at AUTO and guarded and FUEL VALVE MIs show inline or crossline.

NOTE

On the ground, any valve may be in either position, depending upon the respective fuel and air temperatures.

Observe TEMP VALVE position indicators (4) read C approx.

Equipment bay cooling panel ....SET

Confirm sws and sels set.

Fuel management panel ....CHECK/SET

Observe M lt (amber), U/FULL lts (yellow) and LOW LEVEL lts (amber) on or off, "ENGINE FEED PUMPS" "LOW PRESS" lts (yellow) on, ACC lts (yellow) on, engine inlet LOW PRESS lts (amber) on or off and all other indication lts off.

Observe REFUEL MI reads GRD.

Observe FQI for tanks 1 to 8 inclusive show failure flags.

Observe the digital indicators on the FQI for tanks 9, 10 and 11 are obscured by black flags.

Verify tank 9 INLET VALVE MAIN sels at AUTO and O/RIDE sels at OFF.
Observe tank 9 INLET VALVE MIs show crossline.
Verify tank 9 PUMP sels at AUTO.
Verify tank 10 DE-AIR sw at OFF.
Observe DE-AIR MI reads OFF.
Set tanks 9 & 10 load limit control to zero.
Verify tank 10 PUMP sels at AUTO.

(Unchanged)

Verify FQI test rty sel at OFF. Observe on CG & CG indicator, cg limit bugs FWD and AFT are at approximately 51.8% and 53.8%. Flag visible on M selection whilst refuelling. Verify CG channel rty sel at M.

Verify TANKS 1 & 4 sw at NORM.
Observe TANKS 1 & 4 MI reads NORM.

Observe no failure flags visible on TOTAL CONTENTS indicator.

NOTE

The TOTAL CONTENTS indicator will be increasing during refuelling but the apparent rate will be incorrect as only the fuel flowing into tanks 9,10 and 11 is indicated.

Verify TOTAL FUEL REM and A/C WEIGHT rty sel at N. Press and hold left hand knob.
Observe TOTAL FUEL REM digital indicators (4) read 8s and A/C WEIGHT digital indicators (5) read 8s. Release the left hand knob.

Verify tank 11 INLET VALVES MAIN sel (2) at AUTO and OVERRIDE sels (2) at OFF.
Observe tank 11 right hand inlet valve MI shows crossline and left hand inlet valve MI shows in accordance with refuelling.

NOTE

During refuelling the tank 11 left hand inlet valve is used as a refuelling valve and controlled by a switch on the refuel control panel.

Verify tank 11 PUMP GREEN sel and PUMP BLUE sel at AUTO
Verify tank 11 left and right hand PUMPS sels at AUTO.
Verify tank 11 DE-AIR sw at OFF.

Observe tanks 1,2,3 and 4 jettison valve MIs show crossline.
Observe JETTISON MASTER VALVES MIs (2) show crossline.

Set FUEL TEMP rty sel to positions 2, 3 and 4 in turn and return to 1.
Observe fuel temperature indications for TANK and ENG show sensible readings at each position.

NOTES

Each numbered position refers to the fuel feed system of the selected engine.
TANK indicates the temperature of the fuel upstream of the air conditioning and hydraulic heat exchangers i.e. the tank temperature.

ENG indicates the temperature downstream of these heat exchangers i.e. the engine inlet temperature.

Verify tanks 5,6,1,2,3,4,10,7 and 8 STANDBY INLET VALVES sws at SHUT.
Observe tanks 1,2,3,4 and 10 STANDBY INLET VALVES MIs (5) read in accordance with refuelling.

NOTE

During refuelling the standby inlet valves are used as refuelling valves and are controlled by switches on the refuel control panel.

Verify the FUEL LP PROTECTION sw at ARMED.
Observe the HYD/COND FUEL EXCH BY-PASS MIs (4) show black or read OPEN.

Verify tank 5A PUMPS sws (2) and tank 7A PUMPS sws (2) at OFF.

Verify TRIM PIPE DRAIN sw at SHUT.
Observe LH and RH MIs read SHUT.
Observe SCAVENGE PUMP MI reads ON or OFF.

NOTE

During refuelling, the scavenge pump may or may not be operating.

Verify TRANS VALVE 5A-5 sw and TRANS VALVE 7A-7 sw at SHUT.
Observe TRANS VALVE 5A-5 MI and TRANS VALVE 7A-7 MI show crossline.
Verify tank 5 and tank 7 PUMPS sel at OFF and guarded and tank 5 and tank 7 PUMPS sw at OFF.

Verify tank 5 and tank 7 INLET VALVE MAIN sel at AUTO and O/RIDE sel at OFF.
Observe tank 5 and tank 7 INLET VALVE MI show crossline.

Verify tank 6 and tank 8 PUMPS sws (2) at OFF.

Verify INTER-CON VALVE (6-7) sw and INTER-CON VALVE (5-8) sw at SHUT.
Observe INTER-CON VALVE MIs read SHUT.

Verify ENGINE FEED PUMPS sws (12) at OFF.
Verify engine LP VALVE sels (4) at OPEN and guarded.
Observe LP VALVE MIs show inline and pea lts off.

Verify engine CROSSFEED sty sels (4) are crossline.

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Observe CROSSFEED MIs show crossline.

Pull, turn anti-clockwise and release the number 1 engine FUEL CONSUMED indicator reset/test knob.
Observe the digital indicator reads 0 at the least significant figure and blanks in the other spaces.
Repeat for engines 2,3 and 4.

Press to test, in turn, the LEAK lts (4).
Observe the LEAK lt (red) on, MWS ENG 1 (2,3 and 4) lt (red) on.

Observe, on TANK PRESSURE gauge, no failure flag is visible.

Temperature control panel .... CHECK/SET

Observe LEAK lts (4) off.
Observe CAU IN temp gauges (4) and DUCT temp gauges (4) show sensible readings.
Observe MASS FLOW gauges (4) are indicating 0.

Observe GROUP 1 sw at ON and guarded and group 1 MI shows a vertical line from group 1 to FLIGHT DECK.
Observe GROUP 2 sw at ON and guarded and group 2 MI shows a line from Group 2 to FWD CABIN.
Observe GROUP 3 or 4 sw at ON and guarded and group 3 or 4 MI shows a line from group 3 to REAR CABIN.
Observe COMPARATOR lt is off and that FLIGHT DECK, FWD CABIN and REAR CABIN temps show sensible readings.

Rotate group 1 temperature sel to AUTO and NORMAL and repeat for groups 2,3 and 4.

Hydraulic management panel ....CHECK/SET

Observe green system, yellow system and blue system reservoirs L/PRESS lts off.

CAUTION
To prevent cavitation of the engine-driven hydraulic pumps the three reservoirs must be pressurized.

IF ...one or more L/PRESS lt(s) (yellow) on
Press AIR COMP pb.

NOTE
One cycle of the air compressor is normally sufficient to pressurize the three reservoirs.

CAUTION
After operating the air compressor twice, wait 10 minutes cooling time before operating again.

Observe green, yellow and blue system O/HEAT lts and

L/LEVEL lts off.

Observe on the GREEN, YELLOW and BLUE system reservoir contents gauges that the pointer indicates within the green bands and no failure flags are visible.

Observe the SHUT OFF VALVES MIs (6) read OPEN.

Set the green system pump sels 1 and 2 and blue system pump sels 3 and 4 to OFF.
Observe the guard against SHUT is wirelocked and PUMPS MIs read OFF.
Observe yellow system pump sels 2 and 4 at AUTO, guarded and yellow system PUMPS MIs read ON.

Observe HYD TEMP indication is in normal range on a selected reservoir.

NOTE

Normal hydraulic temperature range is below 60 deg C but may be up to 90 deg C on short transit.

Repeat temperature check for the other two reservoirs using the HYD TEMP rty sel.
Observe hyd pump L/PRESS lts (6)(amber) are on.

Observe GREEN, YELLOW and BLUE systems pressure gauges, pointers at 0 and no failure flags visible.

Observe YELLOW PUMPS sw is at NORM and guarded.

Electrics panel ....CHECK/SET

Observe CSD high inlet temperature lts (4) off and no failure flags visible.
Observe CSD disconnect sws (4) at NORM, guarded and locked.

NOTE

If a CSD has been disconnected, it can be reset only on the ground with the engine stopped. Thus, if a switch is not at NORM a, ground engineer check must be made before engine start.

Observe CSD lts (4)(amber) on.
Observe KW KVAR Meters (4) condition and reading 0.

Verify generator sels (4) at ON.
Observe generator control breaker MIs(4) show crossline.
Observe GEN lts (4) (amber) on.

Observe AC MAIN BUS lts (4) off.

Verify the parallel PUSH TO ARM pb lt is in the disarmed position.
Verify BTB sels (4) at NORM and guarded.
Cbserve BTB MIs (4) show inline.

(Completely Revised)

Observe the SSB MI shows inline.

NOTE

The SSB must be closed or no supply will be available to the cockpit.

Observe ess main isolate MIs shown inline.
Observe AC ESS BUS lts (4) off.

Verify EMERG GEN isolate sw at NORM and guarded.

NOTE

The NORM position arms the emergency generator for subsequent automatic operation.

Verify EMERG GEN control sel at AUTO.
Observe O/HEAT lt off
Observe EMERG GEN SELECTED lt and EMERG GEN FAIL lt off
Observe EMERG GEN KVA meter condition and indicating 0.

Observe auto shed breaker MI shows crossline.
Observe No.1,2,3 and 4 d.c. ammeters indicate loads.

NOTE

The four TRUs are identical. The d.c. busbars supplied by them are normally connected together but the TRU ammeter readings may differ.

Observe ess main split MIs (2) show inline.
Observe DC ESS BUS lts (2) off.
Observe DC MAIN BUS lt off

Set the left hand battery sel to BATT ON, then to BATT OFF.
Observe BATT ISOLATE lt (amber) on, MWS ELEC lt (amber) on.

NOTE

This tests the BATT ISOLATE light and its connection to the master warning system.

Repeat this test for the right hand battery sel.

Verify GEN 1 & 3 and GEN 2 & 4 GALLEYS sws (2) at ON.
Verify WATER HTRS sw at ON.

Centre & Aft Lights ....TEST

Select and hold, in turn, the Centre Lights and Aft Lights sel to TEST.
Observe, on the associated section of the Flight Engineers panel, all warning lights on.
Release sels to HI or LO as required.
Observe lights return to system status.

Radiation meter .... TEST

On radiation indicator.
Observe no flag visible, pointer at a low reading and no warning lts on.

Press and hold TEST pb.
Observe pointer moves into red sector, amber lt on at 10, red on at 50, MWS RAD'N (red) on at 50, and millerems counter display operates.

NOTE

It may be necessary to hold the TEST pb in the pressed position for nearly a minute to activate the counter display.

Release TEST pb.
Observe pointer returns to a low reading, red lt off at 50, MWS RAD'N off at 50 and amber off at 10.
Record millirems reading shown on counter.

Fuel management (refuelling completed)........................ CHECK/SET

Observe REFUEL MI reads FLT.

Observe standby inlet valves MIs for tanks 1,2,3,4 and 10 read SHUT.

NOTE

Once refuelling is complete and the REFUEL MASTER selector is set to OFF/DEFUEL, control of all the standby inlet valves reverts to the STANDBY INLET VALVES switches.

Observe SCAVENGE PUMP MI does not read ON permanently.

NOTE

The scavenge pump may be running due to normal leakage of fuel into the vent system. The MI must be monitored to ensure that the pump switches off at intervals.

Rotate the FQI test rty sel to GAUGES.
Set and hold the FQI test sel to TEST.
Observe that quantity indications increase, for tank 11 by 3000 kg, for tanks 9,10,5,6,7 and 8 by 500 kg, for tanks 5A,7A,1,2,3 and 4 by 200 kg and TOTAL CONTENTS indication increases by approximately 7200 kg.
The CG% CO indicators (2) show approx. 1% aft movement.
The CG% CO indicator lights (red) on
The CG digital display shows approx 1% aft movement.
The machmeter (2) bugs move such that the AFT bug comes on scale and the FWD bug shows a higher Mach number.

(Complete, Revised)

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NOTE

If the actual CG is forward of 52.7% the Machmeter AFT bug will not come on scale.
If the actual CG is aft of 53% then it is likely that the aft CG movement indication will activate the aft normal boundary warning i.e. the M/CG lts (red) on,
the CG indicator pea lts (red) on and
the MWS M/CG (red) on.
If the CG movement is insufficient to activate the warnings, the warnings may be activated by adjusting the ZFCG selector.

Release the FQI test sel.
Observe the FQI and c.g. indications return to their original readings and all warning lts off.

Rotate the FQI test rty sel to MIN A, set and hold the FQI test sels to TEST.
Observe the appropriate 9,10 and 11 lts (yellow) on.
Set the FQI test sel to CANCEL and release.
Observe the 9,10 and 11 lts off.
Repeat the last two actions for MAX A, MAX B and MIN B.

Rotate the FQI test rty sel to 1 CG.
Rotate the CG channel rty sel to 1.
Set and hold the FQI test sel to TEST
Observe CG channel 1 lt (amber) on, MWS CG (amber) on and channel A 11 lt (yellow) on. (channel A 9 and 10 lts (yellow) may also be on).
Tanks 1, 2, 5, 5A and 6 contents indication increases.
The CG digital display shows approx 1% aft movement.
On captain's and first officer's machmeters the CG failure flag is visible and the bugs move as in the GAUGES test.
On captain's and flight engineer's CG% Co indicators failure flag visible,
Rotate the FQI test rty sel to MAX A.
Set the FQI test sel to CANCEL and release
Observe CG channel 1 lt off and channel A,9,10 and 11 lts off
Observe the FQI and c.g. indications return to their original readings and all warning lts off.
On captain's and first officer's machmeters CG flag not visible and bugs return to their original position.
On captain's and flight engineers' CG% Co indicator no failure flags.

(Deletion)

Repeat the test with FQI test rty sel at 2CG for CG channel 2, CG channel rty sel at 2 and with reference to tanks 4,3,7,7A and 8.

Rotate the FQI test rty sel to MIN B.
Set the FQI test sel to CANCEL and release.

Rotate the FQI test rty sel to FIL CG, set and hold the FQI test sel to TEST.
Observe the c.g. display reads 88.8.
Release the FQI test sel and rotate the FQI test rty

sels to OFF.
Observe CG digital display is within tolerance
Rotate the CG channel rty sel to 1
Observe CG digital display is within tolerance
Rotate the CG channel rty sel to M
Observe CG digital display is within tolerance

NOTE

The CG digital display reading at 1,2 and M should be within 0.2% of each other, or the reading at 1 and 2 should be equidistant about the reading at M with the tolerance compatible with the fuel balance of the left and right hand contents.

Observe tank 11 left hand INLET VALVES MI crossline.
Observe FQI for tanks 1 to 8 inclusive do not show failure flags and FQI for tanks 9,10 and 11 do not have digital indicators obscured.

NOTE

Once refuelling is complete and the REFUEL MASTER selector is set to OFF/DEFUEL control of tank 11 left hand inlet valve reverts to AUTO setting of the INLET VALVES MAIN selector and signals from the fuel quantity packs are restored to the flight deck FQI. The M lt (amber) may be on, indicating a CG discrepancy until all the FQI agree with their tank contents.

Observe individual tank quantities agree with the refuelling sheet (plus or minus 2%).
Observe the TOTAL CONTENTS indicator agrees with the refuelling sheet (plus or minus 2%) and that the pilots' TOTAL CONTENTS indicator repeats the indication.
Sign the refuelling sheet.

GREEN GO LIGHTS ....CHECK

(Deletion)

Set P7 gauge indices below gauge reading.
Set Engine Fuel Flow gauge indices to maximum.
Arm T/O Monitor.
Observe four green lights on.
Reset controls as required.

Captain's documentation stowage ....CHECK

Check the contents on the Flight Equipment Check List (Navigation Manual Section 8).

Lighting panel (left) ....AS REQUIRED

Set LH DASH INSTRUMENTS and LH & CENTRE DASH FLOOD rty sels to required settings.
Observe lighting as selected.
Press CHART LIGHT pb and set rty sel as required.
Observe light as selected.
Set COMPASS lt sel as required.
Observe lt as selected.
Set STOWAGE FLOOD sw as required.
Observe lts as selected.
Select and hold D/B LIGHT sel at TEST.
Observe on left hand dash panel all lights on.

Release D/B LIGHT sel to HI or set to LO as required.
Observe lts return to system status.
Set SIDE CONSOLE rty sel to required setting.
Observe lighting as selected.
Set DIGITS rty sel to required setting.
Observe lighting as selected.

Seat .... SET

With the seat in its fully forward position, adjust the elevation such that it is just possible to scan along the top plane of the centre glareshield.
Observe the W/SHIELD DE-ICE and VISOR DE-ICE O/HEAT lights are within vision.

Oxygen (mask) ....TEST

On the associated audio selector panel set RT/INT sw to INT.
Press INT pb lt.
Observe INT pb lt (white) on.
Rotate BOOM/MASK rty sel to MASK and don headset.
Observe, on mask stowage panel, blinker indicator shows black.
Push down and hold RESET/TEST slide control at TEST.
Observe blinker indicator shows yellow cross, then shows black.
With RESET/TEST control slide still held at TEST, squeeze the red levers.
Observe blinker indicator shows yellow cross, then shows black.
With RESET/TEST slide controls still held at TEST, verify N/100% sw at 100%.
Press, momentarily, TEST pb.
Observe the sound of oxygen flowing over the mask microphone.
Release RESET/TEST slide control and verify white area not visible.
Observe blinker indicator shows black.

On the associated audio selector panel, rotate BOOM/MASK rty sel to BOOM. Remove headset.

INS 1,2 and 3 ....PRESENT POSITION CHECK
DME STATION DATA
INSERTED AND VERIFIED
/SET WAYPOINTS

Position INS 1 data selector to POS. Record displayed present position on captain's flight log. Cross check recorded position with listed ramp position in the Aerodrome Folder.

To insert DME station data in both INS simultaneously press REMOTE key on both INS 1 and INS 2. Insert DME data card into card insertion slot of ADEU. The coded side of the card must be facing fwd and the heavy black line on the left.

NOTES

The READ light on the ADEU illuminates as the card is taken into the ADEU and extinguishes when reading is complete.

If the DME station data has been loaded using the REMOTE function the following verification procedure need only be carried out on the receiving INS.

Set waypoint/DME selector on INS 1 to desired DME station number.
Set data selector to WAY PT. Press keys 7 and 9 simultaneously.
Verify that the correct latitude and longitude appear in the left and right data displays respectively.
Press keys 3 and 9 simultaneously.
Verify that the correct altitude of the DME station in thousands of feet and frequency of the DME station in MHz appear in the left and right displays respectively. Repeat for each DME station for which data has been inserted. Repeat for INS 2 unless the REMOTE function has been used.

To regain waypoint display instead of DME station data display, set data selector to POS then back to WAY PT.

If remote loading of waypoints into all units is desired, press REMOTE switch on each control display unit; check that each REMOTE switch light illuminates.

Position waypoint selector to 1 on each control display unit.

Press switch for north (N2) or south (8S) latitude as appropriate. Press numbered switches in sequence for waypoint latitude. Check correct latitude in left data display. Press INSERT switch; check that INSERT light

(Unchanged)

extinguishes.

Press switch for west (W4) or east (6E) longitude as appropriate. Press numbered switches in sequence for waypoint longitude. Check correct longitude in right data display. Press INSERT switch; check that INSERT light extinguishes. Reposition waypoint selector for each successive waypoint (insert at least three way-points). Cross-check the IN leg distances with the Flight Log. If remote loading has been used, press each REMOTE switch to extinguish REMOTE lights. If more than nine waypoints are required, remaining waypoints will be loaded in place of first waypoints, when the latter are no longer in use.

Position each control display unit AUTO/MAN switch to AUTO to establish automatic navigation leg switching.

STEERING LIGHT .... ON

Observe STEERING lt on.

AUTOLAND light .... OFF

Observe AUTO LAND lt off.

RAD/INS switch .... RAD

Set RAD/INS sw to RAD

VHF/NAV controller .... CHECK/SET

Set captain's HSI course pointer to the lubber line.
On captain's VHF/NAV controller:
Set local ILS frequency
Set and hold TEST sel at VOR-UP/L
Observe on captain's ADI:LOC and G/S flags appear, Localiser and Glide indexes out of view.
Observe on captain's HSI: LOC, G/S and Navigation flags appear, beam bar and Glide indexes unchanged.

After approx. 6 Seconds:

LOC, G/S and Navigation flags disappear, Loc index moves to left stop on ADI and beam bar moves approx. one dot left on HSI; Glide indexes one dot up; ANG appears on HSI.

After approx. 12 seconds:

LOC, G/S and Navigation flags reappear. On ADI, Loc and Glide indexes out of view.
Release TEST sel.
Observe on captain's ADI and HSI, if aircraft is in range of ground station:
LOC, G/S and Navigation flags disappear.
LOC and Glide indexes appear.
Beam bar at original position and ANG appears on HSI.
Repeat actions with TEST sel held at DME-DN/R and check localiser and glideslope indications.

Set captain's HSI course pointer to zero degrees.
Set a local VOR frequency.
Observe on captain's ADI: LOC and G/S flags and indexes out of view.
Observe on captain's HSI: G/S flag and index out of view.
Observe on VOR-RMI s: correct VOR 1 indication.
Set and hold TEST sel at VOR-UP/L.
Observe on captain's HSI:
Beam bar central, Navigation flag in view.

After approx. 6 seconds:

Mavigation flag disappears and ANG appears; FROM pointer appears and beam bar centres.

After approx. 12 seconds:

FROM pointer disappears and Navigation flag reappears.
Observe on VOR-RMI s, upon selecting VOR-UP/L:
VOR 1 pointers move to S on compass cards and VOR 1 flags appear.
After approx. 6 seconds VOR 1 flags disappear.
After approx. 12 seconds VOR 1 flags reappear.
Release TEST sel.
Observe all indications return to original conditions.

Set DME sel to DME.
Observe on DME Indicators that correct DME 1 information is displayed.
Set and hold TEST sel at DME-DN/R.
Observe for the first second, DME 1 indicators blank.
for 2nd second, four dashes.
for 3rd second, 000.0 (+0.1 - 0).
Release TEST sel and check DME 1 indications return to original condition.

AFCS panel ....CHECK

Verify AT 1, AT 2, FD 1, AP 1, AP 2 and FD 2 sws all at OFF.
Observe all warning lts off on both landing display. indicators.

Autothrottle .... CHECK

Set AT 1 sw to engage.
Observe sw remains engaged, IAS HOLD pb lt (white) on and throttle levers move from the idle position.

Set AT 2 sw to engage.
Observe sw remains engaged.

(Deletion)

Press AT instinctive disconnect pbs (2) on No. 1 or No.4. throttle levers.
Observe AT 1 and AT 2 sws drop to OFF, IAS HOLD pb lt off and AT 1 lt (red) flashing on both warning and landing display indicators.

Press again the AT instinctive disconnect pb.
Observe AT lt (red) off on both warning and landing display indicators.

Retard throttle levers (4) to the idle position.

PULL UP light (pre-mod TERRAIN light) ....OFF

Observe light is off.

M/CG light ....OFF

Observe M/CG lt off.

Warning and Landing Display ....TEST

Press and hold TEST pb.
Observe AP light (red), AT light (red), ILS boundaries exceedence warnings (white). aircraft symbol (amber) and LAND 2 and LAND 3 lts (green) and DH lt (amber) on.
Observe, on first officer's warning and landing display, AP light (red) AT light (red) ILS boundaries excedence warnings (white) and aircraft symbol (amber) on.
Observe brief audio warning (cavalry charge) and captain's and first officer's AUTOLAND lt (red) on.
Release TEST pb.
Observe all lts off.

IF .... AP light (red) on and/or AT light (red) flashing,
Press associated instinctive disconnect pb to cancel
Observe AP and AT lts off.

NOTE
With the autopilots and autothrottles disengaged a true disengagement warning will be observed when the TEST pb is released.

R NAV ....OFF

Observe the R NAV, TK O/S and VOR FQY lts are off.
Observe the DEV SENS MI reads LOW.

RADAR light ....OFF

Observe WX RDR lt off.

Instrument transfer switches ....SET

Verify ATT sw set at ATT/INS 1, COMP 1/COMP 2 sw at COMP 1. DEV 1/DEV 2 sw at DEV 1 and NAV sw at INS 1.

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NOTE
The normal position of the captain's instrument transfer switches is to the left.

ASI ....CHECK/SET

Verify ASI mode sw at N.
Observe mode flag reads ADC and no failure flags visible on ASI.

ADI ....CHECK

Press and hold TEST pb.
Observe flag G visible, sphere moves 10 deg pitch up and 10 deg right bank on captain's ADI and CHECK ATT lts (amber) on both ADIs.
Release TEST pb.
Observe sphere returns to initial attitude on captain's ADI.
Observe G flag not visible, and CHECK ATT lts off on both ADIs

VSI ....CHECK

Observe no failure flags visible on VSI.

Radio altimeter ....CHECK/SET

Observe that red fail flag is out of view.
Rotate the DH setting knob to the detent (below zero feet) on the captain's and first officer's radio altimeter indicators.
Observe radio altimeter pointer indicates between minus 5 ft and minus 12 ft.
Observe on both ADIs, runway symbol is indicating aircraft height and red ALT flag is out of view.
Observe DH lts off on both ADIs and the warning and landing display.
Press and hold TEST pb.
Observe pointer indicates 100 ft and red fail flag in view.
On first officer's ADI, observe runway symbol out of view and ALT flag in view.
Release TEST pb.
Observe red fail flag disappears, pointer rotates past 2500 ft behind the mask, then returns to below zero.
Observe, on first officer's ADI: the runway symbol appears and the ALT flag disappears.
Observe a continuous 800 Hz audio warning sounds and the DH lts remain off.
Rotate DH setting knob to set bug to 20 ft.
Observe the audio warning ceases and the DH lts illuminate on both ADIs and the warning and landing display.
Press the DH setting knob and observe all DH lts off.

Standby horizon ....CHECK/SET

(Unchanged)

Observe no flag visible on standby horizon.

NOTE
The failure warning flag disappears after power on. Allow at least 50 seconds after power on in order to have true indications.

Pull standby horizon knob.
Observe pitch and roll attitude goes to zero.
Release standby horizon knob.
Observe standby horizon shows aircraft attitude.

NOTE
A period of 30 seconds may be necessary to obtain a correct stabilization.

Markers ....TEST

Press and hold marker lts TEST pb.
Observe captain's and first officer's marker lts,
OUTER lts (blue) on, then off, audio while lts on.
MIDDLE lts (amber) on, then off, audio while lts on.
AIRWAYS lts (white) on, then off, audio while lts on.
Release the TEST pb

Incidence and Accelerometer ....CHECK

Observe no failure flags visible on the incidence indicator.

Standby ASI/Machmeter ....CHECK

Observe condition of Standby ASI/Machmeter

Machmeter ....CHECK

Observe no failure flags visible on the Machmeter.

HSI ....CHECK/SET

Pull No. 1 HDG/TRK rty sel to the HDG position.
Rotate No. 1 HDG/TRK rty sel to the left or right.
Observe the corresponding heading is displayed on the AFCS panel and on the captain's HSI; the heading index indicates the heading selected and HDG is displayed.
Observe MAG, RAD and 1 visible.
Press and hold TEST pb.
Observe HDG alarm flag visible, compass rotates, 8888 visible in MILES and GND SPD displays and HDG lt (amber) on in captain's and first officer's HSIs.
Release TEST pb.
Observe, HDG flag disappears, compass indicates a correct heading, 0000 visible in GND SPD displays and HDG lt off on both HSIs.

(Unchanged)

FD1/FD2 switch FD1

Set FD1/FD2 sw to FD1 and observe FD1 visible on ADI.

CAPTAIN'S COCKPIT PREPARATION ⑤ ⑥

Altimeter ....CHECK/SET

Verify, on altimeter, mode sw at N.
Observe mode flag reads ADC and no failure flags visible on altimeter.
Rotate static pressure knob to set the airfield QNH in the corresponding windows and check the altimeter reads within plus or minus 35 feet of the airfield elevation.
Set bugs to airfield elevation and 3 eng. acceleration height.

Clock ....SET

To adjust the GMT display,
- set the Timer/Chro switch to CHRO
- set the GMT sel. to FAST or SLOW as required.

When the correct time is established,
- set the GMT sel. to RUN.

To zero the Elapsed Time display,
- set the Elapsed Time sel. to RESET then to STOP.

To set a countdown time in the Chrono display,
- set the Timer/Chro switch to TIMER
- set the GMT sel. to FAST or SLOW as required.

When the countdown time in mins & secs is established
- set the GMT sel to RUN.

Engine rating lights ....CHECK

Observe T/O lt on.

DME ....CHECK

Observe sensible readings.

VOR/RMI..CHECK

Observe no flags visible on VOR/RMI if a VOR station in range.

Side slip ....CHECK

Observe no failure flags visible on SIDE SLIP indicator.

ADF/RMI ....CHECK

Observe no heading failure flag visible on ADF/RMI.

INS monitor lights ....CHECK

Observe INS 1, INS 2 and INS 3 lts on and INS COMP lt OFF.

TEMPERATURE ....CHECK

Observe no failure flags visible on temperature indicator.

C.G. indicator ....CHECK

Observe no failure flag visible on C.G. indicator.

(Standby altimeter (Post mod) .... SET)
(Rotate static pressure knob to set 29.92ins, then leave as set)
(for the duration of the flight.)
( )
(Cabin altimeter (Premod) .... CHECK)

Radar .... SET

CAUTION

The radar must not be selected on while the aircraft is being refuelled. It must not be operated, except in STBY or TEST mode, when any refuelling operation is taking place within 100 yards of the antenna.

Verify SYSTEM rty sel at 1
Press the STBY pb lt and observe STBY lt (white) on.
Verify TILT sel at 5 deg UP.
Rotate GAIN control to AUTO.
Rotate RANGE rty sel to 100
Rotate RANGE MARKS control as required.
Move the polaroid filter to the left stop
Set the IND OFF/LEFT/AHEAD/RIGHT rty sel to AHEAD.

If a radar test is required.

Rotate INT knob fully counter-clockwise.
Press TEST pb on radar controller and observe TEST lt (white) on and STBY lt off.
Rotate INT knob clockwise until correct TEST pattern appears.

NOTE

A 3-minute warm-up period should be allowed before checking radar display.
Due to the integrating properties of this type of indicator, it is important to appreciate that the effect of adjusting the intensity (brilliance) will be fully apparent only after approximately four to five azimuth sweeps.
The assessment of any adjustment should be made only after this condition has been met.
Under normal conditions a satisfactory display will be obtained with the INT control set between the 10 o'clock and 2 o'clock positions.
Too high a setting of the INT control will result in "blooming" and severe loss of definition.

Press the STBY pb lt
Observe STBY lt (white) on and TEST lt off.

Emergency flight control system ....CHECK

Observe EMERG CONT pb lt off and disc unbroken.

Air data computer No. 1 ....CHECK

Observe ADC1 and TEST lts off and no failure flags visible on associated instruments.

Set ADC 1 TEST rty sel to 1.
Observe ADC 1 lt (amber) on, audio warning (two tones), stick shaker operating, and MWS ADC (amber) on.

As soon as the stick shaker operates
Set ADC 1 rty sel to NORM,
When the instruments stabilize.
Press to reset the ADC 1 lt (amber) and observe instrument readings return to previous values, and no failure flags visible, MWS ADC lt off, no audio warning, TEST lt off, ADC 1 lt off.

NOTE

This is a minimal check required to test the stick shaker, for a full ADC check see Conditional Procedures.

Briefing ....AS REQUIRED

Brief as required.

First Officer's documentation stowage ....CHECK

> Check contents as the First Officer's checklist (Navigation Manual Section 8).

Seat .... SET

With the seat in its fully forward position, adjust the elevation such that it is just possible to scan along the top plane of the centre glareshield.
Observe the W/SHIELD DE-ICE and VISOR DE-ICE O/HEAT lights are within vision.

Stab, feel and trim panel ....SET

Verify AUTO STAB No.1 PITCH, ROLL and YAW sws at OFF.
Verify AUTO STAB No.2 PITCH,ROLL and YAW at OFF.
Verify ARTIFICIAL FEEL No.1 PITCH, ROLL and YAW at OFF.
Verify ARTIFICIAL FEEL No.2 PITCH, ROLL and YAW at OFF.
Verify ELECTRIC TRIM No. 1 and No. 2 sws at OFF.

Flight control inverters ....ON

Set BLUE INVERTER sel to ON.
Observe BLUE INVERTER FAIL lt off.

Press to test BLUE INVERTER FAIL lt.
Observe FAIL lt (red) and MWS PFC lt (red) on.

Repeat actions for GREEN INVERTER.

Flight control selection ....GREEN

Verify OUTER AND MIDDLE ELEVONS sel and INNER ELEVONS sel at GREEN.

Observe MECH JAM lt (red) on.

NOTE
The MECH JAM light is on because, with no hydraulic pressure, the elevons droop, thus introducing loads into the mechanical linkage that are sensed as a jamming of the linkage.

Verify RUDDER sel at GREEN,

Anti-Stall ....ON

Verify ANTI STALL SYSTEM 1 sw at ON.
Observe SYS 1 FAIL lt (amber) on.

NOTE
The FAIL light is on because the pitch auto-stab is off.

Repeat the action for ANTI STALL SYSTEM 2.

W/SHIELD DE-ICE MI ....OFF

Observe W/SHIELD DE-ICE MIs L and R read OFF.

Landing lights ....RETRACT/OFF

Verify LIGHTS MAIN LANDING sws at OFF and RETRACT.
Observe EXTENDED lt off.

Windshield de-ice ....OFF

Verify W/SHIELD DE-ICE sels L and R at OFF.

Visor de-ice ....OFF

Verify VISOR DE-ICE sws L and R at OFF.

DV de-mist ....OFF

Verify DV DE-MIST sws L and R at OFF.

Taxi-lights ....RETRACT/OFF

Verify LIGHTS LANDING TAXI sws at OFF and RETRACT.
Observe EXTENDED lt off. Verify LIGHTS TAXI TURN sws L and R at OFF.

MW lights ....TEST

Press and hold the CANCEL LTS TEST pb.
Observe all master warning lts on. Release the CANCEL LTS TEST pb
Observe all master warning lts off.
Press the INHIBIT pb.
Observe the INHIBIT lts (amber) on.
Press and hold the CANCEL LTS TEST pb and observe the master warning lts ADS, TRIM, PFC, ENG1, ENG2, ENG3 and ENG4 (red) on.

NOTE
This test confirms the inhibit facility.

Release the CANCEL LTS TEST pb.
Observe all master warning lts off.
Press and release the RECALL pb.
Observe the master warning lts indicate correct system status and the INHIBIT lts off.
Press and release the CANCEL LTS TEST pb.
Observe all master warning lts on and then off.

Lighting panel (right) ....AS REQUIRED

Set RH DASH INSTRUMENTS and RH DASH FLOOD rty sels to required settings.
Observe lighting as selected.
Press CHART LIGHT pb and set rty sel as required.
Observe light as selected.
Set RADAR ALERT sw to ON.
Select and hold D/B LIGHT sel at TEST.
Observe on right hand dash panels, all lights on.

Release D/B LIGHT sel to HI or set to LO as required.
Observe lts return to system status.
Set STOWAGE FLOOD sw as required.
Observe lts as selected.
Set SIDE CONSOLE rty sel to required setting.
Observe lighting as selected.
Set DIGITS rty sel to required setting.
Observe lighting as selected.

Oxygen (mask) ....TEST

On the associated audio selector panel set RT/INT sw to INT.
Press INT pb lt.
Observe INT pb lt (white) on.
Rotate BOOM/MASK rty sel to MASK and don headset.
Observe, on mask stowage panel, blinker indicator shows black.
Push down and hold RESET/TEST slide control at TEST.
Observe blinker indicator shows yellow cross, then shows black.
With RESET/TEST control slide still held at TEST, squeeze the red levers.
Observe blinker indicator shows yellow cross, then shows black.
With RESET/TEST slide controls still held at TEST, verify N/100% sw at 100%.
Press, momentarily, TEST pb.
Observe the sound of oxygen flowing over the mask microphone. Release RESET/TEST slide control and verify white area not visible
Observe blinker indicator shows black.
On the associated audio selector panel, rotate BOOM/MASK rty sel to BOOM. Remove headset.

RAD/INS switch ....RAD

Set the RAD/INS sw to RAD

VHF/NAV controller .... CHECK/SET

Set first officer's HSI course pointer to the lubber line.
On first officer's VHF/NAV controller:
Set local ILS frequency,
Set and hold TEST sel at VOR-UP/L
Observe on first officer's ADI: LOC and G/S flags appear, Localiser and Glide indexes out of view.
Observe on first officer's HSI: LOC, G/S and Navigation flags appear, beam bar and Glide indexes unchanged.

After approx. 6 seconds:

LOC, G/S and Navigation flags disappear, Loc index moves to left stop on ADI and beam bar moves approx. one dot left on HSI; Glide indexes one dot up; ANG appears on HSI.

After approx. 12 seconds:

LOC, G/S and Navigation flags reappear. On ADI, Loc and Glide indexes out of view.
Release TEST sel.
Observe on first officer's ADI and HSI, if aircraft is in range of ground station:
LOC, G/S and Navigation flags disappear.
Loc and Glide indexes appear.
Beam bar at original position and ANG appears on HSI.

Repeat actions with TEST sel held at DME-DN/R and check localiser and glideslope indications.
Set first officer's HSI course pointer to zero degrees.
Set a local VOR frequency.
Observe on first officer's ADI: LOC and G/S flags and indexes out of view.
Observe on first officer's HSI: G/S flag and index out of view.
Observe on VOR-RMIs: correct VOR 2 indication.
Set and hold TEST sel at VOR-UP/L.
Observe on first officer's HSI:
Beam bar central, Navigation flag in view.

After approx. 6 seconds:

Navigation flag disappears and ANG appears, FROM pointer appears and beam bar centres.

After approx. 12 seconds:

FROM pointer disappears and Navigation flag reappears.
Observe on VOR-RMIs, upon selecting VOR-UP/L:
VOR 2 pointers move to S on compass cards and VOR 2 flags appear.
After approx. 6 seconds: VOR 2 flags disappear.
After approx. 12 seconds: VOR 2 flags reappear.
Release TEST sel.
Observe all indications return to original condition.

Set DME sel to DME.
Check, on DME indicators, that correct DME 2 information is displayed.
Set and hold TEST sel at DME-DN/R.
Observe, for the first second, DME 2 indicators blank.
For 2nd second, four dashes.
For 3rd second, 000.0 (+0.1 - 0).
Release TEST sel and check DME 2 indications return to original condition.

AUTOLAND light .... OFF

(Completely Revised)

Observe AUTOLAND lt off.

STEERING light ....ON

Observe STEERING lt on.

Ground proximity warning ....TESTED

With the droop nose at 5 degrees or UP
Press and hold the TERRAIN lt.
Observe TERRAIN lts (red) (2) flashing and audio warning "glide slope" followed by "whoop whoop pull up" repeated.
Release the TERRAIN lt
Observe audio warnings cease and TERRAIN lts (2) off.

M/CG light ....OFF

Observe M/CG lt off.

Warning and Landing display ....TEST

Press and hold TEST pb.
Observe AP light (red), AT light (red), ILS boundaries exceedence warnings (white). aircraft symbol (amber) and LAND 2 and LAND 3 lts (green) and DH lt (amber) on.
Observe, on captain's warning and landing display, AP light (red) AT light (red) ILS boundaries excedence warnings (white) and aircraft symbol (amber) on.
Observe brief audio warning (cavalry charge) and captain's and first officer's AUTOLAND lt (red) on.
Release TEST pb.
Observe all lts off.

IF ... AP light (red) on and/or AT light (red) flashing.
Press associated instinctive disconnect pb to cancel.
Observe AP and AT lts off.

NOTE

With the autopilots and autothrottles disengaged a true disengagement warning will be observed when the TEST pb is released.

R NAV ....OFF

Observe the R NAV, TK O/S and VOR FQY lts off.
Observe the DEV SENS MI reads LOW.

RADAR light ....OFF

Observe WX RDR lt off.

ASI ....CHECK/SET

Verify ASI mode sw at N.

Observe mode flag reads ADC and no failure flags visible on ASI.

ADI ....CHECK/TEST

Press and hold TEST pb.
Observe flag G visible, sphere moves 10 deg pitch up and 10 deg right bank on first officer's ADI and CHECK ATT lts (amber) on both ADIs.
Release TEST pb.
Observe sphere returns to initial attitude on first officer's ADI

Observe G flag not visible and CHECK ATT lts off on both ADIs.

VSI ....CHECK

Observe no failure flags visible on VSI.

Radio altimeter ....CHECK/TEST

Observe that red fail flag is out of view.

Rotate the DH setting knob to the detent (below zero feet) on the captain's and first officer's radio altimeter indicators.
Observe radio altimeter pointer indicates between minus 5 ft and minus 12 ft.
Observe on both ADIs, runway symbol is indicating aircraft height and red ALT flag is out of view.
Observe DH lts off on both ADIs and the warning and landing display.
Press and hold TEST pb.
Observe pointer indicates 100 ft and red fail flag in view.
On captain's ADI, observe runway symbol out of view and ALT flag in view.
Release TEST pb.
Observe red fail flag disappears, pointer rotates past 2500 ft behind the mask, then returns to below zero.
Observe, on captain's ADI: the runway symbol appears and the ALT flag disappears.
Observe a continuous 800 Hz audio warning sounds and the DH lts remain off.
Rotate DH setting knob to set bug to 20 feet.
Observe the audio warning ceases and the DH lts illuminate on both ADIs and the warning and landing display.
Press the DH setting knob and observe all DH lts off.

Instrument transfer switches ....SET

Verify first officer's ATT sw set at ATT/INS 2, COMP 1/COMP 2 sw at COMP 2, DEV1/DEV2 sw at DEV 2 and NAV sw at INS 2.

NOTE

The normal position of the first officer's instrument transfer switches is to the right.

(Unchanged)

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FIRST OFFICER'S COCKPIT PREPARATION (15) (16)

Machmeter ....CHECK

Observe no failure flags visible on machmeter.

HSI ....CHECK/SET

Pull No.2 HDG/TRK rty sel to the HDG position
Rotate No.2 HDG/TRK rty sel to the left or right.
Observe the corresponding heading is displayed on the AFCS panel and on the first officer's HSI; the heading index indicates the heading selected and HDG is displayed.
Verify MAG, RAD and 2 visible
Press and hold TEST pb.
Observe HDG alarm flag visible, compass rotates, 8888 visible in MILES and GND SPD displays and HDG lt (amber) on in captain's and first officer's HSIs.
Release TEST pb.
Observe HDG flag disappears, compass indicates a correct heading, 0000 visible in GND SPD displays and HDG lt off on both HSIs.

FD1/FD2 switch..FD2

Set first officer's FD1/FD2 sw to FD2.
Observe FD2 visible on first officer's ADI

Altimeter ....CHECK/SET

Verify mode sw at N.
Observe mode flag reads ADC and no failure flags visible on altimeter.
Rotate static pressure knob to set the airfield QNH in the corresponding windows and check altmeter reads within plus or minus 35 feet of the airfield elevation.
Set bugs to airfield elevation and 3 eng. acceleration height.

Clock ....SET

To adjust the GMT display,
- set the Timer/Chro switch to CHRO
- set the GMT sel. to FAST or SLOW as required.
When the correct time is established,
- set the GMT sel. to RUN.

To set a countdown time in the Chrono display,
- set the Timer/Chro switch to TIMER
- set the GMT sel. to FAST or SLOW as required.
When the countdown time in mins & secs is established,
- set the GMT sel. to RUN.

....CHECK

Observe sensible readings

VOR/RMI ....CHECK

Observe no flags visible on VOR/RMI if a VOR station in range.

Side slip ....CHECK

Observe no failure flags visible on SIDE SLIP indicator.

ADF/RMI ....CHECK

Observe no heading failure flag visible on ADF/RMI.

Temperature ....CHECK

Observe no failure flags visible on temperature indicator.

Nose and visor control and indication ....CHECK

Observe VISOR/NOSE indication matches lever position.

Wiper override ....CHECK

Verify WIPER O/RIDE sw at NORMAL.

WHEEL O/HEAT light ....CHECK

Observe the WHEEL O/HEAT light is OFF providing the wheel brake temperature is less than 200 degrees C.

Incidence and Accelerometer ....CHECK

Observe no failure flags visible on the incidence indicator.

Landing gear lever and lights ....DOWN/CHECK

Confirm L/GEAR lever at DOWN.
Observe LH SHORT, UPPER LOCKS and RH SHORT lts off, L/GEAR transit lts off and LH, NOSE, T and RH arrow lts (green) on.

Flight control indicators ....CHECK

If ...elevons or rudders not aligned.
Delay this step until after the engineer's external inspection and request he observes and notes control surface positions.

NOTE

During a turnaround, because the outer elevons are lighter than the others, they may not droop at the same rate. The rudders may also be misaligned because the surfaces are independant and can be affected by wind gusts.

Observe the flight control channel MIs (8) read M.

Observe flight control position indicator warning lts (8) off.

IF ...any warning lts on
Press the RESET pb and observe all warning lts off.

Press and hold the ALARM TEST pb.
Observe warning lts (8) (red) flash.
Release the ALARM TEST pb.
Observe warning lt (8) on, MWS PFC lt (red) on and audio (gong).
Press ALARM RESET pb.
Observe warning lts (8) off, MWS PFC lt off and INNER ELEV lt (red) on.

NOTE
On ground with no hydraulic pressure available, the elevons droop and unload their corresponding servo controls which causes the INNER ELEV light to come on.

NOSE WHEEL lt ....ON

Observe NOSE WHEEL lt (amber) on.

Anti-skid ....CHECK

Hold, then release, anti-skid system test sel at TEST 1.
Observe anti-skid R lts (8) (white) on, then off.
Repeat the test with test sel at TEST 2 position.

Brake pressures and warning lights ....CHECK

Verify brake control lever at NORM, then depress brake pedals.
Observe dual BRAKES pressure gauge reads 0, BRAKES EMERG lt off and BRAKES FAIL lt (red) on.

Release brake pedals, set brake control lever to PARK.
Observe dual BRAKES pressure gauge reads full scale on both sides, no failure flag visible, BRAKES FAIL lt off and BRAKES EMERG lt (amber) on.

Take-off monitor ....DISARM

Pull T/O MONITOR control button.

AFCS lights ....AS REQUIRED

Set AFCS MODES lighting rty sel as required.

Total fuel contents indicator ....CHECK

Observe no failure flag showing on TOTAL CONTENTS indicator and sensible readings indicated.

(Unchanged)

Primary engine indication .... CHECK

Observe power management lts (12) off
Observe N2 pointers (4) and digital counters (4) at 0, overlimit pointers 110% and no flag across digital counters (4).
Observe N1 pointers (4) and digital counters (4) at 0, overlimit pointers at 108.5%, N1 auto reduction lts (4) off and no flags across digital counters (4).
Observe FUEL pointers (4) and lower digital counters (4) at 0, instrument mode flags read F/E, top digital displays and bug settings agree and no flags across lower digital counters (4).
Observe EGT pointers (4) and digital counters (4) show sensible readings, no flags across digital counters (4) and EGT instrument warning lt off.

NOTE
The EGT failure flags may be visible if the outside temperature is below minus 5 deg C.

Observe AREA instrument pointers (4) show sensible readings and no flags and reheat selected lts (4) off.

INS 2 ....PRESENT POSITION CHECKED

Position INS 2 data selector to POS. Record displayed present position on first officer's flight log. Cross check recorded position with listed ramp position in the Aerodrome Folder.

Autopilot ....CHECK

Verify AUTOPILOT TURN knob in detent.

Selcal .... TEST

Set SELCAL 1 and SELCAL 2 mode sels as required.
Press to test the SELCAL 1 pb lt and adjust lighting as required.
Observe SELCAL 1 pb lt (amber) on when pressed.
Release SELCAL 1 pb lt.
Observe pb lt off.
Press to test SELCAL 2 pb lt, adjust lighting as required.
Observe SELCAL 2 pb lt (amber) on when pressed.
Release SELCAL 2 pb lt.
Observe pb lt off.

Cabin altimeter (Post Mod) .... CHECK
Observe sensible reading

Audio Selector Panels .... SET

Trim wheels ....SET

Verify YAW, PITCH and ROLL trims at neutral.

Throttles .... CHECK

Advance throttle levers (4) to fully forward and return to the idle stop.
Observe no undue force is required.

Baulk override ....CHECK

Verify BAULK O/RIDE handle aligned with the longitudinal axis of the aircraft and fully down.

Windshield wipers .... CHECK

Verify W/S WIPERS rty sels (2) at OFF.

Observe wipers are parked.

CAUTION
W/S wipers must not be operated on a dry screen but may be ground tested on a wet screen.

NOSE and VISOR STBY control ....OFF/GUARDED

Confirm NOSE and VISOR STBY control is OFF and guarded.

Reheat .... OFF

Verify REHEAT sels (4) at OFF.

Throttle lights .... TEST

Press to test No. 1 engine THROT lt.
Observe THROT lt (red) on, MWS THROT lt (red) on, audio (gong) and No. 1 engine THROTTLE MASTER sw lt (red) on.

Repeat action for No. 2, 3 and 4 engine THROT lts.

VHF Com .... AS REQUIRED

Set VHF 1 frequencies as required.

Verify TFR sw at desired position.
Observe corresponding lt (green) on.

Repeat these actions for VHF 2.

Radar .... SET

CAUTION
The radar must not be selected on while the aircraft is being refuelled. It must not be operated, except in STBY or TEST mode, when any refuelling operation is taking place within 100 yards of the antenna.

Verify SYSTEM rty sel at 1
Press the STBY pb lt and observe STBY lt (white) on.
Verify TILT sel at 5 deg UP.
Rotate GAIN control to AUTO.
Rotate RANGE rty sel to 100
Rotate RANGE MARKS control as required
Move the polaroid filter to the left stop
Set the IND OFF/LEFT/AHEAD/RIGHT rty sel to AHEAD.

If a radar test is required

Set SYSTEM rty sel to 2.
Rotate INT knob fully counter-clockwise.
Press TEST pb on radar controller and observe TEST lt (white) on and STBY lt off.

Rotate INT knob clockwise until correct TEST pattern appears.

NOTE

A 3-minute warm-up period should be allowed before checking radar display.
Due to the integrating properties of this type of indicator, it is important to appreciate that the effect of adjusting the intensity (brilliance) will be fully apparent only after approximately four to five azimuth sweeps.
The assessment of any adjustment should be made only after this condition has been met.
Under normal conditions a satisfactory display will be obtained with the INT control set between the 10 o'clock and 2 o'clock positions.
Too high a setting of the INT control will result in "blooming" and severe loss of definition.

Set SYSTEM rty sel to 1.
Press the STBY pb lt
Observe STBY lt (white) on and TEST lt off.

Transponder ....CHECK/STBY

Verify ALT RPTG sw at 1.
Verify ATC sw set at 1.

If transponder test required.

Set ATC mode rty sel to A.
Press and hold ATC TEST pb.
Observe REPLY lt (green) on for 15 seconds.
Release ATC TEST pb.
Set ATC mode rty sel to STBY.

ADF .... TEST

Select the required ADF frequencies for ADF1 and ADF 2 on the ADF control unit.
Observe sensible position of the ADF pointers on both ADF/RMI.

Set BFO sw to 1 or 2 as appropriate.
Press and hold ADF 1 TEST pb.
Observe ADF 1 pointers indicate 135 deg relative on both ADF/RMI and audio warning (1020 Hz).
Release ADF 1 TEST pb.
Observe ADF 1 pointers return to initial positions on both ADF/RMI.
Press and hold ADF 2 TEST pb.
Observe ADF 2 pointers indicate 135 deg relative on both ADF/RMI.
Release ADF 2 TEST pb.
Observe ADF 2 pointers return to initial positions on both ADF/RMI.

HF .... AS REQUIRED

Verify HF 1 and HF 2 sels as required.
Set frequencies as required.

Air data computer No. 2 ....CHECK

Set ADC TEST rty sel to COMP.
Observe MWS ADS lt (red) on, audio (gong), TEST lt (blue) on almost instantaneously after COMP selected and flags on airspeed indicators.
Set ADC rty sel to NORM.
Observe MWS ADS lt off, TEST lt off and no flags on airspeed indicator.

Landing gear horn ....TEST

Press the GRND TEST L/G HORN pb.
Observe landing gear audio (horn).

Lights panel .... TEST

Set and hold LIGHTS sel to TEST.
Observe all warning lights on the centre dash panel are on.

Release LIGHTS sel to HI or set to LO as required.
Observe lts return to system status.

BEFORE START CHECK

Master c/bs ....CHECK/SET ALL

E will - confirm that the master CBs, as identified by the white surrounds are set.

- check no flags on the engine primary and secondary instruments.

C will - confirm that failure flags are not in view on his flight instruments.

P will - confirm that failure flags are not in view on his flight instruments.

Cockpit preparation ....COMPLETED ALL

Confirm the cockpit preparation is completed by scan.

Oxygen ....CHECKED/100% ALL

Confirm oxygen masks checked and
N-100% sw at 100%

DV Windows..CLOSE C.P

Verify the sliding side windows are closed and secure.

Flight control inverters ....ON P

Confirm BLUE INVERTER and GREEN INVERTER sels at ON.

ANTI-STALL SYSTEMS ....ON P

Confirm ANTI STALL SYSTEM sws at ON

RAD/INS SWS ....RAD C.P

Confirm both RAD/INS sws to RAD
Observe on both HSI that RAD and MAG displayed.

Instrument transfer sws ....SET C.P

Confirm the Captain's instrument transfer switches to the left and First Officer's instrument transfer switches to the right.

Altimeters ....CHECKED/SET ALL

Confirm both main altimeters set to QNH & mode sws at "N"
Check bugs set to airfield elevation and three engine acceleration height.
Set Radio Altimeter bugs to 20' & check DH lts on.

NAV/radios .... TUNED/SET ALL

The ADF and VOR should be tuned and checked on the facilities. Required QDM set on VOR LOC selectors and heading or track set on the HDG/TRK selector if required.

Brakes ....PARK/CHECKED P.E

Confirm brakes are full scale and brake control lever at PARK.

BEFORE START CHECK

Throttles ....IDLE E

Confirm throttles at idle.

Nav. Lights ....AS REQD E

Select Navigation lights ON or OFF as required.

THROTTLE MASTER ....ON E

Confirm THROTTLE MASTER sels are at MAIN or ALTERN.

GROUND HYD CHECK OUT ....YELLOW YELLOW/OFF E

Verify the GROUND HYD CHECKOUT rty sel at YELLOW YELLOW
Verify PUMP 1 G-Y and PUMP 2 B-Y sws at OFF.

FUEL HEATERS ....AUTO E

Confirm Fuel Heater selectors at AUTO

ENGINE RECIRCULATION VALVES ....SHUT E

Confirm ENGINE RECIRCULATION VALVES sws at SHUT

SECONDARY AIR DOORS ....AUTO E

Set the SECONDARY AIR DOORS sels to AUTO.

Batteries ....ON E

Set battery sels to BATT ON.
Observe: BATT A and BATT B MIs show inline, BATT ISOLATE lts off and LH and RH ESS/MAIN SPLIT MIs show inline.

NOTE: BATT ON is selected to prevent any interruption of the d.c. supply during engine start.

INS 1, 2 and 3 ....LOADING CHECKED NAV MODE/MIX ALL

C.P.E. select POS on the data selector of INS 1, 2 and 3 respectively. C. reads the ramp position from the Aerodrome Folder. C.P.E. verify that this position is displayed on their respective INS and circle the present position written on their flight logs.

C.P.E. select data selector to WAY PT and waypoint/DME selector to 1.
C. reads from his own flight log the number and name of the first waypoint. P.E. number and check this waypoint on their own flight logs.
C. reads thelatitude and longitude of that waypoint.
C.P.E. verify that displays agree with this position and circle the waypoint number on their flight logs.
This procedure is carried out for a minimum of the first three waypoints.

(Unchanged)

Set data selector to DSRTK/STS
Verify Alignment number is 5 or less
On INS 1, 2 and 3 MSU rotate the mode rty sel to NAV and check mode status 1

Press key 4.
Observe 000004 appears in right data display.
Press INSERT switch
Observe INSERT switch extinguishes and data displays return to normal with 4 appearing in the last digit of right display.
Check INS ground speed within limits
Confirm INS AUTO/MAN Sw. at AUTO
Observe INS 1, INS 2 and INS 3 monitor lts off

ASI bugs and pitch index .... SET ALL

Set the ASI bugs and pitch index.

Clock, Engine and TLA bugs .... SET ALL

Preset noise abatement time.
Set the engine bugs and throttle angle indices.

Briefing .... STATED C

Confirm briefing completed and understood.

Loadsheet ....CHECKED ALL

C will check and sign the loadsheet
P will extract the take-off weight to complete the take-off data sheet
E will extract the ZFW, ZFCG, PTOTR or PTOBO and final tank 11 fuel.

ZFW and ZFCG .... SET/CHECKED EC

E will - set the loadsheet ZFW and ZFCG in the ZFW and ZFCG displays
- call the ZFW and ZFCG settings.

C will - confirm that the ZFW and ZFCG settings agree with the loadsheet values.

TOTAL FUEL REM/A/C WEIGHT ....SET/CHECKED ALL

E will - set the loadsheet ZFW in the A/C Weight display
- zero the Fuel Remaining display by setting the RH knob to any position other than N and momentarily pulling the LH knob.
- extract the Total Fuel Required from the refuel sheet and set this figure in the Fuel Remaining display.

- set the RH knob to N to enable the A/C Weight and Fuel Remaining displays to count down.
- check that the A/C Weight display agrees with the loadsheet take-off weight plus taxy fuel.
- call the Fuel Remaining and A/C Weight indications.

C will - cross check the fuel figure against the Total Contents indicator and the loadsheet.
- cross check the weight against the loadsheet.

P will - cross check the fuel figure against the Total Contents indicator and the fuel flight plan.
- cross check the weight against the take-off data sheet.

Load Limits..SET E

Set tank 11 load limit control to the FINAL TANK 11 CONTENTS from the Load Sheet.

ASI bugs and pitch index.................................... UPDATE ALL

Update the ASI bugs and pitch index as required.

Clock Engine and TLA bugs .... UPDATE ALL

Update the noise abatement time, the engine bugs and throttle angle as required.

Start clearance ....OBTAIN P

Obtain start clearance from ATC.

Door lights ....CHECKED E

Observe all DOORS lts are off with the exception of MISC HATCHES lt

Master warning ....RECALL C

Press the RECALL pb.
Observe the master warning lights indicate the accepted systems status.

Anti collision lights ....ON E

Set the Anti Collision lights sw to ON.

ENGINE FEED PUMPS .... ON E

Set engines 2 and 3 main ENGINE FEED PUMPS sws to ON
Observe the pumps LOW PRESS lts off
Observe the engine inlet LOW PRESS lts off.

NOTE: In the event of the ground electrical supply being suspect only switch on the main ENGINE FEED PUMP of the engine to be started first. The remaining pumps are then switched on after starting the first engine.

Clearance to Start ....OBTAIN EG

Press GRND CALL pb, contact ground crew on interphone and request clearance to start.
The Ground Engineer will check that, chocks are in position, fire equipment immediately available, engines clear, gear locks and covers removed, beacon on and all doors closed. He will respond with, "Clear to Start".

If an engine start is made with a door open, its closure must be confirmed before releasing the aircraft.

(Unchanged)

BEFORE START CHECK

Start Engines ....AS REQUIRED E

CAUTION: IF DURING ENGINE START A RED VIBRATION WARNING OCCURS, SHUT THE HP VALVE IMMEDIATELY AND VERIFY THE START/RELIGHT SELECTOR AT OFF.

Set DEBOW sws (4) to DEBOW.
Observe DEBOW sw lts (yellow) (4) on.

Normal starting order is 3,4, 2, 1.
For push back departures starting order is 3 and 2 on the ramp, then 4 and 1 (cross bleed) when away from the ramp.

ON ENGINE NO.3

Set START/RELIGHT sel to START.
Observe START/RELIGHT sel is latched at START. START VALVE MI reads OPEN. ENGINE DEBOW sw lt off, START PUMP lt (yellow) on, N2 rises.

The minimum recommended air pressure during starting is 29 psi for ambient temperatures above 0 deg C increasing to 32 psi at an ambient temperature of minus 40 deg C.

IF ...START VALVE MI is not reading OPEN inform ground staff to turn off ground air supply, manually open the start valve then turn ground air supply on.

When N2 is between 10-12% set HP VALVE sw to OPEN.
Observe RH IGN or LH IGN lt (green) on, engine shut down handles lts (red) on, THROT lt off and T1 ENGINE PROBE HEATER lt off.

NOTES: With the HP VALVE switch at OPEN the inhibition of the engine shut down handle lights is removed and they are on as part of the engine oil low pressure warning.

During starting, the engine oil low pressure warning light may remain illuminated at the debow speed. The start may be continued provided that some oil pressure is indicated. The low pressure warning must be off when the engine stabilizes at Idle.

IF ...THROT lt (red) comes on immediately HP VALVE is set to open. Set HP VALVE sw to SHUT, START/RELIGHT sel to off, ENGINE DEBOW sw to NORMAL.
Verify THROTTLE MASTER sel at MAIN or ALTERN.
Restart engine.

The THROT lt coming on immediately the HP VALVE sw is set to OPEN indicates there is no throttle lane selected.

Observe EGT increases and monitor the rate of increase.

NOTE: an increase in EGT is an indication of engine light up and should occur within 8 seconds of opening up the HP VALVE; the maximum EGT will not normally exceed 450 deg C.

IF ...no increase in EGT within 8 seconds.
Set HP VALVE sw to SHUT, set START/RELIGHT sel to OFF and set ENGINE DEBOW sw to NORMAL
apply procedure FALSE START.

IF ...EGT rate of rise shows 550 deg C may be exceeded or T1 ENGINE PROBE HEATER lt (yellow) on.
Set HP VALVE sw to SHUT, set START/RELIGHT sel to OFF and set ENGINE DEBOW sw to NORMAL.

IF ...THROT lt (red) comes on after light up but before ENGINE DEBOW sw is set to NORMAL set THROTTLE MASTER sel to opposite selection and continue with engine start.

When N2 is at 25%.

Observe START/RELIGHT sel returns to OFF.

IF ...START/RELIGHT sel remains at START.
Set START/RELIGHT sel to OFF.

Observe the START VALVE MI reads SHUT, the RH IGN and LH IGN lts off.

IF ...START VALVE MI reads OPEN

Inform ground staff to turn off ground air supply and manually close the start valve.

IF ...Ground staff report START VALVE will not shut set HP VALVE sw to SHUT.

DEBOW START

If more than 10 minutes or less than five hours has elapsed since the engine was last operated then it must be run in the debow conditions for at least one minute.

Start clock.
Observe N2 stabilised at approximately 30%

Wait until the ENGINE DEBOW sw lt (yellow) comes on or 1 minute has elapsed since START/RELIGHT sel returned to OFF.

NOTES: The engine speed should stabilise at approximately 30% N2. It is likely, particularly at high altitude airfields, that the engine speed will overshoot the stabilised debow speed. In extreme circumstances this overshoot could be up to 10% of N2.

It is permissible to run the engine in the debow condition for up to 3 minutes provided that icing conditions do not exist. Icing conditions for debow are when the ambient temperature is below 3 deg C and visibility is less than 1,000 metres when debow must be limited to 1 minute.

IF ...Stabilised N2 exceeds 32% or N2 exceeds 32% for more than 5 seconds during overshoot set HP VALVE sw to SHUT, set THROTTLE MASTER sel to opposite selection and restart the engine.

Set DEBOW sw to NORMAL

Observe N2 rises then returns to idle, ENGINE DEBOW sw lt off.

NOTE: THE START PUMP will run for approximately 30 secs after the ENGINE DEBOW sw is set to NORMAL.

IF ...N2 does not rise to clear rotating stall or fails to achieve idle, set THROTTLE MASTER sel to opposite selection when N2 stabilised at idle advance throttle lever slowly to obtain 72% N2, return throttle to idle.

CAUTION: IF THE THROTTLE LEVER IS ADVANCED TOO QUICKLY DURING ROTATING STALL CLEARANCE ENGINE SURGE MAY OCCUR.

Observe AREA fully open.

NOTE: The primary nozzle will normally be fully open during engine start cycle but occasionally it may tend to close during start but should be fully open by the time the engine has achieved idle.

IF ...AREA not fully open when idle achieved, set THROTTLE MASTER sel to opposite selection and observe AREA fully open.

Observe START PUMP lt off.

IF ...START PUMP lt (yellow) ON.
TRIP the start pump cb.

CAUTION: WITH AN INOPERATIVE START PUMP, AUTO AND MANUAL RELIGHTS, WILL NOT BE POSSIBLE.

(Text Unchanged) REPRINT

BEFORE START CHECK

NOTES: It is permissible to leave the start pump running but an inspection of the HP and LP turbines must be made on landing. If during engine start an AMBER vibration warning occurs it may be ignored providing the level of vibration reduces to 2 1/2 ins/sec within 1 min after 25% N2 is achieved and the warning can be cancelled by reset switch action when engine achieves idle speed.

After start or during taxying, engine operation in the range 88% to 93% N1 must be of a transient nature in order to minimise LP compressor blade vibration. There must be no steady state running within this speed band and operation must be kept to the minimum possible.

After start or during taxying, engine 4 must not be oprated above 90% N2 for more than 30 seconds with Eng 4 T/O N1 limiter switch set at 88%. If it is necessary to carry out more than one operation above 90% N2 a cooling period of at least 5 minutes must elapse at idle between such operation.

Set the BLEED VALVE sw to OPEN.
Observe pressure gauge indicator approximately 20 psi.
Set COND VALVE sel to ON
Observe - MI in line within 30 secs
- mass flow satisfactory.

Set the green hydraulic system pump sels 1 and 2 and the blue hydraulic system pump sel 3 and 4 to ON.

Observe CSD lt off.

REPEAT ENGINE STARTING PROCEDURE FOR OTHER ENGINES.

Set appropriate main ENGINE FEED PUMPS to ON
Observe the pumps LOW PRESS lts OFF

(Text Unchanged) REPRINT

FUEL LP PROTECTION CHECK

When 1 and 4 engines are stabilised at idle
Switch engines 1 and 4 Feed Pumps OFF
Observe - pumps Low Pressure lts on
- 1 and 4 Acc lts on
- 1 and 4 Bypass Valve MIs read OPEN.

Switch engines 1 and 4 main Feed Pumps ON
Observe - pumps Low Pressure lts off
- 1 and 4 Acc lts off
- 1 and 4 Bypass Valve MIs show black.

Set ignition rty sel to OFF.

Scan the engine instruments
Observe that for all engine parameters the indications are consistent over the four engines.

The allowable scatter is

N2	TBD	
N1	TBD	
ENG FUEL	TBD	
EGT	TBD	awaiting RR data
AREA	FULLY OPEN	
P7	TBD	

Observe SECONDARY NOZZLE instruments indicate 18-24 deg.

NOTE: For take-off, the buckets should be at 21 deg. However, take-off is permitted with buckets within the range 18-24 deg.

CAUTION

IF, AFTER STARTING ENGINES OR WHEN TAXYING, AN ENGINE RUNS DOWN,
- SET HP VALVE SHUT
- THROTTLE MASTER TO THE OTHER LANE
- RESTART ENGINE

NORMAL PROCEDURES
PUSHBACK CHECK

Start engines ....3 and 2 E

Start engines 3 and 2 using the normal start procedure.

BRAKE FANS ....ON E

Verify BRAKE FANS sw at ON

Hydraulics ....CHECKED E

Observe green, yellow and blue system contents gauges pointers indicate within green band.

NOTE: After engine start there is a slight drop in level in each reservoir which is caused by the filling of the accumulators.

Observe pumps L/PRESS lts (6) off.

Observe green, yellow and blue system pressure gauges read normal.

Crossbleed Valves 2 and 3 ....OPEN E

Verify engines 2 and 3 BLEED VALVE sws at OPEN
Set engines 2 and 3 CROSS BLEED VALVES sws to OPEN

Ground equipment ....CLEAR P.G

Request ground engineer to verify, disconnection of pre-conditioned air truck and access door closed, disconnection of electrical ground truck and access door closed, disconnection of air start truck and start connector blanking cap fitted and access door closed.

PUSHBACK

CAUTION: DURING THE WHOLE PUSHBACK OPERATION THE GROUND INTERPHONE MUST BE OPERATIVE.

Nos 4 and 1 Engines ....START E

Start 4 and 1 using Cross bleed start procedure. Satisfactory bleed pressure (25-30 psi) is normally obtained with engine at high idle.

PUSHBACK CHECKLIST ....COMPLETED E

Nosewheel steering ....CHECKED P

Press the nosewheel RESET pb.
Observe NOSE WHEEL lt off and STEERING lts (2) off.

NOTE: If the nose wheels are not centred it may be necessary to push the RESET pb several times.

IF ...nose wheel inhibit system engaged.
Put off the following actions until the inhibit system is switched off.

NOTE: To tow the aircraft with engines running, or hydraulic pressure on, the nose wheel steering is de-activated by a control lever located in the ground engineer's interphone box.
When the system is inhibited, the NOSE WHEEL lt (red) and the two STEERING lts (red) come on.

Set and hold NOSE WHEEL test sel at TEST 1.
Observe NOSE WHEEL lt (red) and STEERING lts (red) on.
Release test sel.
Observe NOSE WHEEL lt and STEERING lts off.

Repeat these actions, using TEST 2.

Flight Control AFCS and TRIMS ....CHECKED C

Observe, on the flight control position indicator, elevons inline, rudders inline and flight control channel MIs read M.

Press to cancel MECH JAM lt (red).
Observe MECH JAM lt off.

NOTE: The MECH JAM light has remained locked on, even though the elevons have moved to an aligned position.

Trims

Hold the nose wheel steering handle and rotate the YAW TRIM knob to right yaw until it stops.
Observe rudder pedals move correctly, the yaw trim indicator is at 20 deg. and, on the flight control position indicator, both rudders at 20 deg. right.
Rotate YAW TRIM knob to neutral mark.
Observe rudders inline at 0 deg.
Repeat for left yaw and return to neutral.

Rotate the pitch trim wheel to nose up until it stops.

Observe control column moves rearwards, pitch trim indicator is at 15 deg. and on flying control position indicator the elevons at 15 deg. up.
Rotate pitch trim wheel to neutral mark.
Observe elevons inline at 0 deg.
Repeat for nose down trim 8 deg. and return to neutral.

Rotate ROLL TRIM knob to right roll trim until it stops.
Observe pilot control moves correctly, roll trim indicator is at 10 deg. and on the flight control position indicator,

Left middle and outer elevons at	10 deg. down.
Left inner elevon at	7 deg. down.
Right inner elevon at	7 deg. up.
Right middle and outer elevons at	10 deg. up.

Rotate ROLL TRIM knob to neutral mark.
Observe elevons inline.
Repeat for left roll trim and return to neutral.

Set ELECTRIC TRIM 2 sw to engage.
Observe sw remains engaged.

NOTE: The ELECTRIC TRIM No. 2 is engaged first because the subsequent engagement of ELECTRIC TRIM No. 1 will check the priority of system 1 over system 2.

Set ELECTRIC TRIM 1 sw to engage.
Observe sw remains engaged.

On captain's control wheel, set and hold PITCH TRIM sel at UP.
Observe control columns and mechanical trim wheel respond to the order, audio (bell) during operation and flight control indicator bars move accordingly.

Before the maximum limit is reached.
Hold and arrest the movement of the PITCH TRIM wheel.
Observe ELECTRIC TRIM sws drop to OFF, MWS TRIM lt (red) on and audio (gong).
Release PITCH TRIM sel.

NOTE: Maximum pitch up deflection is approximately 15 deg. At this value the electric trim may automatically disengage and activate warnings (MWS TRIM light (red) and audio (gong))

Set No. 2 ELECTRIC TRIM sw to engage
On captain's control wheel, set and hold PITCH TRIM sel at DOWN.
Observe control columns and mechanical trim wheel respond to the order, audio (bell) during operation and flight control indicator bars move accordingly.
Release PITCH TRIM sel when mechanical trim wheel is at neutral position.
Observe control columns and mechanical trim wheel stop.

Set No. 1 ELECTRIC TRIM sw to engage.

Flight Controls Mechanical Channel

With pitch control at neutral, apply full left wing down control.
Observe that control stiffness is normal and, on the flight control position indicator, the elevons sensibly follow the control movement to full roll deflection:

Left middle and outer elevons at	20 deg up
Left inner elevon at	14 deg up
Right inner elevon at	14 deg down
Right middle and outer elevons at	20 deg down

NOTES: Applying full left wing down control tests the mechanical channel in roll, the rate of operation of the PFC servos and relay jacks and the operation of the relay jacks selectors.

The artificial feel system will cause an increase in control stiffness with increasing deflection.

Return controls to neutral.
Observe elevons in line.
Repeat roll test for full right wing down control.

Push control column fully forward.
Observe that control stiffness is normal and, on the flight control position indicator, the elevons sensibly follow the control movement to full pitch deflection.
All elevons 17 deg. down.
Return control column to neutral.
Observe elevons inline.
Repeat pitch test for control column full rearward and all elevons 15 deg. up.

NOTE: The 15 deg. up stop can be overriden to obtain 17 deg. by applying additional pressure.

Hold nose wheel steering handle and push rudder pedals to full left.
Observe that control stiffness is normal, and, on the flight control position indicator, the rudders sensibly follow the control movement to full deflection, both rudders 30 deg. left.

NOTE: The nose wheel will follow the rudder movement, thus scrubbing the tyres, unless the steering handle is firmly held.

Return rudder pedals to neutral.
Observe rudders at neutral
Repeat the rudders test for rudder pedals to full right and both rudders 30 deg. right.

(Completely Revised)

British airways

Flight Controls Electrical Channels and AFCS

Set the O & M ELEVONS sel, the IN ELEVONS sel and RUDDER sel to GREEN.
Press the RESET pb of O & M ELEVONS, IN ELEVONS and RUDDER.
Observe, on the flight control position indicator the flight control channel MIs (8) read G.

Set AUTO STAB No. 1 PITCH and ROLL sws to OFF.

Observe ANTI STALL SYST 1 FAIL lt (amber) on.

NOTE: With No. 1 Autostabilization disengaged the priority is overridden thus allowing a test of No. 2 Emergency Control.

With hands off controls.
Press and hold the emergency control test pb.
Observe EMERG CONT pb lt (green) on.

NOTE: Ensure there is no input control on the control wheel or control column which could upset the test.

Observe on flight control indicator all elevons inline and movement is not more than one degree up or down.

NOTE: Excessive movement of the elevons indicates an erratic signal from the emergency control sensing unit.

Release the emergency control test pb.
Observe EMERG CONT pb lt off.

Re-engage AUTO STAB No. 1 PITCH and ROLL sws.
Observe ANTI STALL SYST 1 FAIL lt off.

Press and hold the emergency control test pb.
Observe EMERG CONT pb lt (green) on.
Observe on flight control indicator all elevons inline and movement is not more than one degree up or down.
Release the emergency control test pb.
Observe EMERG CONT pb lt off.

Verify the AUTOPILOT TURN knob is centred
Set No. 1 AP sw to engage
Observe sw remains engaged AP.1 lt (green), PITCH HOLD pb lt (white) and HDG HOLD pb lt (white) on.

Press and hold the emergency control test pb
Observe the EMERG CONT pb lt (green) on.

(Complete revised)

Apply light nose up and nose down pressures on the control column.
Observe, on the flight control position indicator, response from all elevons.

NOTE: This confirms that the elevons are in green electrical channel.
If undue force is applied the autopilot will disconnect.

Set AP 2 sw to engage

Observe sw remains engaged, AP 2 lt (green) on, AP 1 sw drops to OFF and AP1 lt off.

Press the pilot's autopilot instinctive disconnect pb.
Observe AP 2 sw drops to OFF, AP 2 light off, AP light (red) on at both landing display indicators and audio (cavalry charge).

Press again the pilot's autopilot instinctive disconnect pb.
Observe AP light off at both landing display indicators.

Apply full left wing down control, then full right wing down control and return to neutral.
Observe that control stiffness is normal and the elevons sensibly follow the control movement to full deflection while the rudders deflect 8 deg. Then all surfaces return to neutral.

NOTE: Applying full left wing down and right wing down control tests the green electrical channel in roll and since autostabilization is engaged the roll/yaw turn co-ordination function appears as an 8 degree rudder deflection, thus confirming that both rudder PFC servos are in green electrical mode.

Push control column fully forward, then pull fully rearward and return to neutral.
Observe that control stiffness is normal and the elevons sensibly follow the control movement to full deflection then return to neutral.

Hold nose wheel steering handle and push the rudder pedals to full left, then to full right and return to neutral.
Observe that control stiffness is normal and the rudders sensibly follow the control movement to full deflection and return to neutral.

(Completely Revised)

Set the O & M ELEVONS sel, the IN ELEVONS sel and RUDDER sel to BLUE.
Press the RESET pb of O & M ELEVONS, IN ELEVONS and RUDDER.
Observe on the flight control position indicator the flight control channel MIs (8) read B.

Set No. 1 AP sw to engage
Observe sw remains engaged AP 1 lt (green), PITCH HOLD pb lt (white) and HDG HOLD pb lt (white) on.

Press and hold the emergency control test pb
Observe the EMERG CONT pb lt (green) on

Apply light nose up and nose down pressures on the control column. Observe, on the flight control position indicator, response from all elevons.

NOTE: This confirms that the elevons are in blue electrical channel.

Press the pilot's autopilot instinctive disconnect pb.
Observe AP 1 sw drops to OFF, AP 1 light OFF, AP light (red) on at both landing display indicators and audio (cavalry charge).

Press again the pilot's autopilot instinctive disconnect pb.
Observe AP light off at both landing display indicators.

Rotate the SERVO CONTROLS yellow rty sel to YELLOW GREEN
Press the RESET pbs and observe on the flight control position indicator the flight control channel MIs (8) read B.
Push the control column forward then pull rearward to give approximately half range movement on the control surfaces.
Return the control column to neutral.

Rotate the SERVO CONTROLS yellow rty sel to YELLOW BLUE
Press the RESET pbs and observe on the flight control position indicator the flight control channel MIs (8) read B.
Push the control column forward, then pull rearward to give approximately half range movement on the control surfaces.
Return the control column to neutral.

Rotate the SERVO CONTROLS yellow rty sel to NORMAL
Press the RESET pbs and observe on the flight control position indicator the flight control channel MIs (8) read B.

NOTE: This check of the PFC hydraulic shuttle valves is made to confirm their electrical and hydraulic response to changeover.

Rotate the SERVO CONTROLS black rty sel to GREEN ONLY
Observe the GREEN ONLY pea lts (2) (green) on, BLUE L. PRESS lt (red) on and flight control channel MIs (8) read G.

Rotate the SERVO CONTROLS black rty sel to BLUE ONLY
Observe the BLUE ONLY pea lts (2) (green) on, GREEN L. PRESS lt (red) on and flight control channel MIs (8) read M
Rotate the SERVO CONTROLS black rty sel to NORMAL
Observe GREEN L. PRESS lt off.
Press the RESET pbs and observe the flight control channel MIs (8) read B.

NOTE: This verifies the depressurisation capability of the PFC green and blue hydraulic systems.

Stab and Feel ....ENGAGED P

Set AUTO STAB No. 1 PITCH, ROLL and YAW sws to engage.
Set AUTO STAB No. 2 PITCH, ROLL and YAW sws to engage.
Observe sws remain engaged.

Set ARTIFICIAL FEEL No. 1 PITCH, ROLL and YAW sws to engage.
Set ARTIFICIAL FEEL No. 2 PITCH, ROLL and YAW sws to engage.
Observe sws remain engaged.

Engine anti-icing ....AS REQUIRED E

Engine anti-ice must be selected ON after engine start and left on for taxy and take-off whenever the ambient temperature is below +3°C and visibility less than 1000 metres

BRAKE FANS ....ON E

Verify BRAKE FANS sw at ON

GRD IDLE ....LO E

Confirm the ENG 1 and 4 and ENG 2 and 3 sws are at LO.
Observe idle N_2 reduces slightly

Door Lights .... TESTED/OFF E

Observe all DOORS lts are off.
Press and release the DOORS TEST pb.
Observe DOORS lts (red) on then off.

Engine Feed Pumps .... ALL ON E

Set all ENGINE FEED PUMPS sws to ON.

Observe - all ENGINE FEED PUMPS LOW PRESS lts off.
- all ENGINE INLET LOW PRESS lts off. E

(Completely Revised)

Hydraulics .... CHECKED E

Observe green, yellow and blue system contents gauges pointers indicate within green band.

NOTE: After engine start there is a slight drop in level in each reservoir which is caused by the filling of the accumulators.

Observe pumps L/PRESS lts off.

Observe green, yellow and blue system pressure gauges read normal.

Electrics ....CHECKED: GROUND BYPASS E

Observe CSD OIL overheat lts off, CSD OIL DIFF and INLET temperatures are normal.

Observe each KW KVAR meter indicates a normal load of 10-20 kw with 4 generators operating.

Observe GCB MIs show inline.

Lift the guard and set EMERG GEN sel to MANUAL and AC FREQ/ VOLTS rty sel to EMRG PWR.
Observe volts 110-118 and frequency 390-410. SELECTED lt (blue) on, FAIL lt off, KVA meter indicates 0.

Set EMERG GEN sel to GROUND BYPASS
Observe SELECTED lt off.

The Emergency Generator selector is set to GROUND BYPASS to enable the a.c. essential bus bars to be powered by the Emergency Generator, during take-off and landing, under electrical failure conditions.

Observe the auto shed breaker MI shows inline.
Observe d.c. ammeters indicate loads within limits.

There may be a difference between individual meter indications. Normal operating total dc load is approximately 200 A.

Observe BATT AMPS meters indicate within limits and steady or falling slowly, BATT ISOLATE lts are off.

NOTE: A battery charge reading which is low and steady or falling slowly indicates that the battery is in good condition.

omplete Revised)

Ground equipment ....CLEAR P.G

Request ground engineer to verify, disconnection of pre-conditioned air truck and access door closed, disconnection of electrical ground truck and access door closed, disconnection of air start truck and access door closed.

AFTER START CHECK LIST ....COMPLETED P

TAXI CHECK

Visor Nose .... DOWN 5° P

IF ...the visor nose is not at 5 deg.

Set VISOR/NOSE lever to VIS/O.
Observe visor moves downwards uplock lt on then off and VISOR MI reads DOWN.

Set VISOR/NOSE lever to 5 DEG.
Observe nose moves downwards, unlock lt off, NOSE MI reads 5 DEG and 5 DEG L lt remains off.

Brakes ....CHECKED/NORM C

This check is to be made while the aircraft is stationary.

Depress brakes pedals
Set brakes control lever to NORM then to EMERG, observe BRAKES EMERG. lt (amber) on and full scale indicated on dual BRAKES pressure gauge. Set brakes control lever to NORM.

Observe BRAKES EMERG lt off, BRAKES FAIL lt off, dual BRAKES pressure gauge reads 0.

NOTE: Do not allow the brakes lever to dwell between NORM and EMERG as there is a position between these settings where the brakes will be inoperative. Even with continuous movement through this position the aircraft may lurch as the brakes come off then on.

Release the pedals.

Landing/taxi/taxi turn lights ....AS REQUIRED C

If lights required set LIGHTS TAXI-TURN sws to ON.
Observe taxi/turn lights on.

Set LIGHTS LANDING TAXI sws to EXTEND and ON
Observe EXTENDED lt (blue) is on, landing taxi lts on.

C.G. Management ....TRIM TRANSFER E

When starting to taxy with a full fuel load the aircraft's C.G. will be beyond the flight limit, and the M/CG warning lights will be on. Fuel must be transferred forward to achieve the correct CG position before beginning the take-off roll.

If ...tank 11 contains more than requirement
Set tanks 5, 7 and 9 INLET VALVE MAIN sels to SHUT
Verify tank 11 load limit control at take off value
When there is sufficient space in the collector tanks to accept approximately half the excess fuel in tank 11, set tanks 1,2,3 and 4 STANDBY INLET VALVES sws to OPEN.

(Unchanged)

Observe MIs read OPEN.
Set the TRIM TRANS AUTO MASTER sel to FORWARD
Observe tank 11 quantity decreasing

When tank 11 quantity reaches the loadsheet value, set the TRIM TRANS AUTO MASTER sel to OFF and guarded.

NOTE: As the excess fuel in tank 11 is intended for pre take-off purposes, the take-off may not proceed until the tank 11 quantity is correct and total fuel remaining is correct.

Set tanks 1,2,3 and 4 STANDBY INLET VALVES sws to SHUT.
Observe MIs read SHUT.

Set tanks 5,7 and 9 INLET VALVES MAIN sels to AUTO.

IF ...tank 11 contains less than requirement
Verify tank 11 load limit control at take-off value.
Set tanks 5 & 7 Inlet Valves main sels to SHUT.
Set the TRIM TRANS AUTO MASTER sel to REARWARD.
Observe tank 11 INLET VALVES MIs show inline, tank 11 quantity increasing and tank 9 quantity decreasing.

When tank 11 quantity reaches the take off value,
Set the TRIM TRANS AUTO MASTER sel to OFF and guarded.
Set tanks 5 & 7 Inlet Valves main sels to AUTO.

Observe c.g. indicators show the required T/O C of G.

Set tank 11 load limit control to initial supersonic cruise value. Should a taxy back to the ramp, following a PTOTR, be necessary, transfer the PTOTR quantity from 11 back to 9 in order to set tank 11 contents to the refuel schedule quantity.

Flight Instruments .... CHKD/NO FLAGS ALL

Observe no failure flags on flight instruments.
Observe and compare indication of all attitude indicators, HSIs and RMIs.

Flight controls/EFC ....CHECKED/LIGHT OFF C

Observe flight control channel MIs read B and no warning lights.
Apply full left wing down control, then full right wing down control and return to neutral.
Observe that control stiffness is normal and the elevons sensibly follow the control movement to full deflection while the rudders deflect 8 deg. Then all surfaces return to neutral.

Push control column fully forward, then pull fully rearward and return to neutral.

Observe that control stiffness is normal and the elevons sensibly follow the control movement to full deflection then return to neutral.

Hold nosewheel steering handle and push the rudder pedals to full left, then to full right and return to neutral.
Observe that control stiffness is normal and the rudders (2) sensibly follow the control movement to full deflection and return to neutral.

TEMPORARY REVISION
Insert to face 06.12 page 02

REASON FOR ISSUE:

Several recent hydraulic pipe failures are attributed to surge in the pipes caused when the hydraulically driven pumps in Tank 11 are switched on for forward fuel transfer. Prior to the embodiment of modified selector valves, use of the hydraulically driven pumps is to be minimised.

ACTION:-

After the line,

Observe M1s read OPEN,

Delete the next four lines and read,

Set the tank 11 Hydraulic Pumps to OFF.

Set the TRIM TRANS AUTO MASTER sel to FORWARD
Observe tank 11 quantity decreasing

When the tank 11 quantity reaches the loadsheet value, set the TRIM TRANS AUTO MASTER sel to OFF and guard.

Set the tank 11 Hydraulic Pumps to AUTO.

Observe flights control channel MIs read B and no warning lights.

Observe EMERG CONT pb lt off.

Trims ....SET ALL

Set pitch to required take-off setting.
Verify that roll and yaw trims are set at neutral.
Confirm elevon and rudder positions on F.C.P.I.

ENG RATING MODE ....TAKE OFF E

Confirm ENG RATING MODE sws (4) at TAKE OFF
Observe only T/O illuminated on the Rating Annunciator.

Auto ignition ....ON E

Set AUTO IGNITION sws (4) to ON.

Throttles ....CHECKED E

Set all Throttle Master sws to the other selection.
Observe - all THROT lts off
- all engines stable
Set all Throttle Master sws back to original selection.

Drain Mast Heaters ....ON E

Confirm DRAIN MAST HTRS sels (3) ON.

ENG FLIGHT RATING ....CLIMB E

Confirm ENG FLIGHT RATING sws (4) at CLIMB.

Press Static Heaters ....ON E

ADS and STBY Heaters ....TT INHIB/ON E

Set ADS/ENGINE PROBE HEATERS sels (2) to TT INHIB. STBY sw ON.

NOTE: Tt INHIB is selected when the aircraft is on the ground to avoid an overheat condition that could cause false total temperature gauge readings or false TMO warnings.

Observe ADS/ENGINE PROBE HEATERS lts (15) off.

NOTE: At Tt INHIB the Tt lights (2) will be on (yellow) if the temperatue is below plus 15 deg C.

TAXI CHECK

Air Intakes ....CHECKED/SET E

Set the RAMP AND SPILL MASTER sws (4) to AUTO and set the guards.
Verify the LANE rty sels (4) are at the position required for the flight.
Observe lane in use lts (4) (green) agree with the lane selected.

Observe all AIR INTAKE panel lts off except lane in use lts (4) (green).
Observe RAMP and SPILL indicators show 0%.

Observe AUX INLET MIs (4) read OPEN.
Momentarily select Reset on the Intake Diagnostic Panel to clear the display.

Engine Control Schedule ....CHECKED E

Confirm ENGINE CONTROL SCHEDULE sel at AUTO and rty sel at FLYOVER (F/O) or NORMAL

Eng. 4 T/O N1 Limiter ....88% E

Set the ENG 4 T/O N_1 LIMITER to 88%.

Air conditioning ....CHECKED/SET E

Observe BLEED VALVES MIs (4) show inline, bleed pressure gauges (4) indicating approximately 20 psi.

Observe COND VALVE MIs (4) show inline.

Observe JET PUMP MIs (4) show inline.

Observe on TEMPERATURE CONTROL panel MASS FLOW gauges (4) are indicating 0.25 kg/sec. approx.

FUEL LP PROTECTION sw ....ARMED E

Confirm FUEL LP PROTECTION sw at ARMED.
Observe MIs (4) show black.

De-air pumps ....ON E

Set tank 10 DE-AIR pump sw to ON.
Observe de-air MI reads ON.

Set tanks 5A and 7A PUMPS (4) to ON.
Observe PUMPS LOW PRESS lt (yellow) on momentarily then off.

Verify TRANS VALVE 5A-5 sw and 7A-7 sw at SHUT.
Observe 5A-5 and 7A-7 MIs crossline.

NOTE: These TRANS VALVES must remain shut during take-off and climb while tanks 5A and 7A pumps are being used for de-aeration.

(Unchang

Set tank 6 and tank 8 right-hand PUMPS sws to ON
Observe PUMPS LOW PRESS lts (yellow) on momentarily then off.

NOTE: This initiates de-aeration of tanks 6 and 8. No transfer to the collector tanks will occur as tanks 5 and 7 fuel is transferred preferentially.

Set tank 11 DE AIR sw to ON.
Observe PUMPS left hand LOW PRESS lt (yellow) on momentarily then off.

Fuel consumed indication ....CHECKED E

Observe - Fuel Remaining and A/C Weight display decreasing.

Rotate the test knob on each indicator clockwise and hold for 3 seconds.
Observe - associated indicator shows 8s
- Main and Reheat density compensator lights illuminate
- indicators return to normal status with readings increasing.

CAUTION: SHOULD ANY DENSITY COMPENSATOR LIGHT FAIL TO ILLUMINATE ON TEST THE FUEL FLOW SIGNALS FROM THE ASSOCIATED TRANSMITTER MAY BE INACCURATE: REFER TO MEL SECTION 77.

ENGINE FEED PUMPS sws ....ALL ON E

Verify ENGINE FEED PUMPS sws (12) at on.

Fuel crossfeed valves ....SHUT E

Confirm CROSSFEED rty sel (4) are crossline.

Reverse A.S.O.V.s ....CHKD/18°-24° C.E

Set all 4 throttles to idle.

Set both NOZ AIR SOV & WIND DOWN test sels. direct to E and check,

- all 4 Reverse lts. flashing

- all 4 Wind Down lts. on.

NOTE: N_2s may increase or decrease slightly.

Set throttle levers to mid travel
Observe N_{2s} do not increase by more than 6%
Set throttle levers to idle.

Select reverse idle on all 4 engines and check,

- buckets rotate to between 27° and 37° then stop
- Wind Down lts. extinguish
- Reverse lts. continue to flash
- N_2 increases to reverse idle

Cancel reverse by maintaining a steady downward pressure on the reverse levers. The forward baulk will remain engaged until the following action is taken:-

Rotate both test sels. through D to OFF and check,

- buckets return to between 18° and 24°
- reverse lts. extinguish
- reverse levers fully down
- N_2 at idle

NOTE: Position D opens the electrical latch circuit on the ASOVs thus permitting them to re-open.

If ...the Wind Down lt(s) remain out when at position E, carry out the following:-

- set the associated test sel. OFF
- trip, wait 5 secs. then reset the appropriate CB from table 1.
- attempt a further test

TABLE 1

ENG1	REV THRUST ASOV CONT	3-213	G3
ENG2	REV THRUST ASOV CONT	1-213	D7
ENG3	REV THRUST ASOV CONT	1-213	D8
ENG4	REV THRUST ASOV CONT	3-213	G4

If ...the buckets do not move to 27-37 deg.

- set the GROUND IDLE sws to HI

If nil response

- set the SYMMETRIC PAIR of reverse levers to idle/fwd baulk
- set the associated test sel to OFF
- trip, wait 5 secs then reset the appropriate CB from TABLE 1
- attempt a further test.

CAUTION: DO NOT MOVE THE TEST SEL FROM E TO OFF UNTIL THE REVERSE LEVERS ARE DOWN TO THE FORWARD BAULK.

If ...the buckets fail to return to 21° when the test sel is rotated through D to OFF, carry out the following:-

- leave the test sel. at OFF
- trip, wait 5 secs. then reset the appropriate CB from table 2
- reselect D then OFF
- when the buckets are at $21^{\circ} \pm 3^{\circ}$, cancel the reverse selection and attempt a further test.

TABLE 2

ENG1	BUCKET CONT UNIT SUP	14-215	E12
ENG2	BUCKET CONT UNIT SUP	13-215	G14
ENG3	BUCKET CONT UNIT SUP	13-216	C 6
ENG4	BUCKET CONT UNIT SUP	14-216	C 6

If ...the buckets are stuck outside the range 18° - 24° but are within 10° - 27°:-

flight is permitted provided that the take-off performance penalty and the in flight fuel penalty, in sections 5 of the Performance Manual and Cruise Control Manual respectively, are observed.

Engine o/heat...CHECKED E

Set the Overheat test sel. to TCA
Observe - TCA gauges show approx 640°C
- high TCA temp. lights on
- Engine Shut Down Handle lights on
- MWS ENG reds on

TAXI CHECK

Rotate the Overheat test sel clockwise to the next (reset) position.

Observe - TCA guages resume normal indication
- high TCA temp. lights off
- Engine Shut Down Handle lights off
- MWS ENG reds off

Rotate the Overheat test sel to O/HEAT A

Observe - Engine O/heat lights on
- Engine Shut Down Handle lights on
- MWS ENG reds on

Rotate the Overheat Test sel. to the next reset position

Observe - Engine O/heat lights off
- Engine Shut Down Handle lights off
- MWS ENG reds off

Repeat the above test for O/HEAT positions B, C and D

Rotate the Overheat test sel. to OFF

Seats & Harness ....Locked/Power off & Secure ALL

Captain, First Officer and Flight Engineer check seats locked and power off and harness correctly fitted and secure

Cabin/slides ....SECURE/ARMED S

Obtain confirmation from senior cabin crew member that the cabin is secure for take off, all cabin door locking handles are in the fully closed position (checked manually and by reference to the indicators), that the slides are armed and window blinds checked fully up or down.

(Unchanged)

Trim tank Contents ....CHECKED E

Confirm the fuel distribution in the trim tanks is as required by the load sheet.

TAXI CHECK

T/O CG sw ....AS REQUIRED EC

E will - set the switch to NORMAL if the T/O CG is 53.5%

OR - set the switch to 54% if the T/O CG is 54% and check Aft limit index moves 0.5%. rearward.

C will - verify which setting is required.

C.G. position ....CHECKED ALL

E. states the C.G. position from his CG. indicator
C and P observe that their CG.Co indicator reading agrees
All check that the CG position is correct for take-off

CAUTION: TAKE OFF CG POSITION OF 54%
IF FUEL USED ON TAXY EXCEEDS THE PLANNED QUANTITY BY MORE THAN 2000 KGS, TAKE OFF AT CG POSITION OF 54% IS NOT PERMITTED. IN THIS EVENT 1500 KGS MUST BE TRANSFERRED FROM TANK 11 TO TANKS 5 & 7 TO ACHIEVE T/O CG OF 53.5%. T/O CG WARNING SWITCH MUST BE RESET TO NORMAL.

AN EXCESS TAXY CONSUMPTION OF 2000 KGS WILL MORE THAN OFFSET THE PERFORMANCE PENALTY OF USING A T/O CG OF 53.5%. THE PERFORMANCE SPEEDS CALCULATED FOR 54% CG TAKE-OFF ARE TO BE USED WITHOUT ALTERATION.

CAUTION: IF THE INDICATED CG POSITION IS NOT WITHIN THE DEFINED LIMITS, TANK CONTENTS MUST NOT BE ADJUSTED TO CONFLICT WITH THE BALANCE CHART REQUIREMENTS.

TAKE OFF MUST NOT BE ATTEMPTED UNTIL THE REASON FOR THE DISCREPANCY IS ESTABLISHED.

Observe the MWS M/CG lt off

CAUTION: TAKE-OFF MUST NOT BE ATTEMPTED WITH A M/CG LIGHT (RED) ON.

Main transfer pumps ....FOUR ON E

Set tank 5 and tank 7 PUMPS sel and sw to ON
Observe PUMPS LOW PRESS lts (yellow) on momentarily then off.
IF ...tanks 5 and 7 are empty, switch on pumps in tanks 6 and 8.

ANTI-SKID R lts ....OFF E

When taxiing above 10 kts, observe all R lights remain off during gentle braking and when rolling freely.

Cont'd.............

TAXI CHECK

NOTES

One R light on during gentle braking above 10 kts, indicates that one wheel is not rotating normally e.g. a flat tyre, the associated brake is broken or the anti-skid system has failed.

The take-off prohibition when any R light is permanently on, does not apply when the aircraft is operated in accordance with the MEL concession, which allows dispatch with a confirmed indication fault which results in one of the R lights being permanently on.

TAXI CHECKLIST .... COMPLETED E

BEFORE TAKE-OFF CHECK

Briefing ....UPDATED C

Captain ensures that crew are fully briefed on latest requirements for take-off and confirms the transition altitude.

Cabin Crew Call ....3 PRESSES E

Press the STEWARD CALL pb three times.

Landing Lights ....AS REQUIRED P

For every take-off, set the TAXI-TURN lts sws to ON.
IF...main landing lights required,
Set LIGHTS MAIN LANDING sws to EXTEND and ON.
Observe EXTENDED lt is on.

NOTE: The main landing lights provide sufficient illumination but if more light is required the LAND TAXI lights may be used. Some buffet may be experienced with these lights extended in flight.

Transponder ....SET P

Confirm required ATC code displayed.

WHEEL O/HEAT light ....OFF P.E

Observe the WHEEL O/HEAT lt is off.

CAUTION: TAKE OFF MUST NOT BE ATTEMPTED WITH WHEEL O/HEAT LIGHT ON.

OVERLOAD MI ....BLACK E

Observe the OVERLOAD MI shows black.

CAUTION: IF THE OVERLOAD MI IS SHOWING A CLOVERLEAF PATTERN THE ANTI-SKID R LIGHTS MUST BE CAREFULLY MONITORED DURING THE TAKE OFF ROLL. IF AT 10 KNOTS THE R LIGHT (WHITE) IS ON, THE TAKE-OFF MUST BE ABANDONED.

GRD IDLE ....HI E

Set the GRD IDLE, ENG 1-4 and 2-3 sws to HI.

Master Warning ....RECALL/INHIBIT C

Press the RECALL pb.
Observe the master warning lights indicate the accepted system status.

Press the INHIBIT pb.
Observe the INHIBIT lts (2) (amber) on.

BEFORE TAKE-OFF CHECK

IF ...INHIBIT lts off
Brief for take-off with inhibit function inoperative.

T/O MONITOR ....ARMED P

Press to arm the T/O MONITOR pb.

Reheat ....ON E

Set REHEAT sels (4) to RHT using the gang bar
Observe REHEAT selected lts (4) (white) on

Pitch Index ....CHECKED ALL

Verify that the pitch indices are correct for take-off.

Radar ....AS REQUIRED C.P

If radar is required, set TILT sel as required between 0 and 15 deg up.

Press NORM pb lt.
Observe NORM pb lt (white) on, STBY pb lt off.

NOTE: When NORM mode is selected, the beam remains conical for maximum range coverage. NORM corresponds to a normal meterological detection.

IF ...no picture
Set TRANSFER rty sel to 2.

Repeat same procedure as for system 1.

On both radar screens set RANGE rty sel as required (30-100-300).

On both radar screens, adjust INT and RANGE MARKS as required.

NOTES: After changing range, allow 30 seconds for the display to settle down. Do not adjust the intensity unless the display remains too dim. Too high a setting of the INT control will result in "blooming" and severe loss of definition.

At 30 nm only one mark appears, at 25 nm. At 100 nm four marks appear, one every 25 nm. At 300 nm six marks appear, one every 50 nm.

BEFORE TAKE-OFF CHECK LIST ....COMPLETED E

AFTER TAKE-OFF CHECK/CLIMB CHECK

Landing gear ....UP, LIGHTS OFF NEUTRAL P.E.

Observe WHEEL O/HEAT lt off
Set L/GEAR lever to UP
Observe landing gear position indication lts go off at the end of the retraction sequence.

Set L/GEAR lever to NEUTRAL
Observe landing gear position indication lts off.

LANDING/LIGHTS ....OFF/RETRACT P

Confirm - landing lights off and retracted, Extended light off
- landing taxi lights off and retracted, Extended light off

CAUTION: IF BLOW BACK HAS OCCURRED, THE LAMP MUST BE MOTORED BACK TO THE FULLY RETRACTED POSITION.

Master warning ....RECALL C

Press the RECALL pb.
Observe the INHIBIT lts (2) off; the master warning lights indicate the accepted system status.

NOTE: This will indicate any faults that occurred while the system was inhibited and which still exist.

ADS and Stby Heaters ....ON E

Set ADS 1 and ADS 2 sels (2) ON
Observe ADS/ENGINE PROBE HEATERS lts (15) off.

CAUTION: THE ADS 1 AND ADS 2 SELECTORS MUST NOT BE SELECTED TO OFF DURING FLIGHT.

NO SMOKING SIGNS ....OFF E

Set NO SMKG sw to OFF

ENG RATING MODE ....FLIGHT E

Verify ENG RATING MODE sws (4) to FLIGHT.
Observe CLB lt (white) on, T/O lt off, CRS lt off.

(Deletion)

AFTER TAKE-OFF CHECK/CLIMB CHECK

Pressurisation .... CHECKED E

Observe - Ground Pressure Relief Valve shut
- unselected system discharge valves shut
- selected system discharge valves in controlling positions
- cabin rate of climb satisfactory.

Visor Nose .... UP/LOCKED E.P

Set VISOR/NOSE lever to UP.
Observe NOSE MI reads UP, VISOR MI reads UP and unlock lt off.

Altimeters .... SET ALL

Set subscale to required setting.

AFTER TAKE-OFF CHECKLIST .... COMPLETED E

CLIMB CHECK

At M = 0.7

Fuel Transfer .... AFT E

Set Trim Trans Auto Master to REARWARD
Observe - tank 9 pumps LP lights flash on start up
- tank 11 Inlet Valves MIs go in line
- tank 11 LH pump stops.

Set tank 11 De-air sw to OFF
Observe tank 11 LH pump LP light off

Observe - tank 9 contents decreasing
- tank 11 contents increasing
- CG moving aft

When the CG is at 55%.
Set the Trim Trans Auto Master to OFF and guarded
Observe - tank 11 Inlet Valves MIs crossline
- transfer ceases

T/O CG sw .... NORMAL E

Verify that the switch is at NORMAL and set the guard.

Brake Fans .... OFF E

Set the brake fans switch to OFF.

Engine Control Schedule .... NORMAL E

Rotate the Engine Control Schedule sel to NORMAL
Observe - HI schedule lights on
- correct response on N_1 and Area gauges.

(Unchanged)

AFTER TAKE-OFF CHECK/CLIMB CHECK

Secondary Air Doors ....OPEN E

Observe secondary air doors MIs read OPEN

CAUTION: IF THE SECONDARY AIR DOORS ARE NOT OPEN ABOVE MO.95 NACELLE OVERHEATING WILL OCCUR.

Flight Deck Door ....NORMAL E

Set the flight deck door switch to NORMAL

Seat Belt Signs ....AS REQUIRED E

Set the seat belt signs switch to OFF when no longer required.

Taxi Turn Lts..OFF P

When clear of the terminal area, set the TAXI TURN lts sws to OFF.

Climb Check..COMPLETE E

TRANSONIC CHECK

Auxiliary Inlets......................................SHUT E

Before the aircraft speed is greater than M = 0.90
Observe AUX INLET vane MI(s) (4) read SHUT.

Secondary Nozzle...................................... <15 DEG E

Observe the SECONDARY NOZZLE instrument indicates less than 15 deg. Supersonic flight is permitted with bucket angles of up to 27°. See Cruise Control Manual for penalty.

NOTE: Reheat must not be selected on any engine indicating a Secondary Nozzle angle greater than 15 degrees.

If.... the buckets have not moved from the take off position, carry out the following procedure:-

1. Trip the associated REV THRUST ASOV CONT C/B (see table)

ENG 1 REV THRUST ASOV CONT	3.213	G3
ENG 2 REV THRUST ASOV CONT	1.213	D7
ENG 3 REV THRUST ASOV CONT	1.213	D8
ENG 4 REV THRUST ASOV CONT	3.213	G4

2. Wait a minimum of 5 secs after tripping C/B
3. Reset associated C/B.

CAUTION

DO NOT TRIP A REV THRUST ASOV CONT CIRCUIT BREAKER IF THE BUCKET POSITION IS 27° OR MORE.

Reheat..ON E

Advance throttle levers fully.
Select Reheats in symmetric pairs - selected lights on.
Observe fuel flow increase, F_T flags appear and area increase:
Con lights off, MID schedule lights on.
Start clock for reheat timing.

NOTE: Two reheats are the minimum required for transonic acceleration, however due note must be taken of additional fuel usage with one or two reheats failed.

If the total temperature exceeds approx. 80°C before reheat is selected off, the engine will automatically return to the dry climb values of N_2 N_1 and EGT but the reheat system will continue to function normally.

(Deletion)

TRANSONIC CHECK

Fuel transfer ....................................TRANSFERRING AFT E

Set TRIM TRANS AUTO MASTER sel to REARWARD.
Observe tank 11 INLET VALVES MIs (2) inline.

Observe tank 9 contents decreasing towards zero, tank 11 contents increasing towards load limit.

Observe the CG moving rearwards towards the required value.

If ...The CG position approaches within 0.25% of the AFT bug

Set the TRIM TRANS AUTO MASTER sel OFF until the CG position is midway between the FWD and AFT bugs then set the TRIM TRANS AUTO MASTER sel to REARWARD.

Repeat as necessary.

When tank 11 contents equal the load limit initial cruise quantity.
Observe tank 11 INLET VALVES MIs (2) crossline and contents remain at the initial cruise quantity.

Observe tank 5 and tank 7 inlet valves MIs (2) inline.

Observe the contents of tanks 5 and 7 increasing.

NOTE: In the event of tank 5 and/or tank 7 reaching high level the respective inlet valve(s) will shut until the level falls.

When tank 9 contents are approximately zero.
Observe tank 9 PUMPS LOW PRESS lts (2) yellow on.
Observe tank 10 pump LOW PRESS lts (2) off

NOTES: There is a 4 sec. delay between tank 9 Low Pressure lights illuminating and tank 10 pumps starting in order to prevent tank 10 pumps responding to a transient low pressure. Tank 9 low pressure lights remain on until its pumps are switched off or trim transfer is complete.

(Unchan)

Observe the contents of tank 10 decreasing.

When tank 9 LOW PRESS lts (2) (yellow) have been on steady for 20 secs.
Set tank 9 PUMP sels to OFF.

NOTE: The pumps are normally left operating for 20 secs after the LOW PRESS lights are on steady in order to scavenge the tanks.

When tank 10 contents are zero
Observe tank 10 LOW PRESS lts off and tank 5 and tank 7 INLET VALVE MIs show crossline.

Set the TRIM TRANS AUTOMASTER sel to OFF
Observe indicated CG position between 58% and 59.3%.

NOTE: At the completion of the rearward transfer the CG indicator should read between 58% and 59.3%. If the indication is not between these limits the tank 11 INITIAL CRUISE QUANTITY should be checked and the actual CG computed to determine if the CG indicator is in error.

Set the tank 9 and 10 load limit control to 8000 kg
Set the tank 11 load limit control to the load sheet LANDING BALLAST FUEL TANK 11 value.

NOTE: When tank 9 and 10 Load limit control is set to 8000 kg. and the tank 11 load limit control is set to the LANDING BALLAST FUEL TANK 11 value, the trim transfer system is ready for an emergency forward transfer by the TRIM TRANS AUTO MASTER selector providing the associated PUMPS and INLET VALVES selectors are at AUTO. FUEL FWD TRANS SW overrides the load limit control settings.

At M = 1.0

PRESS STATIC HEATERS ....OFF E

Set PRESS STATIC HEATERS sws OFF.

NOTE: The pressurisation static vent heaters should not be operated in supersonic flight as there is a risk of heater damage.

ENGINE ANTI-ICE ....OFF E

Set the engine anti-ice switches to OFF
Observe IGV PRESS lights off.

WING & INTAKE ANTI-ICE ....OFF E

Set the wing and intake anti-ice rty sel to OFF

TRANSPARENCY DE-ICE DEMIST ....OFF P

Verify DV DE-MIST sws OFF, VISOR DE-ICE sws OFF, W/SHIELD DE-ICE sels

At M = 1.1

Secondary Nozzle ....0-5 DEG E

Observe SECONDARY NOZZLE instruments indicate 0-5 deg

For continued supersonic flight with bucket angles between 0° and 27° see Cruise Control Manual section 5 for fuel penalty.

TRANSONIC CHECK

Intake Lanes ....NO.1 TO AUTO A ... E
NO.2 TO AUTO A
NO.3 TO AUTO B
NO.4 TO AUTO B

Rotate the intake lane rotary selector of engines 1 and 2 to AUTO A and engines 3 and 4 to AUTO B. Observe the lane in use lights (green) agree with the selected lanes. This selection avoids the use of control lanes which derive their Mach number from the right hand manometric system, thus avoiding the effects of known differences between the left and right hand systems. Cancel Intake Test Panel lights.

If for any reason the required intake lane is not used during the acceleration from M = 1.1 to the normal cruise Mach number the fact should be logged and reported.

During the acceleration between M = 1.7 and M = 1.95, i.e. with reheat off, the INTAKE PRESSURE RATIO ERROR indicator may show a significant error. The pointer will be to the left of the scale and at temperatures well below ISA the error may be sufficient for the pointer to enter the amber band. As speed is increased toward the normal cruise Mach number the pointer will move progressively back to give a zero error indication.

<u>At M = 1.7</u>

Reheat ....OFF E

At M = 1.7 or when 15 min has elapsed since reheat light up initiated.

Set reheats OFF in symmetric pairs.
Observe engine FUEL flow drops by approximately 35% and FUEL instrument flag reads FE, reheat selected lts off, ENGINE CONTROL SCHEDULE HI lts (white) on, ENGINE CONTROL SCHEDULE MID lts off.

AFCS ....CHECKED CP

Confirm that the same system AP, AT and FD are selected i.e. No.1 AP, No.1 AT and No.1 FD or No.2 AP, No.2 AT and No.2 FD.

<u>WHEN FUEL TRANSFER IS COMPLETE</u>

Fuel tank pressure ....CHECKED E

Above 44,000 feet
Observe the TANK PRESSURE indicator reading slowly increasing.

NOTE: During the climb above 44,000 feet the air pressure in the fuel tanks will slowly increase to a maximum of between 1.2 psi and 1.5 psi.

De-air pumps ....OFF E

Set tank 10 de-air pump and tanks 6 and 8 right hand pumps to OFF.

TRANSONIC CHECK

Tank 5A and Tank 7A ....TRANSFER E

Set TRANS VALVE 5A-5 and 7A-7 sws to OPEN.
Observe TRANS VALVE 5A-5 and 7A-7 MI(s) show inline.

NOTES: This transfer should be made as early as possible after the completion of the trim transfer to prevent excessive kinetic heating of the fuel in tank 5A and tank 7A.

In the event of tanks 5 and/or 7 reaching high level the respective inlet valve(s) will close until the level falls.

When tanks 5A and 7A PUMPS LOW PRESSURE lts (Yellow) come on.
Observe tanks 5A and 7A contents indicators read approximately zero.

When tank 5A and 7A PUMPS LOW PRESS lts (Yellow) have been on for 20 seconds, set PUMPS sws to OFF.
Observe PUMPS LOW PRESS lts off.

NOTE: The pumps are normally left operating for about 20 seconds after the tanks are empty in order to scavenge the tanks.

Set TRANS VALVE 5A-5 sw and TRANS VALVE 7A-7 sw to SHUT.
Observe TRANS VALVE 5A-5 MI and TRANS VALVE 7A-7 MI show crossline.

At FL500

ENG FLIGHT RATING ....CRUISE E

Set ENGINE FLIGHT RATING sws (4) to CRUISE.
Observe CRS lt (white) on, CLB lt off, N1, N2 EGT are sensibly in line.

Intake Lanes ....ALL AUTO A OR B .... E

Set the Intake Lanes to Auto A on outbound sectors and to Auto B on inbound sectors. Cancel Intake Test Panel lights.

TRANSONIC CHECKLIST ....COMPLETED

Fuel and CG management ....DURING CRUISE E

Throughout the cruise phase of flight apply as necessary the conditional procedures, CG Aft of 59%.
Longitudinal Trim
Lateral Trim

Monitor the CG position

NOTE
Subject to the CG being at or forward of 59% the optimum elevon angle is half a degree down.

Monitor the elevon displacement in pitch on the flight control position indicator.

NOTE
Pitch displacement of the elevons increases the aircraft drag. To trim the aircraft longitudinally, fuel is transferred from rear to front tanks or by reduced level operation in tanks 1 & 4, thus allowing the elevons to obtain the optimum position of the half a degree down.

Monitor the elevon displacement in roll on the flight control position indicator.

NOTE
Roll displacement of the elevons increases the aircraft drag. To trim the aircraft laterally, fuel is transferred between left and right wing tanks thus allowing the elevons to return to the roll neutral position.

When tank 5 and 7 PUMPS LOW PRESS lts (yellow) are on or their contents indicators read zero, set tank 6 and tank 8 PUMPS sws (4) to ON.
Observe tank 6 and tank 8 PUMPS LOW PRESS lts (yellow) on momentarily then off.

NOTE
This continues the main transfer. Tank 6 is replenishing tank 1 via the left hand pump and tank 2 via the right hand pump. Tank 8 is replenishing tank 3 via the left hand pump and tank 4 via the right hand pump.

When tank 5 and 7 PUMPS LOW PRESS lts (yellow) have been on for 20 seconds set tank 5 and 7 PUMPS sws (4) to OFF.
Observe PUMPS LOW PRESS lts off.

(Unchanged)

Fuel and CG management ....END OF CRUISE E

When tank 6 or 8 contents indicator reads 4000 kg (or before top of descent).

CRUISE CLIMB

Observe TANKS 1 & 4 sw position

IF ...TANKS 1 & 4 sw not at NORM

Set TANKS 1 & 4 sw to NORM.
Observe TANK 1 & 4 MI reads NORM, tank 1 and tank 4 U/FULL lts (yellow) on.
Observe tank 1 & 4 contents indicators show contents increasing, tanks 1 & 4 U/FULL lts go off when tanks 1 & 4 contents indicators read approximately 3300 kg.

NOTE

If tanks 1 & 4 low level operation has been in use, setting TANKS 1 & 4 switch to NORM arms the tank 1 and tank 4 U/FULL light. The U/FULL light will go off when the underfull level is exceeded.

When tanks 6 and 8 PUMPS LOW PRESS lts (yellow) come on.
Observe tank 6 and 8 contents indicators read approximately zero.

When tanks 6 and 8 PUMPS LOW PRESS lts (yellow) have been on for 20 seconds set PUMPS sws (4) to OFF.
Observe PUMPS LOW PRESS lts off.

When any collector tank contents fall to 2500 kg
Set tank 5 and tank 7 INLET VALVE sels to OPEN.
Observe tank 5 and tank 7 INLET VALVE MIs show inline.

Note tank 11 contents
Set tank 11 left hand and right hand PUMPS sels to ON
When tank 5 and tank 7 contents are greater than 100 kg
Set tank 5 and tank 7 PUMPS sws and sels to ON

NOTES

Maintaining 2500 kg in each collector tank ensures adequate pump performance, even in the event of loss of tank pressurisation.

100 Kg in each tank 5 and 7 is the minimum quantity at which both pumps in each tank are sure to be submerged. Waiting for this quantity ensures that the pumps do not start dry.

Transferring cool fuel from tank 11 through tanks 5 and 7 to the collector tanks ensures adequate pump performance in the event of loss of tank pressurisation.

When CG reaches 57.3%
Set tank 11 left hand and right hand PUMPS sels to AUTO

(Deletion)

TEMPORARY REVISION
Insert facing 06.18 page 02

REASON FOR ISSUE:
To eliminate risk of pipe damage due to pump scavenging

ACTION:

Immediately after the first NOTE ignore the line

"When tanks 6 and 8 PUMPS LOW PRESS lts (yellow) come on"

and read in its place:-

When tanks 6 contents read 100 kg or immediately tank 6 left hand PUMPS LOW PRESS lt (yellow) on

Set tank 6 left hand PUMPS sw to OFF

When the tank 6 right hand and tank 8 PUMPS LOW PRESS lts (yellow) come on.

CRUISE CLIMB

Set tank 5 and 7 INLET VALVE sws and sels to AUTO

Observe FUEL TANK PRESSURE indicator reading 1.2 PSI or greater.

NOTE

Normal supersonic cruise operation can be continued, provided the fuel tank pressure is greater than 1.2 psi until any collector tank content reduces to 1000 KG.

DECELERATION AND DESCENT

Warning and Landing Display ....CHECKED C.P

Press and hold the captains warning and landing display TEST pb.
Observe AP light (red), AT light (red), ILS boundaries exceedence warnings (white), aircraft symbol (amber) and LAND 2 and LAND 3 lts (green) and DH lt (amber) on.
Observe, on first officer's warning and landing display, AP light (red) AT light (red) ILS boundaries excedence warnings (white) and aircraft symbol (amber) on.
Observe brief audio warning (cavalry charge) and captain's and first officer's AUTOLAND lt (red) on.
Release TEST pb.

Repeat the test on the first officer's warning and landing display.

NOTE
The two Warning and Landing displays must not be tested simultaneously.

Briefing ....STATED C

Review with crew the briefing sheets, procedures and drills relating to the approach and landing and confirm transition level.

Safety Height ....CHECKED ALL

All crew members check the safety height for each leg of the descent and ensure that adequate terrain clearance is maintained at all times.

ASI bugs ....SET ALL

Set ASI bugs for landing.

Harness ....SECURE ALL

All crew members ensure their safety harnesses are fastened and checked for freedom.

AT THE DECELERATION POINT

ENGINE RECIRCULATION VALVES sws ....OPEN E

Prior to but not more than 5 minutes before retarding the throttle levers set ENGINE RECIRCULATION VALVES sws (4) to OPEN.

Throttles ....ISA-10 deg C or warmer 18 DEG C.E
ISA-11 deg C or colder 24 DEG

Observe the temperature deviation from ISA

IF ...temperature warmer than ISA-10 degrees C
Retard the throttles (4) to 18 degrees

IF....temperature colder than ISA-11 degrees C
Retard the throttles (4) to 24 degrees

NOTE

The throttle lever position of 18 deg or 24 deg, depending on temperature, is necessary to ensure adequate surge margins at speeds greater than M = 1.6.

Tanks 1 & 4...NORM E

Confirm that TANKS 1 & 4 sw is at NORM.

Tank 11 Electric Pumps..................................OFF E

Set both electric pumps to OFF to prevent CG moving forward too quickly

Fuel transfer..................................TRANSFER FWD E

Set tank 9 + 10 load limit sel to landing value

Observe the CG position and Mach number.

IF....The CG is forward of or equal to 57.5% and
speed is above M = 1.5
Wait until the speed reduces to M = 1.5

IF....The CG is rearward of 57.5% and the speed is above
M = 1.5
Set the TRIM TRANS AUTO MASTER sel to FORWARD
Observe the CG moves forward
When the CG reaches 57.5%.
Observe the Mach number

IF....the speed is above M = 1.5
Set the TRIM TRANS AUTO MASTER to OFF
Wait until the speed reduces to M = 1.5.

Verify the TRIM TRANS AUTO MASTER sel at FORWARD
Observe the CG moves forward
When the CG reaches 55%
Observe the Mach number

IF....The speed is above M = 0.93
Set the TRIM TRANS AUTO MASTER sel to OFF until
the speed reduces to M = 0.93
Then providing a subsonic cruise leg is not
planned set the TRIM TRANS AUTO MASTER to FORWARD

When tank 9 contents equal the preset load limit
Observe tank 9 INLET VALVE MIs (2) show crossline and
tank 5 and tank 7 INLET VALVE MIs show inline.

When contents of tank 5 and tank 7 are over 100 Kg
Verify tank 5 and tank 7 PUMPS sels and sws to ON
Control tank 5 and tank 7 PUMPS to achieve equal quantities
in the collector tanks.

Verify tank 11 contents are equal to the preset landing
ballast quantity.

TEMPORARY REVISION
Insert to face 06.19 page 02

REASON FOR ISSUE:

Several recent hydraulic pipe failures are attributed to surge in the pipes caused when the hydraulically driven pumps in Tank 11 are switched on for forward fuel transfer. Prior to the embodiment of modified selector valves, use of the hydraulically driven pumps is to be minimised.

ACTION:

Replace the action

TANK 11 ELECTRIC PUMPS ....OFF E

by

TANK 11 HYDRAULIC PUMPS .... OFF E

DECELERATION AND DESCENT

Observe tank 5 and tank 7 INLET VALVE MIs show crossline
Set the TRIM TRANS AUTO MASTER sel to OFF.

Observe the CG is forward of 53.8%

When tank 5 and tank 7 LOW PRESS lts (yellow) have been on steady for 20 seconds
Set tank 5 and tank 7 PUMPS sels and sws to OFF.

ENG FLIGHT RATING ... .CLIMB E

Set ENG FLIGHT RATING sws (4) to CLIMB.
Observe CLB lt (white) on, CRS lt off.

Throttles ....34 DEG C.E

At M = 1.6

Retard the throttles (4) to 34 degrees

NOTE
The throttle lever position of 34 deg ensures adequate airconditioning flows at speeds greater than M = 1.0.

Throttles ....IDLE C.E

At M = 1.0

Retard the throttles (4) to idle.

NOTE
During the latter stages of the descent and subsequent approach it is possible that rapid movement of the throttles may cause transient operation of the auto ignition system. This will cause the RH IGN and LH IGN lights and the associated START PUMP light to come on momentarily.

Pressurisation ....SET E

On SYS 1 cabin alt sel, rotate knob B to set curser to QNH.
Rotate knob A to set destination airfield height
Rotate knob R to set cabin rate of descent, white dot is 400 ft/min.

PRESS STATIC HEATERS ....ON E

At M = 1.0 or before descent if subsonic

Verify PRESS, STATIC HEATERS sws (2) at ON.

TRANSPARENCY DE-ICE DEMIST ....ON P

At M = 1.0 or before descent if subsonic

DECELERATION AND DESCENT

Set W/SHIELD DE-ICE sels (2) to LOW.
Observe O/HEAT lts (2) off.

Set VISOR DE-ICE sws (2) to ON.
Observe O/HEAT lts (2) off.

NOTE
The visor heater operates only when the visor is locked up.

Set DV DE-MIST sws (2) to ON.
Observe O/HEAT lts (2) off.

DECELERATION AND DESCENT CHECK LIST ....COMPLETED E

APPROACH CHECK

Landing Briefing ....UPDATED C

Update the landing briefing as necessary.

Taxi Turn Lts ....ON P

For every approach, set the TAXI TURN lts sws to ON.

RAD/INS sws ....RAD ALL

Set both RAD/INS sws to RAD.
Observe on both HSI that RAD and MAG displayed.

Altimeters ....SET/CROSS CHECKED ALL

Standby flags clear
Set bugs to ILSH DH and airfield elevation
Set QNH and cross check settings.

Radio altimeter ....DH SET ALL

Set decision height DH on bugs and crosscheck.

Flight Deck Door sw..OPEN E

Set the F/D DOOR sw to OPEN.

CABIN SIGNS ....ON

Set FASTEN SEAT BELT sw and the NO SMOKG sw to ON.

Emergency Lights ....ARM E

Confirm the LIGHTS EMERG sel is at ARM

ENG RATING MODE ....TAKE OFF E

Set ENG RATING MODE sws to T/OFF.
Observe T/O lt (white) on, CLB lt off.

Visor/Nose ....DOWN, 5 DEG E.P

Set the Visor/Nose lever to VIS/O
Observe - visor moves downwards
- unlock light on then off
- visor MI reads DOWN
- 5 deg Lock light is off

CAUTION: THE SIMULTANEOUS SELECTION FROM VISOR UP TO NOSE 5° IS PROHIBITED IN FLIGHT UNLESS THE LIMITATION FOR NOSE AT DOWN IS OBSERVED.

Set the Visor/Nose lever to 5 DEG
Observe - nose moves downwards
- unlock light on then off
- nose MI reads 5 DEG
- 5 deg Lock light remains off.

(Unchanged)

Brake Fans ....ON E

Set the Brake Fans sw to ON.

APPROACH CHECK

ENGINE RECIRCULATION VALVES ....SHUT E

Set ENGINE RECIRCULATION VALVES sws to SHUT

ENGINE CONTROL SCHEDULE ....APPROACH E

Rotate ENGINE CONTROL SCHEDULE sel to APPROACH
Observe - correct response on N_1 and Area gauges
- MID lts on.

NOTE: The MID engine control schedule is used for noise abatement during approach to touchdown.

ENGINE FEED PUMPS ....ALL ON E

Verify all ENGINE FEED PUMPS sws at ON.
Observe ENGINE FEED PUMPS LOW PRESS lts OFF.

Fuel crossfeed valves ....SHUT E

Verify CROSSFEED rty sels at crosslined position
Observe CROSSFEED MIs show crossline.

CAUTION: THIS ACTION MUST BE DELETED WHEN THE PROCEDURE "MANAGEMENT WITH ABNORMALLY LOW FUEL QUANTITY" IS BEING USED.

SSB ....AS REQUIRED E

The SSB must be open for cat 3 landings.
The following limitations apply:-

1. All BTBs closed.
2. Three or more main generators serviceable.
3. When one main generator is off-line, the Emergency Generator must be started by MANUAL selection and its voltage and frequency checked within limits (110-118V, 390-410 Hz).

BATT sels ....AS REQUIRED E

The Battery selectors must be set to ESS/MAIN SPLIT for cat 3 landings.

Fuel/weight/CG ....CHECKED E

Update landing data card fuel and weight figures as required.
Verify CG within the landing limits.

ASI BUGS ....SET ALL

Update the ASI bug settings as required.

Seats ....LOCKED: PWR OFF ALL

All crew check seats locked and power off.

QNH ....SET ALL

Verify QNH set on both main altimeters and crosscheck readings.

Autopilot changeover ....CHECKED C

With both autopilots engaged.
Disengage AP1 sw and observe AP1 lt off and AP2 remains engaged and operating.
Observe on both Warning and Landing displays LAND 3 lt off and LAND 2 lt (green) on.
Set AP1 sw to engage and observe AP1 lt (green) on and sw remains at engaged position.
Observe on both Warning and Landing displays LAND 3 lt (green) on, if electrics split.

NOTE: On re-engagement of AP1 it will engage in the LAND mode provided at lease one flight director is engaged.

APPROACH CHECKLIST ....COMPLETED E

LANDING CHECK

Landing Gear ....DOWN 4 GREENS ALL

Move the guard to the left and set the L/GEAR lever to DOWN. Observe LH, NOSE, T and RH arrow lts (green) (4) on and LH SHORT, RH SHORT, UPPER LOCKS and transit lts off at end of the lowering sequence.

NOTE: Before extending the landing gear by normal control the visor uplock must be released to restore the green system hydraulic supply to the landing gear and door selectors.

Cabin Crew Call ....3 PRESSES E

Press the STEWARD CALL pb 3 times to indicate that landing is imminent.

Nose ....DOWN, GREEN E.P

Set VISOR/NOSE lever to DOWN,
Observe 5 DEG L lt on then off, unlock lt on then off, down lt (green arrow) on, NOSE MI reads DOWN.

Brakes .... CHECKED/NORM P

Verify the brakes lever is at NORM.
Press and release brake pedals.
Observe BRAKES FAIL lt off.

NOTE: This test will confirm that normal brake pressure is available.

Anti-skid ....CHECKED E

Observe brakes ANTI-SKID R lts (white) on

NOTE: The anti-skid system allows brake applications before touchdown if all eight release (R) lights are on.

If ...one R lt off on any one landing gear.
Apply brakes only after touchdown and use with care to prevent burst tyres.

NOTE: NORMAL brake system can still be used with three R lights off.

If ...four or more R lts off, apply procedure USE OF EMERG BRAKES.

Radar ....STANDBY E

Press the STBY pb.

AUX INLET MIs ....OPEN/CROSS HATCHED E

Observe AUX INLET MIs read OPEN or show crosshatched.

SECONDARY AIR DOORS sels ....SHUT E

When the speed is less than 220 knots

Set SECONDARY AIR DOORS sels (4) to SHUT
Observe SECONDARY AIR DOORS MIs (4) read SHUT

NOTE: This prevents the secondary air doors cycling, should the aircraft speed vary around M = 0.26 on the approach.

Yellow System ....CHECKED E

Observe - YELLOW hydraulic system PUMPS MIs (2) read ON
- YELLOW system contents and pressure normal.

Landing/landing taxi/taxi turn lights ....AS REQUIRED C

If lights required
Set LIGHTS MAIN LANDING sws (2) to ON and EXTEND (2).
Observe EXTENDED lt (blue) on.

If additional lighting required
Set LIGHTS LANDING TAXI sws (2) to ON and EXTEND (2)
Observe EXTENDED lt (blue) on.

NOTE: Some buffeting may be experienced with the landing/taxi lights extended in flight.

LANDING CHECKLIST ....COMPLETED E

(Unchanged)

AFTER LANDING CHECK

MASTER WARNING ....INHIBIT C

Press the INHIBIT pb.

GRD IDLE sws .... LO E

Set ENG 1-4 and ENG 2-3 GRD IDLE sws to LO
When clear of runway and at taxiing speed shut down inboard engines to reduce thrust, if system status permits.

RAMP SPILL MASTER sws .... MAN E

Set the RAMP/SPILL MASTER sws (4) to MAN

NOTE
This prevents random indications of failure should the electrical supply to the air intake system be interrupted.

AUTO IGNITION ....OFF E

Set the AUTO IGNITION sws (4) to OFF

PRESS STATIC HEATERS ....OFF E

Set the PRESS STATIC HEATERS sws (2) to OFF.

ADS AND STBY HEATERS ....OFF E

Set the ADS1 and ADS2 probe heater sels to OFF and the STBY sw to OFF.

DRAIN MAST HTRS ....AS REQUIRED E

Set the DRAIN MAST HTRS sels (3) as required.

WING & INTAKE ANTI-ICING ....OFF E

Verify WING AND INTAKE ANTI-ICING MAIN sel OFF, ALTERN sel OFF.
Observe INT lts (2) off, CYCLIC lts (2) off.

W/SHIELD EMERGY DE-ICE sws ....OFF/GUARDED E

Verify the W/SHIELD EMERGY DE-ICE LEFT and RIGHT sws at OFF and guard in position.

FLIGHT CONTROL INVERTERS ....OFF INV P

Set BLUE INVERTER sel to OFF INV and observe flight control channel MIs (8) read G. Set GREEN INVERTER sel to OFF INV.
Observe flight control channel MIs (8) read M.

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AFTER LANDING CHECK

NOSE ....5 DEG E.P

Set VISOR/NOSE lever to 5 deg.
Observe 5 deg L lt on then off, NOSE MI reads 5 deg, unlock lt on then off, down lt off.

LANDING/LANDING TAXI/TAXI TURN LIGHTS .... AS REQUIRED C

Set LIGHTS MAIN LANDING sws to and set LIGHTS. LANDING TAXI sws as required, set LIGHTS TAXI-TURN sws (2) as required.

TRANSPONDER .... STANDBY E

Set ATC mode sel to STBY.

PRESSURISATION ....CHECKED E

Observe GROUND PRESSURE RELIEF VALVE MI reads OPEN and SYS 1 and SYS 2 discharge valves position indicators FWD and AFT at OPEN.

SSB ....CLOSED E

Verify the SSB sw at CLOSE

BATTERIES .... ON E

Verify the battery sels (2) at BATT ON

BRAKES TEMP lts.................................... CHECKED E

Observe the BRAKES TEMP FWD and REAR lts (red)(8) are on.

Press each BRAKES TEMP FWD and REAR lt in turn.
Observe temperature when lt pressed.

NOTES

If any reading differs significantly from the others (either above or below) the affected brake must be inspected in accordance with the Maintenance Manual instructions before the next flight.

The non illumination of a BRAKES TEMP light and an abnormally low brake temperature indicate lack of braking on that wheel.

SLIDES ....DISARMED E

Just prior to arriving on chocks make the PA call "Will cabin crew set doors to DISARM now".

TANK 9 SHUT DOWN FUEL .... 4000 KG E

Observe tank 9 contents are 4000 kg or more

(Deletion)

AFTER LANDING CHECK

NOTE

4000 kg in tank 9 ensures stability of the aircraft during unloading of payload and crew.

IF ...tank 9 contents less than 4000kg and fuel is available in tanks 1,2,3 and 4

Verify tank 11 INLET VALVES MIs show crossline
Verify JETTISON MASTER VALVES MIs show crossline
Set tanks 9 INLET VALVES MAIN sel to OPEN
Set tanks 1,2,3 and 4 jettison valves sws to OPEN
Observe tank 9 contents increasing

When tank 9 contents reach 4000 kg
Set tanks 1,2,3 and 4 jettison valves sws to SHUT
Set tank 9 INLET VALVES MAIN sels to AUTO

NOTE

If fuel is not available to increase tank 9 contents to 4000 kg, on first contact with ground request message given to duty officer that tank 9 contents are less than 4000 Kg.

AFTER LANDING CHECKLIST ....COMPLETED E

PARKING CHECK

BRAKES ....PARK C

Set brakes control lever to PARK.
Observe dual BRAKES pressure gauge indicating full scale and BRAKES EMERG lt (amber) on.

LANDING LIGHTS ....OFF/RETRACT

Set the LIGHTS MAIN LANDING, LANDING TAXI and TAXI TURN to RETRACT and OFF. C

EMERGENCY GENERATOR .... AUTO E

Set the Emergency Generator selector to AUTO to prevent the generator attempting to run as Engine No.1 is shut down.

VISOR/NOSE .... UP P

Set VISOR/NOSE lever to UP.
Observe nose then visor move upwards, unlock lt on then off, NOSE MI reads UP, VISOR MI reads UP.

GROUND POWER ....ON E

Observe GRND PWR AVAILABLE lt (white) on.

Set ground power sw to CLOSE and release and generator sels of live generator(s) to off

HP VALVES .... SHUT E

Retard THROTTLE LEVERS (4) to idle. Set HP VALVE sws (4) to SHUT
Observe HP MIs (4) read SHUT, engine(s) run down.

If... engine does not run down
Set LP VALVE sel to SHUT 1 or SHUT 2.

NOTE
When the LP VALVE is used to shut the engine down from idle, up to 20 secs may elapse before an engine run down is positively indicated.

THROTTLE MASTERS .... OFF E

Set THROTTLE MASTER sels (4) to OFF,
Log N1, and N2 overlimit pointer position if limits exceeded.

ANTI-COLLISION LIGHTS............................ OFF E

Set LIGHTS ANTI-COLN sw to OFF.

FASTEN SEAT BELTS .... OFF E

Set FASTEN SEAT BELTS sw to OFF.

PARKING CHECK

ENGINE ANTI-ICING ... .OFF E

Verify ENGINE ANTI-ICING sws (4) OFF.

IGNITION ....OFF E

Verify the ignition rty sel to OFF.

GROUND CONDITIONING ....AVAILABLE E.G

Observe BLEED VALVES MIs (4) show crossline. Set BLEED VALVES sws (4) to shut.

Observe COND VALVE MIs (4) show crossline. Set COND VALVE sws (4) to OFF.

Request ground staff connect pre-conditioned air truck.

TRANSPARENCY DE-ICE, DEMIST ....OFF C

Verify WINDSHIELD DE-ICE sels at OFF.
Verify VISOR DE-ICE sws at OFF
Verify DV DE-MIST sws at OFF.

FUEL PANEL ....GROUND STATE E

Verify fuel panel in ground state, i.e.

Tank 9 INLET VALVE MAIN sels at AUTO, O/RIDE sels at OFF
Tank 9 PUMP sels at OFF
Tank 10 DE-AIR sw at OFF
Tank 10 PUMP sels (2) at OFF
TRIM TRANS AUTO MASTER sel at OFF and guarded
Tank 11 INLET VALVES MAIN sels at SHUT, O/RIDE sels at OFF
Tank 11 PUMP sels (4) at AUTO
Tank 11 DE-AIR sw at OFF
STANDBY INLET VALVES sws (9) at SHUT
Tanks 5A and 7A PUMPS sws at OFF
TRIM PIPE DRAIN sw at SHUT
TRANS VALVE 5A-5 and 7A-7 sws at SHUT
Tanks 5 and 7 PUMPS sels at OFF and guarded
Tanks 5 and 7 PUMPS sws at OFF
Tanks 5 and 7 INLET VALVE MAIN sels at AUTO, O/RIDE sels at OFF
Tanks 6 and 8 PUMPS sws at OFF
INTER CON VALVE (6-7) and (5-8) sws at SHUT
ENGINE FEED PUMPS sws (12) at OFF
Fuel jettison transparent covers shut and JETTISON MASTER VALVES MIs (2) crossline.

BATTERIES ....BATT OFF E

Set battery sels (2) to BATT OFF.
Observe BATT ISOLATE lts (2) (amber) on, battery MIs (4) show crossline, MWS ELECT lt (amber) operates.

REASON FOR ISSUE:

See TR facing 6.11 page 2.

After the item "Landing Lights ....OFF/RETRACT .... C"
complete the following new item:-

EMERG GENERATOR sel ....AUTO ....E

The selector was set to GROUND BYPASS during the After Start check to enable the Emergency Generator to power the a.c. essential bus bars, under electrical failure conditions, during take-off and landing. It is reset to AUTO at this stage to prevent the Generator attempting to run as no. 1 engine is shut down.

Proceed with the remainder of the checklist items from,
"Visor Nose ....As required ....P", to completion.

PARKING CHECK

INS .... POST FLT INFO E

Mode Selector must remain in NAV.

Enter ramp co-ordinates as waypoint. Select TEST/AUTO/MAN. Switch to MAN. to prevent auto sequencing beyond waypoint. Select WYPT CHG. Press O and the waypoint number of the ramp co-ordinates. Press INSERT button. Select DIST/TIME. The distance is the terminal error of the INS and is used with the block time to extract the drift rate from the chart. Select DSTRK/STS; this will give the direction of the drift. Key 1 and INSERT. Repeat the above procedure for INS in unaided mode. Press TEST button to obtain any malfunction codes present. Record all data on the reverse side of the Fuel Flight Plan.

CHOCKS ....IN POSITION C.G

Request ground crew to confirm aircraft wheel chocks in position.

BRAKES ....NORM C

When chocks in position. Set BRAKES lever to NORM. Observe BRAKES EMERG lt off, dual brakes pressure gauge reads 0.

BRAKE FANS ....AS REQUIRED E

Observe WHEELS O/HEAT lt

IF ...WHEELS O/HEAT lt off
Set BRAKE FANS sw to OFF.

RADIATION METER ....NOTED E

Record millirems reading displayed on counter.

NOTE

After each flight the millirems reading displayed on the counter is logged.

ITEM ....CHECKED E

Read the stored failures
Cancel any failures known to be spurious or caused by faulty procedures.

INS ....RELOAD (TRANSIT) P.E

Set each MSU to STBY then ALIGN. Load Present Position into each INS.
Set each MSU to OFF if the flight deck will be left unattended

PARKING CHECKLIST ....COMPLETED E

STOPOVER CHECK

This check must be performed whenever the planned turnround time is greater than 4 hours.

Air data computers ....OFF E

Set ADC1 and ADC2 sws to OFF.
Observe flags visible on associated instruments.

INS ....OFF E

Set INS 1, INS 2 and INS 3 mode sels to OFF.

Radar...OFF E

On both radar screens.
Set IND OFF-LEFT-AHEAD-RIGHT rty sel to IND OFF.

Press OFF pb lt on radar controller.
Observe OFF pb lt (white) on.

Flight control inverters ....PWR OFF P

Move the guard and set BLUE INVERTER sel to PWR OFF. Observe FAIL lt (red) on. Move the guard and set GREEN INVERTER sel to PWR OFF and observe FAIL lt (red) on.

Emergency lights ....OFF E

Set LIGHTS EMERG sel to OFF.
Observe sel lt (yellow) on.

NOTE

The OFF position is selected before normal shutdown of electrical power. This isolates the battery supplies in the lighting units and prevents the emergency lights from coming on when ground power is removed thus preventing discharge of the lighting unit batteries.

ENGINE VIBRATION SUPPLY ....OFF E

Set the ENGINE VIBRATION SUPPLY sel to the centre, off, position.

OXYGEN ....OFF E

Press and rotate the CREW SUPPLY rty sel to OFF.

Ground power ....AS REQUIRED E

Set ground power sw to TRIP and release.
Observe GRND PWR AVAILABLE lt on, cockpit panels are electrically dead.

Master c/bs ....TRIP E

Trip the Master c/bs identified by white surround markings.

STOPOVER CHECK

NOTE
The Master c/bs are tripped, while the aircraft is on the ground, to reduce rack heating and prolong instrument life. The Master c/bs are located in the bottom left corner of the following panels:

2.213	13.215	14.215
	13.216	14.216

STOPOVER CHECKLIST ....COMPLETED E

(Unchanged)

FLIGHT ENGINEER'S LEAVING PANEL CHECK

Before leaving the flight deck in flight, the Flight Engineer must perform a scan check of his panel excluding the leg panels, and then complete the following items by check list.

Cabin temperature .... STABLE

Observe the duct and cabin temperatures are stable

C.G. .... CHECKED

Observe that the CG is stable at the correct position for the phase of flight.

Trim Transfer .... CHECKED

Confirm that the TRIM TRANS AUTO MASTER sel is at OFF and guarded. Confirm the TANKS 1 & 4 sw is as required.

Confirm that the tanks, 5,7,9 and 11 INLET VALVE MAIN and O/RIDE sels are at AUTO and OFF respectively and their associated MIs show crossline.

Confirm that tanks, 9, 10 and 11 PUMPS sel are at AUTO

Fuel Transfer .... SAFE

Set both pumps sw/sel of each main transfer tanks, 5,6 7 and 8 that contains fuel to ON. Confirm that each collector tank is being supplied with fuel.

Engine Feed Pumps .... ALL ON

Set the ENGINE FEED PUMPS sws (12) to ON.
Observe the ENGINE FEED PUMPS LOW PRESS lts (12) and ENGINE INLET LOW PRESS lts (4) are off.

Crossfeed .... SHUT

Set the CROSSFEED rty sels (4) to shut
Observe the associated MIs show crossline and ENGINE INLET LOW PRESS lights (4) remain OFF.

Jettison System .... VALVES SHUT/COVER CLOSED

(Deletion)

Confirm that the tanks 1,2, 3 and 4 jettison valve sws are at SHUT, the JETTISON MASTER VALVES sels (2) are at SHUT.
Observe all associated MIs (6) show crossline
Confirm the transparent covers are closed

Emergency Generator .... NORMAL/GROUND BYPASS

Confirm the EMERG GEN NORM/ISOL sw is at NORM and guarded.
Confirm the EMERG GEN sel is at GROUND BYPASS

EMERGENCY/ABNORMAL DRILLS

POWER PLANT

FUEL SYSTEM

Unchanged

British airways

LIST OF CONTENTS

FLIGHT CONTROLS

HYDRAULIC POWER

NAVIGATION

ELECTRICAL

LANDING GEAR

LIST OF CONTENTS

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GENERAL

The drills and checklist contained in this chapter are a reprint of those published in the Emergency and Abnormal Drills booklet.

Where no drills are published for abnormal situations the contents list refers to Section 3 and is annotated with a †

Emergency checklists are identified by titles printed on a black background. Abnormal checklists are identified by black printed titles surrounded by a continuous line.

Flight Operations Division Orders, Section 1, Page 7.7.5, paragraph 6.3., requires that Captains ensure that in any emergency all passengers are briefed on the emergency action they should take.

DRILL PRESENTATION

MEMORY ITEMS

Memory items are those shown above a heavy broken line.

START POINTS

Where several start points are possible they are annotated thus "●▶". Normally each alternative will run to an END// or APPLY PROCEDURE:, however, in certain cases, where the start point is defined by a phase of flight and the drill may continue into the following phase, it will end CONTINUE//.

Example: ●▶ DURING TRANSONIC ACCELERATION (CG 55% OR REARWARD)

CONTINUE WITH NORMAL FUEL HANDLING BUT OBSERVE THE FOLLOWING ....E

1. STOP THE CLIMB IF ELEVON ANGLE EXCEEDS 3° UP.
2. STOP REARWARD TRANSFER IF ELEVON ANGLE EXCEEDS 2° DOWN AT SPEEDS GREATER THAN M = 1.3.
3. IF THE CLIMB IS INTERRUPTED, STOP FUEL TRANSFER AND RESTART WHEN THE CLIMB IS CONTINUED.

CONTINUE//

●▶ DURING SUPERSONIC CRUISE

ADJUST TANK QUANTITIES TO MAINTAIN AN ELEVON ANGLE BETWEEN O AND 1° DOWN ....E

ADDITIONAL ACTIONS

Where additional actions may be required the clue to the additional action is underlined and annotated as in the following example:-

BATTERY sel .... BATT ON .... E

<u>IF BATTERY AMMETER OFF SCALE</u>

BATTERY sel .... BATT OFF .... E

TRU NORM/ISOL sws .... NORM .... E
DC VOLTS sel .... AFFECTED BUSBAR .... E

ALTERNATIVE PATHS

Where a drill splits into two or more paths, each of which contains its own terminating statement the clue to each path is under lined and annotated as in the following example:-

SERVO CONTROLS YELLOW rty sel ... YELLOW BLUE OR
YELLOW GREEN C

<u>IF YELLOW LEVEL FALLS</u>

WHEN SYSTEM ISOLATION OCCURS
APPLY PROCEDURE : LOW HYDRAULIC PRESSURE
AT FLYING CONTROLS

<u>IF BLUE OR GREEN LEVEL CONTINUES TO FALL</u>
HYD PUMPS OF AFFECTED SYSTEM .... OFF .... E
RELAY JACK sel .... NORMAL C

END//

OMITTED ALTERNATIVE PATH

Where it is obvious that an ALTERNATIVE PATH would lead directly to an END// without any further drill actions it has been omitted for clarity of drill and presentation. A simplified example is shown below:-

$\boxed{\text{EGT INSTRUMENT LIGHT ON}}$

THROTTLE MASTER .... OTHER LANE .... E

IF EGT INSTRUMENT LT IS OFF
CONTINUE WITH NORMAL FLIGHT

END//

OMITTED FOR CLARITY

IF EGT INSTRUMENT LT REMAINS ON

EGT AND N_2 ....MAINTAIN WITHIN LIMITS .... E

END//

CHECKLIST APPLICATION

The check list must be read from the beginning and continued until a START POINT or ALTERNATIVE PATH is reached. Select the START POINT or ALTERNATIVE PATH appropriate to the conditions and continue to an END// or APPLY PROCEDURE//.

When an END// is reached the drill actions are complete, however, all NOTES & CAUTIONS at the end of the total drill presentation must be read and complied with, where applicable.

In the case of the obvious omitted END// the NOTES & CAUTIONS must also be read and complied with, where applicable.

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EMERGENCY/ABNORMAL DRILLS

EMERGENCY

POWER PLANT	ENGINE FIRE, OVERHEAT OR SEVERE DAMAGE	07.01.01
	FOUR ENGINE FLAME OUT ABOVE M = 1.2	07.01.03
	FOUR ENGINE FLAME OUT BELOW M = 1.2	07.01.05
FLIGHT CONTROLS	SERVO CONTROL SPOOL VALVE JAM CONTROL COLUMN JAM IN PITCH OR ROLL	07.03.01
HYD	LOW HYDRAULIC PRESSURE AT FLYING CONTROLS	07.04.01
NAV	DISCREPANCY BETWEEN ADC 1 AND ADC 2	07.05.02
	LOSS OF SECOND ADC	07.05.03
ELECTRICAL	FAILURE OF FOUR MAIN GENERATORS	07.06.01
	FAILURE OF THREE MAIN GENERATORS	07.06.05
LANDING GEAR	LANDING WITH ABNORMAL LANDING GEAR CONFIGURATION	07.07.01
AIR COND. AND PRESS	RAPID DEPRESSURIZATION	07.10.01
	EMERGENCY DESCENT	07.10.02
FIRE PROTECTION	SMOKE WARNING FREIGHT HOLD FIRE	07.13.01
	AIR CONDITIONING SMOKE CABIN FIRE	07.13.02
	ELECTRICAL SMOKE OR FIRE	07.13.03
MISC	EMERGENCY LANDING	07.14.01
	PASSENGER EVACUATION ON LANDING	07.14.02
	DITCHING	07.14.03
	GPWS PULL-UP WARNING	07.14.05

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EMERGENCY/ABNORMAL DRILLS

ABNORMAL

(Unchang

EMERGENCY/ABNORMAL DRILLS

EMERGENCY/ABNORMAL DRILLS

ABNORMAL

ELECTRICAL	AC MAIN BUS LIGHT ON	07.06.06
	AC ESS BUS LIGHT ON	07.06.08
	EMERG GEN O/HEAT LIGHT ON	07.06.09
	EMERG GEN FAIL LIGHT ON	07.06.09
	FAILURE OF ONE OR TWO GENERATORS	07.06.09
	DC ESS BUS LIGHT ON	07.06.10
	DC MAIN BUS LIGHT ON	07.06.10
	CSD LIGHT ON	07.06.11
	CSD OIL INLET TEMP LIGHT ON	07.06.11
	CSD HIGH DIFFERENTIAL TEMPERATURE	07.06.11
	BATT ISOLATE LIGHT ON	† 03.06.16
	TRU OVERHEAT LIGHT ON	† 03.06.17
	GENERATOR FAILS TO PARALLEL	† 03.06.18
	MANUAL PARALLEL	† 03.06.20
L/GEAR	LANDING GEAR STANDBY LOWERING	07.07.12
	MAIN GEAR-FREE FALL	07.07.13
	NOSE GEAR-FREE FALL	07.07.14
	WHEELS O/HEAT LIGHT ON IN FLIGHT	07.07.15
	USE OF BRAKES IN EMERG	07.07.16
	L/G ABNORMAL IND. AFTER UP SELECT	†03.07.12
	UPPER LOCKS LIGHT ON IN FLIGHT	†03.07.13
	LOSS OF NOSEWHEEL STEERING	†03.07.14
	HIGH ENERGY STOP	†03.07.15
	BRAKES OVERLOAD MI SHOWS WHITE	†03.07.16
VISOR/NOSE	VISOR/NOSE UNLOCK LIGHT ON	07.08.01
	NOSE 5° L LIGHT ON	07.08.01
	VISOR/NOSE STANDBY LOWERING (VISOR UP TO NOSE 5°)	07.08.02
	NOSE STANDBY LOWERING (5° TO DOWN)	07.08.03
	VISOR/NOSE FREE FALL	07.08.04
	VISOR FAILS TO RISE	† 03.08.08
AIR CONDITIONING & PRESSURIZATION	SHUTDOWN OF AIR CONDITIONING GROUPS	07.10.03
	BOTH FWD EXTRACT FLOW LIGHTS ON	07.10.04
	RH OR LH FWD EXTRACT FLOW LIGHT ON	07.10.05
	REAR EXTRACT FLOW LIGHT ON	07.10.06
	FAILURE OF WINDOWS	07.10.07
	CABIN EXCESS PRESSURE	07.10.09
	NAC/WING O/HEAT LIGHT ON	07.10.10
	DUCT LIGHT ON	07.10.11
	ABNORMAL RATE OF CLIMB AFTER TAKE-OFF	† 03.10.13
	BLEED OVERPRESSURE AND/OR OVERPRESS LIGHT ON	† 03.10.14
	PRIM EXCH LIGHT ON	† 03.10.15
	SEC EXCH LIGHT ON	† 03.10.16
	LOSS OF AUTOMATIC TEMPERATURE CONTROL	† 03.10.17
	BLEED VALVE MALFUNCTION	† 03.10.18
	LEAK LIGHT ON	† 03.10.19
	COMPARATOR LIGHT ON	† 03.10.20
	FUEL/AIR EXCHANGER OVERHEAT	† 03.10.21
	LOSS OF MASS FLOW	† 03.10.22

ABNORMAL

ICE & RAIN	ANTI-ICING LEFT & RIGHT INT & CYCLIC LIGHTS ON	07.12.01
	ANTI-ICING INT LIGHT ON	07.12.02
	ANTI-ICING CYCLIC LIGHT ON	07.12.03
	MAST LIGHT ON	†03.12.07
	W/SHIELD DE-ICE O/HEAT LIGHT ON	†03.12.08
	VISOR DE-ICE O/HEAT LIGHT ON	†03.12.09
	DV DEMIST O/HEAT LIGHT ON	†03.12.10
	ADS ENGINE PROBE HEATER	†03.12.11
	WINDSHIELD EMERGENCY DE-ICING	†03.12.13
F.PROT	WHEEL BRAKE FIRE	07.13.06
	FLAME SENSOR LIGHT ON	07.13.06
	FIRE SENSOR LIGHT ON	†03.13.03
MISC	AMBER RADIATION LIGHT ON	07.14.06
	RED RADIATION LIGHT ON	07.14.06
	MWS HEALTH MONITOR	†03.14.03
	DOORS WARNING WITH AIRCRAFT PRESSURISED	†03.14.04

(Unchanged)

ENGINE FIRE, OVERHEAT OR SEVERE DAMAGE

AUDIO	CANCEL	E
ENGINE SHUT DOWN HANDLE	PULL	E

WHEN FIRE FLAPS LT ON (OR HANDLE PULLED + 7 SEC)

1 SHOT	PRESS	E

IF ENGINE SHUT DOWN HANDLE LT FLASHING AFTER 30 SECS

2 SHOT	PRESS	E

SPEED	SUBSONIC	C
ADJACENT ENGINE THROTTLE MASTER	MAIN	E
AUTO THROTTLE MASTER	OFF	E
CSD	DISC	E

IF FIRE PERSISTS

CLEAN UP DRILL	APPLY IMMEDIATELY	E
APPROPRIATE WARNINGS	RESET	E
SYSTEM FAILURE PROCEDURES	APPLY	E

END//

CLEAN UP DRILL

AUTO IGNITION	OFF	E
HP VALVE	SHUT	E
THROTTLE LEVER	IDLE	E
REHEAT	OFF	E
ENGINE RECIRCULATION VALVE	OPEN	E
SECONDARY AIR DOORS	SHUT	E
BLEED VALVE	SHUT	E
CROSS BLEED VALVE	SHUT	E
LP VALVE	SHUT	E
HYD PUMP(S)	SHUT	E
APPROPRIATE WARNING	RESET	E
SYSTEM FAILURE PROCEDURES	APPLY	E

(Deletion)

PRECAUTIONARY ENGINE SHUT DOWN

AUTO THROTTLE MASTER	OFF	E
THROTTLE	IDLE	C
HP VALVE	SHUT	E
ADJACENT ENGINE THROTTLE MASTER.......	MAIN	E
GENERATOR	OFF	E
REHEAT	ALL OFF........	E
SPEED	SUBSONIC	C
SYSTEM FAILURE PROCEDURES	APPLY	E

END//

THROT LIGHT ON

CAUTION

WITH REVERSE THRUST SELECTED DO NOT CANCEL REVERSE UNTIL THE THROT LIGHT IS OFF OR THE ENGINE HAS BEEN SHUT DOWN.

THROTTLE MASTER .... OTHER LANE .... E

IF THROT LT REMAINS ON

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

ENGINE FLAME OUT

● ▶ IF HP VALVE MI READS SHUT

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

● ▶ IF HP VALVE MI READS OPEN

THROTTLE MASTER .... OTHER LANE ..... E

APPLY PROCEDURE: ENGINE IN-FLIGHT START

FOUR ENGINE FLAME OUT

ABOVE M=1.2

FUEL FWD TRANS sw	O/RIDE	C
TANK 9 & TANK 10 PUMP sels	VERIFY OFF	E
SERVO CONTROLS YELLOW rty sel	YELLOW GREEN	C
ENGINE FEED PUMPS	ALL ON	E
FWD EXTRACT FANS	ALL ON	E

— — — — — — — — —

THROTTLES	IDLE	C
HP VALVES	SHUT	E
AUTO IGNITION	OFF	E
ENGINE FUEL FEED	CHECK	E
TRIM TRANSFER	CHECK	E
START RELIGHT sels	RELIGHT	E

<u>30 SECS AFTER CLOSURE OF HP VALVES</u>

HP VALVES	OPEN	E

ON ANY ENGINE THAT FAILS TO RELIGHT WITHIN 20 SECS.

HP VALVE	SHUT	E

<u>IF ALL ENGINES FAIL TO RELIGHT</u>

<u>AT APPROXIMATELY M = 1.20</u>

TANK 9 INLET VALVES O/RIDE sels	OPEN	E
TANK 11 GREEN AND BLUE PUMP sels	ON	E
TRIM TRANS AUTO MASTER sel	OFF	E
FUEL FWD TRANS sw	GUARDED	E
RAM AIR TURBINE	DEPLOY	E
REAR EXTRACT STANDBY FAN	ON	E
EMERG GEN	MANUAL	E
AIR INTAKE LANE rty sel	1 & 3 TO A 2 & 4 TO B	E
AIR INTAKE HYD sel	1 TO GREEN 3 TO BLUE 2 & 4 TO YELLOW	E
THROTTLE MASTERS	MAIN	E
F/O ASI AND ALTIMETER	STANDBY MODE	P
ADC 2	OFF	P
EMERG RELIGHT BUSBAR	2	E
ENGINE FUEL FEED	CHECK	E
TRIM TRANSFER	CHECK	E

(Deletion)

contd.

FOUR ENGINE FLAME OUT ABOVE M = 1.2 (continued)

30 SEC AFTER CLOSURE OF HP VALVES
NO 2 ENGINE HP VALVE .... OPEN .... E

CONCURRENT

IF NO.2 ENGINE FAILS TO RELIGHT IN 20 SEC
NO.2 ENGINE HP VALVE .... SHUT .... E
EMERG RELIGHT BUSBAR .... 4 .... E
NO.4 ENGINE HP VALVE .... OPEN .... E

IF NO.4 ENGINE FAILS TO RELIGHT IN 20 SEC
NO.4 ENGINE HP VALVE .... SHUT .... E

REPEAT FOR ENGINES 3 & 1, AND THEN AS NECESSARY

DURING RELIGHT ATTEMPTS
MONITOR MANUAL FORWARD TRANSFER TO ACHIEVE A CG OF 53.5%

IF ALL ENGINES FAIL TO RELIGHT

AT M = 0.90
SERVO CONTROLS BLACK rty sel .... GREEN ONLY ... C

DITCHING & EMERGENCY LANDING DRILLS .. REVIEW ..... ALL
RELIGHT ATTEMPTS .... CONTINUE ..... E

WHEN VISOR/NOSE LOWERING REQUIRED
USE VISOR/NOSE STANDBY LOWERING

AT 10,000 FT
CAPTAINS ASI AND ALTIMETER .... STANDBY MODE . C
ADC 1 .... OFF .... P
SPEED .... 270 KT C
EMERG GEN .... ISOL .... E
RAMP/SPILL MASTERS .... MAN .... E

IF LANDING GEAR LOWERING REQUIRED
LOWER LANDING GEAR USING LANDING GEAR STANDBY LOWERING

BRAKES .... EMERG C

APPROACH SPEED .... 250 KT C
MINIMUM LANDING SPEED .... 200 KT C

END//

(Unchanged)

FOUR ENGINE FLAME OUT

BELOW M=1.2

RAM AIR TURBINE	DEPLOY	E
TANK 9 INLET VALVE O/RIDE sels	OPEN	E
TANKS 5 7 & 11 INLET VALVES O/RIDE sels	SHUT	E
TANK 11 PUMP GREEN AND PUMP BLUE sels	ON	E
SERVO CONTROLS YELLOW rty sel	YELLOW GREEN	C
SERVO CONTROLS BLACK rty sel (IF LESS THAN M = 0.90)	GREEN ONLY	C
ENGINE FEED PUMPS	ALL ON	E

REAR EXTRACT STANDBY FAN	ON	E
EMERG GEN	MANUAL	E
AIR INTAKE LANE rty sel	1 AND 3 TO A 2 AND 4 TO B	E
AIR INTAKE HYD sel	1 TO GREEN 3 TO BLUE 2 AND 4 TO YELLOW	E
THROTTLES	IDLE	C
HP VALVES	SHUT	E
AUTO IGNITION	OFF	E
THROTTLE MASTERS	MAIN	E
F/O ASI AND ALTIMETER	STANDBY MODE	P
ADC 2	OFF	P
START RELIGHT sels	RELIGHT	E
EMERG RELIGHT BUSBAR	2	E
ENGINE FUEL FEED	CHECK	E
TRIM TRANSFER	CHECK	E

<u>30 SEC AFTER CLOSURE OF HP VALVES</u>

NO.2 ENGINE HP VALVE	OPEN	E

CONCURRENT

<u>IF NO.2 ENGINE FAILS TO RELIGHT IN 20 SEC</u>

NO.2 ENGINE HP VALVE	SHUT	E
EMERG RELIGHT BUSBAR	4	E
NO.4 ENGINE HP VALVE	OPEN	E

<u>IF NO.4 ENGINE FAILS TO RELIGHT IN 20 SEC</u>

NO.4 ENGINE HP VALVE	SHUT	E

REPEAT FOR ENGINES 3 & 1, AND THEN AS NECESSARY.

DURING RELIGHT ATTEMPTS

MONITOR MANUAL FORWARD TRANSFER TO ACHIEVE A CG OF 53.5%

contd.

FOUR ENGINE FLAME OUT BELOW M = 1.2 (continued)

IF ALL ENGINES FAIL TO RELIGHT

AT M = 0.90
SERVO CONTROLS BLACK rty sel .... GREEN ONLY C

DITCHING & EMERGENCY LANDING DRILLS .. REVIEW ...... ALL
RELIGHT ATTEMPTS .... CONTINUE ...... E

IF THE VISOR IS DOWN
VISOR/NOSE STBY CONTROL sw .... VISOR LOWER ... P

IF VISOR/NOSE LOWERING REQUIRED
LOWER VISOR/NOSE USING VISOR/NOSE STANDBY LOWERING
and/or
NOSE STANDBY LOWERING

AT 10,000 FT
CAPTAINS ASI AND ALTIMETER .... STANDBY MODE.. C
ADC 1 .... OFF .... P
SPEED .... 270 KT C
EMERG GEN .... ISOL .... E
RAMP/SPILL MASTERS .... MAN .... E

IF LANDING GEAR LOWERING REQUIRED
LOWER LANDING GEAR USING LANDING GEAR STANDBY LOWERING

BRAKES .... EMERG C

APPROACH SPEED .... 250 KT C
MINIMUM LANDING SPEED .... 200 KT C

END//

ENGINE IN-FLIGHT START

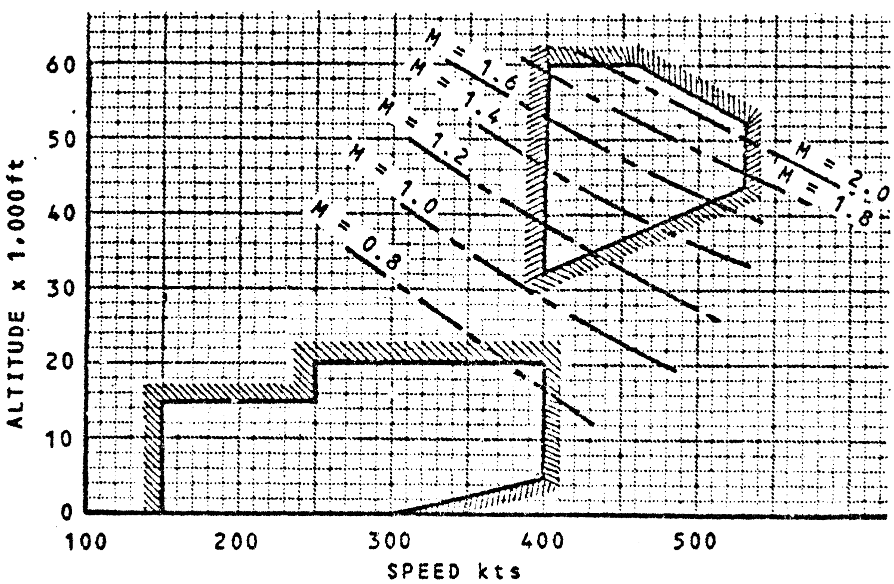
THROTTLE .... IDLE C
HP VALVE .... SHUT .... E
AUTO IGNITION .... OFF .... E
ENGINE FEED PUMPS .... ON .... E
START RELIGHT sel .... RELIGHT .... E

30 SEC AFTER CLOSURE OF HP VALVE
HP VALVE .... OPEN .... E

IF THE ENGINE FAILS TO RELIGHT IN 20 SEC
HP VALVE .... SHUT .... E
ATTEMPT FURTHER RELIGHTS AT LOWER ALTITUDE
OR HIGHER SPEED
(SEE RELIGHT ENVELOPE)

WHEN THE ENGINE IS STABILISED
START RELIGHT sel .... OFF .... E
START PUMP LT .... OFF .... E
SYSTEMS .... RE-ESTABLISH .. E

END//



RELIGHT ENVELOPE

NOTE: Relights may be attempted outside the envelope but may not be successful.

The best area for relight attempts outside the envelope is within 375-400 kt at altitudes below 45000 ft.

(Unchanged)

ENGINE HIGH OIL TEMP LIGHT ON

WITH FUEL TEMPERATURE LESS THAN 70°C

ENGINE RECIRCULATION VALVE ...... OPEN .... E

SPEED .... SUBSONIC C

OIL TEMP .... MONITOR .... E

IF OIL TEMPERATURE STABILIZING AT LESS THAN 190°C

SPEED .... SUBSONIC C

END//

IF OIL TEMPERATURE GREATER THAN 195°C OR
REMAINS ABOVE 190°C FOR 5 MINUTES

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

WITH FUEL TEMPERATURE GREATER THAN 70°C

FUEL HEATER .... OFF .... E

OIL TEMP .... MONITOR .... E

IF OIL TEMPERATURE STABILIZING AT LESS THAN 190°C

CONTINUE WITH NORMAL FLIGHT

END//

IF OIL TEMPERATURE RISING TOWARDS LIMITING VALUES

ENGINE RECIRCULATION VALVE ...... OPEN .... E

SPEED .... SUBSONIC C

OIL TEMP .... MONITOR .... E

IF OIL TEMPERATURE STABILIZING AT LESS THAN 190°C

SPEED .... SUBSONIC C

END//

IF OIL TEMPERATURE GREATER THAN 195°C OR
REMAINS ABOVE 190°C FOR 5 MINUTES

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

REHEAT LIGHT ON

(Reheat not in use)

● ▶ WITH FUEL FLOW FLAG SHOWING F_E
CONTINUE NORMAL FLIGHT

END//

● ▶ WITH FUEL FLOW FLAG SHOWING F_T
AUTO THROTTLE MASTER .... OFF .... E
THROTTLE .... IDLE C
HP VALVE .... SHUT .... E
ADJACENT ENGINE THROTTLE MASTER . MAIN .... E
GENERATOR .... OFF .... E
LP VALVE .... SHUT .... E
CSD .... DISC .... E
COND VALVE .... OFF .... E
SPEED ....SUBSONIC......... C
SYSTEM FAILURE PROCEDURES .... APPLY .... E

END//

REHEAT FAILS TO CANCEL

IF FUEL FLOW DOES NOT REDUCE

REHEAT SYSTEM A.C. C/Bs .... TRIP .... E

A.C. CIRCUIT BREAKERS

CIRCUIT BREAKER	PANEL	GRID REF
ENG 1 REHEAT AMP SUP	14-215	C12
ENG 2 REHEAT AMP SUP	13-215	B14
ENG 3 REHEAT AMP SUP	13-216	B7
ENG 4 REHEAT AMP SUP	14-216	D7

END//

INADVERTENT REVERSE THRUST

REV LT FLASHING OR ON STEADY WITH FORWARD THRUST SELECTED

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUTDOWN

INADVERTENT FORWARD THRUST

REV LT FLASHING OR OFF WITH REVERSE THRUST SELECTED

REVERSE THRUST .... CANCEL C

IF REV LT ON STEADY OR FLASHING

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

IF REV LT OFF AND SECONDARY NOZZLE INDICATOR SHOWS LESS THAN 27°

CONTINUE NORMAL FLIGHT BUT DO NOT USE REVERSE THRUST ON ASSOCIATED ENGINE

END//

EGT INSTRUMENT LIGHT ON

THROTTLE MASTER .... OTHER LANE ..... E

IF EGT INSTRUMENT LT REMAINS ON

EGT AND N_2 .... MAINTAIN WITHIN LIMITS .... E

END//

CAUTION

IF THE EGT INSTRUMENT LIGHT IS ON AND THE EGT INDICATION HAS FAILED AND N_2 FALLS BELOW 70% RETARD THROTTLE LEVER TO IDLE AND LEAVE AT IDLE.

DO NOT USE REVERSE THRUST ON ASSOCIATED ENGINE.

ENGINE RELIGHT ATTEMPTS WITH THE EGT INSTRUMENT LIGHT ON ARE ONLY PERMITTED IF THE ASSOCIATED EGT INDICATOR IS WORKING SATISFACTORILY.

INTAKE HYD LIGHT ON

AFFECTED INTAKE .... YELLOW .... E

IF INTAKE HYD LT REMAINS ON
RAMP/SPILL MASTER .... MAN .... E

- APPLY PROCEDURE : INTAKE LIGHT ON

(Deletion)

INTAKE LIGHT ON

AIR INTAKE LANE rty sel .... A .... E

IF INTAKE LT REMAINS ON
AIR INTAKE LANE rty sel .... B .... E

IF INTAKE LT REMAINS ON
RAMP/SPILL MASTER .... MAN .... E

IF NO ASSOCIATED MAIN SYSTEM LOW PRESSURE
AND/OR LOW LEVEL WARNING
AFFECTED INTAKE .... BLUE/GREEN ..... E

REHEAT .... ALL OFF .... E

IF SPEED GREATER THAN M = 1.50
SPEED .... REDUCE TO M=1.50.C
AFFECTED INTAKE/ENGINE .... MAINTAIN
POINTER BETWEEN
AMBER BANDS .... E

IF SPEED IS AT OR LESS THAN M = 1.50
AFFECTED INTAKE/ENGINE .... IDLE C
SPEED .... SUBSONIC C

AT M = 1.30
RAMP .... 0% .... E
SPILL .... 0% .... E

IF RAMP & SPILL DOORS AT 0%
CONTINUE WITH NORMAL DESCENT

END//

IF RAMP & SPILL DOORS NOT AT 0%
AFFECTED INTAKE/ENGINE .... IDLE C

CAUTION
DO NOT USE REVERSE THRUST IN FLIGHT
ON AFFECTED INTAKE/ENGINE

(Unchanged)

contd.

INTAKE LIGHT ON (continued)

AT M = 0.60
RAMP POSITION FOR AFFECTED INTAKE/
ENGINE .... OBSERVE .... E

IF RAMP POSITION GREATER THAN 50%
CONTINUE WITH NORMAL DESCENT BUT KEEP AFFECTED INTAKE/ENGINE AT IDLE

END//

IF RAMP POSITION LESS THAN 50%
ENGINE CONTROL SCHEDULE .... LO .... E

IF LO NOT OBTAINED
CONTINUE WITH NORMAL DESCENT BUT KEEP AFFECTED INTAKE/ENGINE AT IDLE

END//

IF LO OBTAINED
AFFECTED INTAKE/ENGINE .... MOVE THROTTLE SLOWLY C

END//

CAUTION

ON LANDING IF RAMP POSITION GREATER THAN 20% LIMIT REVERSE THRUST TO REVERSE IDLE ON AFFECTED INTAKE/ENGINE. IF RAMP WITHIN RANGE 0-20% NORMAL REVERSE THRUST MAY BE USED.

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AUX. INLET MI FAILS TO READ OPEN

- ▶ SPEED IS GREATER THAN 200 KT
  CONTINUE NORMAL FLIGHT

  CONTINUE//

- ▶ SPEED IS LESS THAN 200 KT
  N_2 .... REDUCE TO LESS THAN 85% C

  END//

AUX. INLET MI FAILS TO READ SHUT

IF DURING THE EARLY PART OF THE TRANSONIC ACCELERATION

ENGINE SURGE OCCURS
OR
INTAKE PRESSURE RATIO ERROR SIGNIFICANTLY OUT OF LINE WITH OTHER ENGINES AT SPEEDS GREATER THAN M = 1.30
OR
P_7 INDICATION SIGNIFICANTLY LOWER THAN OTHER ENGINES

SPEED .... REDUCE TO LESS THAN M = 0.95 .. C

END//

INTAKE INCIDENCE SIGNAL FAILURE LIGHT ON

INTAKE .... IDENTIFY .... E
LANE .... OTHER AUTO POSITION .... E

IF α FAILURE LT REMAINS ON
MAINTAIN 1G INCIDENCE WHEN SPEED IS GREATER THAN M = 1.80 WHEREVER POSSIBLE

END//

INTAKE N_1 SIG AND/OR LANE LIGHT ON

LANE .... NON AUTO POSITION TO AGREE WITH LANE IN USE LT ...... E

IF N_1 SIG LT REMAINS ON
MAINTAIN FIXED THROTTLE LEVER ANGLE ON AFFECTED ENGINE WHEN SPEED IS GREATER THAN M = 1.80 WHEREVER POSSIBLE

END//

IF LANE AND N_1 SIG LTS OFF
LANE .... AUTO POSITION TO AGREE WITH LANE IN USE LT . E

END//

N_1 REDUCE LIGHT ON

THROTTLE MASTER .... OTHER LANE .... E

IF N_1 REDUCE LT REMAINS ON
INTAKE .... OTHER AUTO POSITION ...... E

IF N_1 REDUCE LT REMAINS ON
SPEED .... DO NOT EXCEED M = 1.95 C

END//

FUEL FILTER LIGHT ON

CAUTION
WITH THE FUEL FILTER LIGHT ON
A LOSS OF ENGINE POWER MAY OCCUR.

ENGINE RECIRCULATION VALVE .... SHUT .... E
ENGINE FUEL TEMPERATURE .... OBSERVE .... E

IF ENGINE FUEL TEMPERATURE ABOVE + 70°C
CONTINUE WITH NORMAL FLIGHT

END//

IF ENGINE FUEL TEMPERATURE BELOW + 70°C
FUEL HEATER .... ON .... E

WHEN ENGINE FUEL TEMPERATURE ABOVE + 70°C
FUEL HEATER .... OFF .... E
ENGINE FUEL TEMPERATURE .... MONITOR .... E

END//

ENGINE INLET LOW PRESS LIGHT ON

ENGINE FEED PUMPS .... ON .... E
ENGINE RECIRCULATION VALVE .... SHUT .... E

END//

HIGH FUEL TEMP LIGHT ON

ENGINE FUEL HEATER .... OFF .... E
ENGINE FUEL TEMPERATURE .... OBSERVE .... E

IF ENGINE FUEL TEMPERATURE REDUCING
CONTINUE WITH NORMAL FLIGHT

END//

IF ENGINE FUEL TEMPERATURE INCREASING
ENGINE RECIRCULATION VALVE .... OPEN .... E
SPEED .... SUBSONIC C
ENGINE FUEL TEMPERATURE .... MONITOR .... E

IF ENGINE FUEL TEMPERATURE LESS THAN 150°C
SPEED .... REMAIN SUBSONIC. C

END//

IF ENGINE FUEL TEMPERATURE GREATER THAN 150°C FOR 2 MIN
OR EXCEEDS 170°
APPLY PROCEDURE : PRECAUTIONARY ENGINE SHUT DOWN

END//

ENGINE ANTI-ICING MALFUNCTION

● ▶ IGV PRESS LT ON WITH ENGINE ANTI-ICING OFF

ENGINE ANTI-ICING sw .... CYCLE ON/OFF ... E

IF IGV PRESS LT REMAINS ON
UNRESTRICTED ENGINE OPERATION PERMITTED, BUT WITH TOTAL TEMPERATURE GREATER THAN 80°C AND N_2 GREATER THAN 96% DAMAGE MAY OCCUR TO THE No 1 BEARING VIBRATION PICKUP CABLE

END//

● ▶ IGV PRESS LT OFF WITH ENGINE ANTI-ICING ON

▶ IF THROTTLE AT IDLE
N_2 .... INCREASE BY 10% .... E

IF IGV PRESS LT OFF WITH THROTTLE ABOVE IDLE
LEAVE ICING CONDITIONS AS SOON AS POSSIBLE

END//

NOZZLE LIGHT ON NOT ASSOCIATED WITH ADC FAILURE

(ENGINE CONTROL SCHEDULE rty sel AT NORMAL ABOVE M = 1.0)

● ▶ <u>WITH ALL ENGINE CONTROL SCHEDULE LTS INDICATING CORRECT SCHEDULE OPERATION</u>

N_2, N_1 AND EGT .... MONITOR DURING SUPERSONIC CRUISE .... E

<u>IF A SYMMETRIC PAIR OF ENGINES EXCEED OPERATING CRUISE RATINGS AT STATIC TEMPERATURES COLDER THAN - 51°C</u>

THROTTLE MASTERS .... OTHER LANE .... E

END//

● ▶ <u>WITH A SYMMETRIC PAIR OF ENGINE CONTROL SCHEDULE LTS INDICATING INCORRECT SCHEDULE OPERATION</u>

THROTTLE MASTERS .... OTHER LANE .... E

END//

● ▶ <u>WITH ALL ENGINE CONTROL SCHEDULE LTS INDICATING INCORRECT SCHEDULE OPERATION</u>

ENGINE CONTROL SCHEDULE .... ABOVE 220 KT HI E
BELOW 220 KT LO E

N_2, N_1 AND EGT .... MONITOR DURING SUPERSONIC CRUISE .... E

<u>IF ENGINES EXCEED OPERATING CRUISE RATINGS WHEN CRUISING AT STATIC TEMPERATURES COLDER THAN - 51°C.</u>

THROTTLES .... RETARD TO OBSERVE CRUISE RATINGS .... E

END//

ENGINE VIBRATION AMBER WARNING LIGHT ON

FRONT VIBRATION WARNING

IF ENGINE MALFUNCTION OR GENERAL AIRCRAFT VIBRATION OBSERVED

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

IF NO EVIDENCE OF ENGINE MALFUNCTION

N_2 .... REDUCE BY 10% .. E

IF INDICATED VIBRATION LEVEL DOES NOT REDUCE WITH N_2

RETURN TO NORMAL ENGINE HANDLING .... E

END//

IF INDICATED VIBRATION LEVEL REDUCES WITH N_2

N_2 .... ADJUST UNTIL VIBRATION BELOW 5 ... E

IF INDICATED VIBRATION GREATER THAN 5 INS/SEC WITH THROTTLE AT IDLE

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

REAR VIBRATION LEVEL GREATER THAN 4 INS/SEC

REHEAT .... OFF .... E
VIBRATION WARNING .... RESET .... E

END//

(Unchanged)

CONTINUOUS ENGINE SURGE ABOVE M=1.3

CAUTION
IF AT ANY TIME DURING SURGE AN UNUSUALLY RAPID RISE IN EGT OCCURS IMMEDIATELY SHUT DOWN ENGINE

ATTITUDE MAINTAIN

THROTTLES	IDLE	C
THROTTLE MASTERS	ALL OTHER LANE.	E
FUEL FWD TRANS sw	O/RIDE	C
AIR INTAKES	ALL OTHER LANE.	E
INTAKE HYDRAULICS	ALL YELLOW	E
REHEAT	ALL OFF	E

IF SURGING CONTINUES

ENGINE CONTROL SCHEDULE	LO	E
ENGINES	IDENTIFY	E
RAMP	INCH TO 70%	E
SPILL	INCH TO 50%	E

IF SURGING CONTINUES

HP VALVE	SHUT	E
ADJACENT ENGINE THROTTLE MASTER	MAIN	E
AUTOTHROTTLE MASTER	OFF	E
RAMP	INCH TO 100%	E
SPILL	INCH TO 100%	E

IF SURGE STOPS AFTER INITIAL ACTIONS

ADVANCE THROTTLES SINGLY, IF NO SURGE OCCURS RETURN TO FLIGHT PLAN

SHOULD SURGE OCCUR DURING THROTTLE ADVANCE.
RETURN THROTTLE TO IDLE. REDUCE SPEED TO SUBSONIC.
WHEN SPEED LESS THAN M = 1.30 ADVANCE THROTTLE.
IF SURGE OCCURS VERIFY RAMP AT 0% AND SPILL AT 0%.
USE HIGHEST SURGE FREE POWER AVAILABLE
END//

IF SURGE STOPS AFTER 70% RAMP AND 50% SPILL OBTAINED

REDUCE SPEED TO SUBSONIC WHEN SPEED LESS THAN M = 1.30 INCH RAMP TO 0% AND SPILL TO 0%. RETURN ENGINE CONTROL SCHEDULE SELECTOR BACK TO AUTO CONTINUE FLIGHT AT SUBSONIC SPEED USING THROTTLE AS REQUIRED.
END//

IF ENGINE SHUT DOWN

REDUCE SPEED TO SUBSONIC WHEN SPEED M = 1.30 INCH RAMP TO 0% AND SPILL TO 0% RETURN ENGINE CONTROL SCHEDULE SELECTOR TO AUTO. RELIGHT ENGINE, IF SURGE OCCURS WHEN ADVANCING THROTTLE AFTER ENGINE RELIGHT, USE HIGHEST SURGE FREE POWER AVAILABLE.
END//

CONTINUOUS ENGINE SURGE AT OR BELOW M=1.3

CAUTION
IF AT ANY TIME DURING SURGE AN UNUSUALLY RAPID RISE IN EGT OCCURS IMMEDIATELY SHUT DOWN ENGINE

ENGINE .... IDENTIFY ...... E
THROTTLE .... IDLE C
THROTTLE MASTER .... OTHER LANE .... E
AIR INTAKE .... OTHER LANE .... E
INTAKE HYDRAULICS .... YELLOW .... E
REHEAT .... ALL OFF .... E

IF SURGE CONTINUES

RAMP .... INCH TO 0% .... E
SPILL .... INCH TO 0% .... E

IF SURGE CONTINUES

RAMP SPILL MASTER .... AUTO .... E
APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

END//

IF SURGE OCCURS DURING THROTTLE ADVANCE
AFTER CORRECTIVE ACTIONS, VERIFY RAMP AT 0% SPILL
AT 0%,USE HIGHEST SURGE FREE POWER AVAILABLE.

END//

ENGINE MALFUNCTION NOT ASSOCIATED WITH THROT LIGHT ON

THROTTLE MASTER .... OTHER LANE ...... E

IF CONDITION PERSISTS SUBSEQUENT ACTIONS ARE DEPENDENT ON FAILURE MODE AS FOLLOWS:

<u>INADVERTENT CHANGE OF THRUST OR UNSTABLE RUNNING</u>.

THROTTLE .... IDLE C

<u>IF ENGINE STABILISES AT IDLE</u>.

CONTINUED OPERATION AT IDLE IS PERMITTED PROVIDED ALL OTHER INDICATIONS ARE NORMAL.

END//

<u>IF CONDITION PERSISTS (INADVERTENT CHANGE OF THRUST OR UNSTABLE RUNNING WITH THROTTLE AT IDLE)</u>.

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN

CAUTION

IN THE EVENT OF INADVERTENT INCREASE IN THRUST WITH REVERSE THRUST SELECTED, REVERSE THRUST SHOULD NOT BE CANCELLED UNTIL ENGINE SPEED HAS BEEN REDUCED TO IDLE OR THE ENGINE HAS BEEN SHUT DOWN.

<u>PRIMARY NOZZLE MALFUNCTION</u>

<u>IF AREA INDICATES NOZZLE JAMMED AT GREATER THAN 15% OR HAS INADVERTENTLY MOVED TO 84% OR GREATER</u>.

APPLY PROCEDURE: PRECAUTIONARY ENGINE SHUT DOWN.

contd.

IF AREA INDICATES NOZZLE JAMMED AT 15% OR LESS

SPEED .... SUBSONIC C

NORMAL ENGINE OPERATION IS PERMITTED EXCEPT THAT THE USE OF RE-HEAT OR REVERSE THRUST IS PROHIBITED ON THE AFFECTED ENGINE.
AT MAXIMUM POWER SETTING THE N_2 MAY BE DEPRESSED BY UP TO 5%.

END//

IF IGN LIGHTS AND START PUMP LIGHT ON

AUTO IGNITION .... OFF .... E

END//

WIND DOWN LIGHT ON NOT ACCOMPANIED BY BUCKET MOVEMENT.

THROTTLE .... IDLE C

WIND DOWN C/BS .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
ENG 1 WIND DOWN CONT SUP 1 ENG 1 WIND DOWN CONT SUP 2	5-213 1-213	B1 C7
ENG 2 WIND DOWN CONT SUP 1 ENG 2 WIND DOWN CONT SUP 2	1-213 5-213	F4 C1
ENG 3 WIND DOWN CONT SUP 1 ENG 3 WIND DOWN CONT SUP 2	1-213 5-213	F5 C2
ENG 4 WIND DOWN CONT SUP 1 ENG 4 WIND DOWN CONT SUP 2	5-213 1-213	B2 C8

THROTTLE .... AS REQUIRED C

END//

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FUEL JETTISON

CAUTION
WHERE POSSIBLE, AVOID STORMY WEATHER CONDITIONS.
DO NOT ENTER A ZONE WHERE FUEL HAS RECENTLY BEEN JETTISONED.

SPEED	NOT ABOVE M = 0.93	C
REHEAT	ALL OFF	E
TRIM TRANS AUTO MASTER	OFF	E
TANK 11 DE-AIR sw	OFF	E
AFT TRIM sw	NORM	E
TANK 9 CONTENTS	LANDING QUANTITY	E

CAUTION
DURING JETTISON, THE ONLY TRUE INDICATION OF FUEL QUANTITY ON BOARD IS THE TOTAL CONTENTS.
THE TOTAL FUEL REMAINING AND A/C WEIGHT INDICATORS DEPEND ON SIGNALS FROM THE ENGINE FLOWMETERS AND JETTISONED FUEL DOES NOT PASS THROUGH THEM.

NOTE
During jettison the aircraft weight will decrease at approximately 2000 kg per min.

contd.

FUEL JETTISON (continued)

JETTISON AS REQUIRED, MAINTAINING CG WITHIN LIMITS.
WHERE POSSIBLE, TRIM TANK FUEL SHOULD BE JETTISONED BEFORE MAIN TANK FUEL

TO JETTISON FROM TRIM TANKS

JETTISON MASTER VALVES ....OPEN .... E
TRIM TRANSFER PUMPS .... ON AS REQ'D .. E

WHEN TANK 9 CONTENTS EQUAL LANDING QUANTITY

TANK 9 PUMPS .... AUTO .... E

WHEN TANK 10 & 11 CONTENTS AS REQUIRED

TANK 10 & 11 PUMPS .... AUTO .... E

TO JETTISON FROM MAIN TANKS

ENGINE FEED PUMPS .... ALL ON .... E
MAIN TRANSFER TANK PUMPS .... ALL ON .... E
TRANS VALVES 5A-5, 7A-7 .... OPEN .... E
COLLECTOR TANK JETTISON VALVES .... OPEN .... E
JETTISON MASTER VALVES .... OPEN .... E

WHEN TOTAL CONTENTS INDICATOR SHOWS THE REQUIRED QUANTITY

COLLECTOR TANK JETTISON VALVES .... SHUT .... E
JETTISON MASTER VALVES .... SHUT .... E
JETTISON MASTER VALVES MIS .... CROSSLINE .... E
JETTISON MASTER VALVES .... OFF .... E

TOTAL FUEL REMAINING .... RESET TO AGREE WITH TOTAL CONTENTS ..... E

END//

TANK PRESS LIGHT ON

WHEN AIRCRAFT IN CLIMB AND TANK PRESSURE INDICATION IN THE POSITIVE AMBER ARC

O/FULL LTS .... OBSERVE ...... E

IF O/FULL LTS ON

APPLY PROCEDURE: O/FULL LIGHT ON

IF O/FULL LTS OFF

REDUCE RATE OF CLIMB TO MAINTAIN TANK PRESSURE INDICATION WITHIN THE POSITIVE YELLOW OR GREEN ARC .... CE

END//

WHEN AIRCRAFT IN CRUISE ABOVE 40,000 FT AND TANK PRESSURE INDICATION APPROXIMATELY ZERO

ENGINE FEED PUMPS .... ALL ON .... E

IF ONE PUMP LOW PRESS LT ON

ENGINE RECIRCULATION VALVE ..... SHUT UNTIL THROTTLE IDLE. E

IF TWO PUMPS LOW PRESS LTS ON (IN ONE TANK)

ENGINE RECIRCULATION VALVE ..... SHUT .... E

ENGINE INLET LOW PRESS LTS .... MONITOR ...... E

IF TWO OR MORE INLET LOW PRESS LTS ON

FLIGHT LEVEL .... 450 OR BELOW . C

IF LESS THAN TWO INLET LOW PRESS LTS ON

TANKS 1 & 4 .... 1500KG MINIMUM.E

TANKS 2 & 3 .... 2500KG MINIMUM.E

IF QUANTITIES CANNOT BE MAINTAINED

FLIGHT LEVEL .... 450 OR BELOW . C

END//

WHEN AIRCRAFT IN DESCENT AND TANK PRESSURE INDICATION IN THE NEGATIVE AMBER ARC

REDUCE RATE OF DESCENT TO MAINTAIN TANK PRESSURE INDICATION IN NEGATIVE YELLOW OR GREEN ARC .... CE

END//

MANAGEMENT WITH ABNORMALLY LOW FUEL QUANTITY

CROSSFEED rty sels .... INLINE .... E
MAIN TRANSFER PUMPS .... ALL ON .... E
TRANS VALVES 5A-5 & 7A-7 .... OPEN .... E
TANKS 5A & 7A PUMPS .... ON .... E

WHEN LOW PRESS LTS ON

TANK 5 & 6 LEFT HAND PUMPS .... OFF .... E
TANK 7 & 8 RIGHT HAND PUMPS .... OFF .... E

CAUTION

BALLAST FUEL SHOULD BE USED ONLY IF THE SAFETY OF THE AIRCRAFT WOULD OTHERWISE BE PREJUDICED.

IF TRIM TANK FUEL IS TO BE USED

TANK 5 & 7 INLET VALVES .... OPEN .... E
TRIM TRANSFER PUMPS .... ALL ON .... E
TANK 6 & 8 STANDBY INLET VALVES ...... OPEN .... E

WHEN TANK 9 LOW PRESS LTS ON

TRIM PIPE DRAIN .... OPEN .... E

WHEN TANK 10 & 11 LOW PRESS LTS ON

TANK 9 & 11 INLET VALVES .... OPEN .... E

END//

NOTE

The total usable fuel should be determined by addition of the collector tank CONTENTS indication.

CAUTION

ALL PUMPS AND VALVES SHOULD REMAIN AS SELECTED UNTIL AFTER LANDING

FAILURE OF TANKS 1 & 4 NORM MODE

CROSSFEED .... TO USE FUEL FROM 2 AND/OR 3 E
STANDBY INLET VALVES .... OPEN .... E
SAME SIDE TANK 11 PUMP .... ON .... E

WHEN COLLECTOR TANK(S) ABOVE UNDERFULL LEVEL

TANK 11 PUMPS .... AUTO .... E
STANDBY INLET VALVES .... SHUT .... E

WHEN TRIM TRANSFER IS COMPLETE AND
MAIN TRANSFER TANKS ARE EMPTY.

CROSSFEED .... CEASE .... E

END//

FAILURE OF TANK 5 OR 7 PUMPS

● ▶ BEFORE OR DURING ACCELERATING CLIMB

▶ IF 5-2 OR 7-4 PUMP FAILED
6-2 OR 8-4 PUMP .... OFF .... E
6-1 OR 8-3 PUMP .... ON .... E

FAILED PUMP .... OFF .... E

▶ IF TRIM TRANSFER IS NOT INTO 5 & 7

WHEN THE COLLECTOR TANK APPROACHES LOW LEVEL

APPROPRIATE TANK 6 OR 8 PUMP ... ON .... E

IF TRIM TRANSFER IS INTO 5 & 7
MANAGE TRIM TRANSFER TO TOP UP AFFECTED
COLLECTOR TANKS USING 5 & 7 MAIN INLET
VALVES AND COLLECTOR TANK STANDBY INLET VALVES .. E

WHEN TRIM TRANSFER IS COMPLETE

5 & 7 MAIN INLET VALVES .... AUTO .... E
COLLECTOR TANK STANDBY
INLET VALVES .... SHUT .... E
CROSSFEED .... AS NECESSARY .. E

END//

● ▶ DURING STABILIZED CRUISE, DECELERATION OR DESCENT

FAILED PUMP .... OFF .... E

▶ IF TRIM TRANSFER IS NOT INTO 5 & 7
CROSSFEED .... AS NECESSARY .. E

IF TRIM TRANSFER IS INTO 5 & 7
MANAGE TRIM TRANSFER TO TOP UP AFFECTED
COLLECTOR TANK USING 5 & 7 MAIN INLET
VALVES AND COLLECTOR TANK STANDBY INLET VALVES .. E

WHEN TRIM TRANSFER IS COMPLETE

5 & 7 MAIN INLET VALVES .... AUTO .... E
COLLECTOR TANK STANDBY
INLET VALVES .... SHUT .... E
CROSSFEED .... AS NECESSARY .. E

END//

FAILURE OF TANK 6 OR 8 PUMPS

DURING TAKE-OFF OR ACCELERATING CLIMB

IF THE FAILED PUMP IS ON FOR DE-AERATION
REMAINING PUMP .... ON .... E

FAILED PUMP .... OFF .... E

WHEN REHEAT OFF AND ENG RATING MODE sw AT FLIGHT

CROSSFEED .... AS NECESSARY ... E

END//

DURING STABILIZED CRUISE, DECELERATION OR DESCENT

FAILED PUMP .... OFF .... E
CROSSFEED .... AS NECESSARY ... E

END//

FAILURE OF TANK 9 PUMP

PUMPS AND VALVES IN
TRIM TRANSFER TANKS..........AUTO...... E

REARWARD TRIM TRANSFER IN PROGRESS

IF TANK 10 CONTENTS GREATER THAN TANK 9
TANK 9 FAILED PUMP .... OFF .... E

END//

IF TANK 10 CONTENTS LESS THAN TANK 9
TANK 9 FAILED PUMP .... OFF .... E
SAME SIDE TANK 10 PUMP .... OFF .... E

Tank 9 and 11 QUANTITIES .... MONITOR .... E

WHEN TANK 11 QUANTITY REACHES TANK 11 LLC

SAME SIDE TANK 10 PUMP .... AUTO .... E

TANK 9 AND 10 QUANTITIES .... MONITOR .... E

IF TANK 10 EMPTIES BEFORE TANK 9 AND THE
LEFT HAND TANK 9 PUMP HAS FAILED
OPERATING TANK 9 PUMP .... OFF .... E
INTER-CON VALVE (5-8) .... OPEN .... E

ALLOW TANK 5 QUANTITY TO INCREASE BY HALF
THAT REMAINING IN TANK 9

WHEN QUANTITY IN TANK 5 IS AS REQUIRED

INTER-CON VALVE (5-8) .... SHUT .... E
TANK 8 STANDBY INLET VALVE ... OPEN .... E
TANK 7 INLET VALVE MAIN sel .. SHUT .... E
TANK 9 RIGHT HAND PUMP .... AUTO .... E

WHEN TANK 8 CONTENTS ARE RESTORED TO ORIGINAL

TANK 8 STANDBY INLET VALVE ... SHUT .... E
TANK 7 INLET VALVE MAIN sel .. AUTO .... E

END//

contd.

FAILURE OF TANK 9 PUMPS (continued)

IF TANK 10 EMPTIES BEFORE TANK 9 AND THE RIGHT HAND TANK 9 PUMP HAS FAILED

OPERATING TANK 9 PUMP .... OFF .... E
INTER-CON VALVE (6-7) .... OPEN .... E

ALLOW TANK 7 QUANTITY TO INCREASE BY HALF THAT REMAINING IN TANK 9

WHEN QUANTITY IN TANK 7 IS AS REQUIRED

INTER-CON VALVE (6-7) .... SHUT .... E
TANK 6 STANDBY INLET VALVE .... OPEN .... E
TANK 5 INLET VALVE MAIN sel ... SHUT .... E
TANK 9 LEFT HAND PUMP .... AUTO .... E

WHEN TANK 6 CONTENTS ARE RESTORED TO ORIGINAL

TANK 6 STANDBY INLET VALVE .... SHUT .... E
TANK 5 INLET VALVE MAIN sel ... AUTO .... E

END//

IF TANK 9 EMPTIES BEFORE TANK 10

RETURN TO NORMAL PROCEDURES

END//

FUEL JETTISON IN PROGRESS

PROCEED WITH JETTISON USING THE REMAINING PUMP

END//

TOTAL LOSS OF CG DATA WITH TRIM TANK FQI SERVICEABLE

PUMPS AND VALVES IN
TRIM TRANSFER TANKS ....AUTO............. E

DURING SUBSONIC CLIMB (CG FWD OF 55%

SPEED .... REMAIN SUBSONIC C
TANKS 9 & 10 LLC .... TAKE-OFF QUANTITY LESS 2500 KG ...... E

AT M = 0.70
TRIM TRANS AUTO MASTER .... REARWARD ..... E

AT COMPLETION OF AUTOMATIC TRANSFER
CG .... CHECK USING CHART .... E
TANKS 9, 10 & 11 .... ADJUST TO OBTAIN 55% FOR CRUISE 53% FOR DESCENT. E

NOTE

Fuel distribution giving an elevon angle of 2° DOWN will ensure safety at M = 0.93

END//

DURING TRANSONIC ACCELERATION (CG 55% OR REARWARD)

CONTINUE WITH NORMAL FUEL HANDLING BUT OBSERVE THE FOLLOWING .... E

1. STOP THE CLIMB IF ELEVON ANGLE EXCEEDS 3° UP.
2. STOP REARWARD TRANSFER IF ELEVON ANGLE EXCEEDS 2° DOWN AT SPEEDS GREATER THAN M = 1.3.
3. IF THE CLIMB IS INTERRUPTED, STOP FUEL TRANSFER AND RESTART WHEN THE CLIMB IS CONTINUED.

CONTINUE//

DURING SUPERSONIC CRUISE

ADJUST TANK QUANTITIES TO MAINTAIN AN ELEVON ANGLE BETWEEN 0 AND 1° DOWN .... E

CONTINUE//

TOTAL LOSS OF CG DATA WITH TRIM TANK FQI SERVICEABLE (continued)

DURING DECELERATION AND DESCENT AT SPEEDS GREATER THAN M = 0.93

TANK 11 ELECTRIC PUMPS	OFF	E
TANK 11 LLC	2500 Kg	E
TANKS 9 & 10 LLC	EXISTING QUANTITY PLUS 2500 Kg	E
TRIM TRANS AUTO MASTER	FORWARD	E

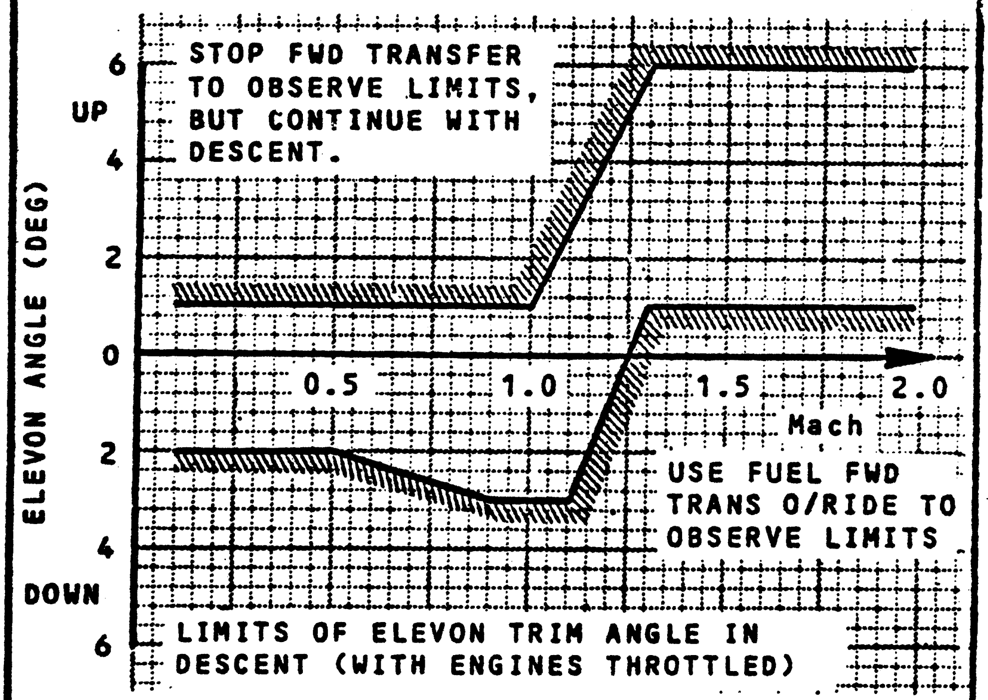
AT END OF AUTO TRANSFER

TRIM TRANS AUTO MASTER	OFF	E

CONTINUE//

CAUTION

1. AFTER THROTTLING FOR DESCENT MONITOR ELEVON ANGLE IN ORDER TO OBSERVE THE LIMITATIONS DEFINED ON FIGURE BELOW



2. IF THE DESCENT IS INTERRUPTED, STOP FUEL TRANSFER AND RESTART WHEN THE DESCENT IS CONTINUED.

contd.

TOTAL LOSS OF CG DATA WITH
TRIM TANK FQI SERVICEABLE (continued)

DURING DESCENT OR CRUISE AT M = 0.93 OR LESS

CG .... CHECK USING CHART .... E
TANKS 9, 10 & 11 .... ADJUST TO OBTAIN
55% FOR CRUISE
53% FOR DESCENT. E

NOTE

Fuel distribution giving an elevon angle of 2° DOWN will ensure safety at M = 0.93.

END//

CG Computation Chart page 07 .02.16

TOTAL LOSS OF CG DATA ONE TRIM TANK FQI UNSERVICEABLE

PUMPS & VALVES IN
TRIM TRANSFER TANKS .... AUTO .... E

DURING SUBSONIC CLIMB (CG FWD OF 55%)

SPEED .... REMAIN SUBSONIC C

At M = 0.70
TRIM TRANSFER .... REARWARD MANUAL CONTROL . E

IF TANK 9 FQI UNSERVICEABLE
WHEN TANK 11 QUANTITY EQUALS
TAKE-OFF VALUE PLUS 2500 KG
TRIM TRANSFER .... CEASE .... E

IF TANK 11 FQI UNSERVICEABLE
WHEN TANK 9 QUANTITY EQUALS
TAKE-OFF VALUE LESS 2500 KG
TRIM TRANSFER .... CEASE .... E

AT COMPLETION OF TRANSFER
CG .... CHECK USING CHART .... E

TANKS 9, 10 & 11 .... ADJUST TO OBTAIN 55% ..... E

NOTE
Fuel distribution giving an elevon angle of 2° DOWN will ensure safety at M = 0.93

END//

DURING TRANSONIC ACCELERATION (CG 55% OR REARWARD)

CONTINUE WITH NORMAL FUEL HANDLING BUT
OBSERVE THE FOLLOWING .... E

1. STOP THE CLIMB IF ELEVON ANGLE EXCEEDS 3° UP.
2. STOP REARWARD TRANSFER IF ELEVON ANGLE EXCEEDS 2° DOWN AT SPEEDS GREATER THAN M = 1.3.
3. IF THE CLIMB IS INTERRUPTED, STOP FUEL TRANSFER AND RESTART WHEN THE CLIMB IS CONTINUED.

CONTINUE//

DURING SUPERSONIC CRUISE

ADJUST TANK QUANTITIES TO MAINTAIN AN
ELEVON ANGLE BETWEEN 0 AND 1° DOWN .... E

CONTINUE//

TOTAL LOSS OF CG DATA WITH ONE TRIM TANK FQI UNSERVICEABLE (continued)

DURING DECELERATION AND DESCENT AT SPEEDS GREATER THAN M = 0.93

TANK 11 ELECTRIC PUMPS .... OFF .... E

TRIM TRANSFER .... FORWARD MANUAL CONTROL .... E

IF TANK 9 FQI UNSERVICEABLE
WHEN TANK 11 QUANTITY 2500 KG
BELOW LEVEL AT TIME OF FAILURE
11 TO 9 TRANSFER .... CEASE .... E

WHEN TANK 11 QUANTITY 2500 KG

11 TO 5 & 7 TRANSFER .... CEASE .... E

IF TANK 11 FQI UNSERVICEABLE
WHEN TANK 9 QUANTITY 2500 KG
ABOVE LEVEL AT TIME OF FAILURE

11 TO 9 TRANSFER .... CEASE .... E

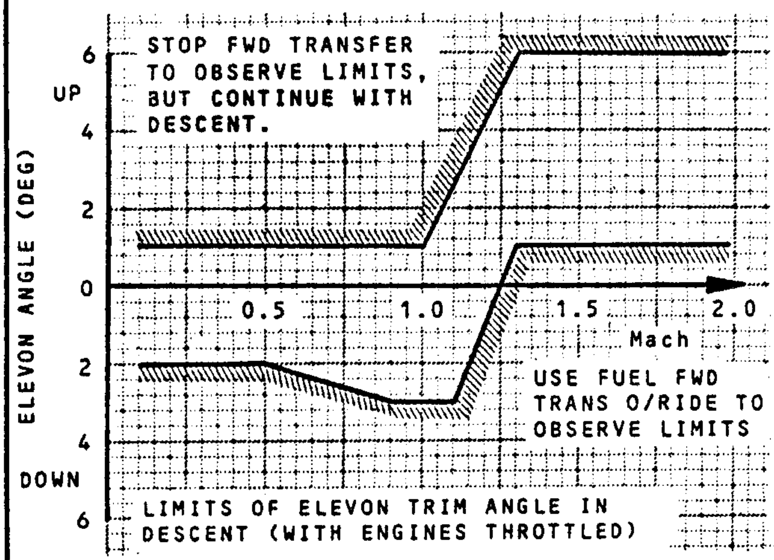
WHEN TOTAL FUEL REMAINING MINUS TOTAL
OF TANKS 1 TO 10 EQUALS APPROXIMATELY 2500 KG

11 TO 5 & 7 TRANSFER .... CEASE .... E

CAREFULLY MONITOR THE ELEVON ANGLE

CAUTION

1. AFTER THROTTLING FOR DESCENT MONITOR ELEVON ANGLE IN ORDER TO OBSERVE THE LIMITATIONS DEFINED ON FIGURE BELOW



2. IF THE DESCENT IS INTERRUPTED, STOP FUEL TRANSFER AND RESTART WHEN THE DESCENT IS CONTINUED.

contd.

CONTINUE//

TOTAL LOSS OF CG DATA WITH
ONE TRIM TANK FQI UNSERVICEABLE (continued)

DURING DESCENT OR CRUISE AT M = 0.93 OR LESS

CG .... CHECK USING CHART .... E

TANKS 9, 10 & 11 .... ADJUST TO OBTAIN 55% FOR CRUISE 53% FOR CONTINUED DESCENT ...... E

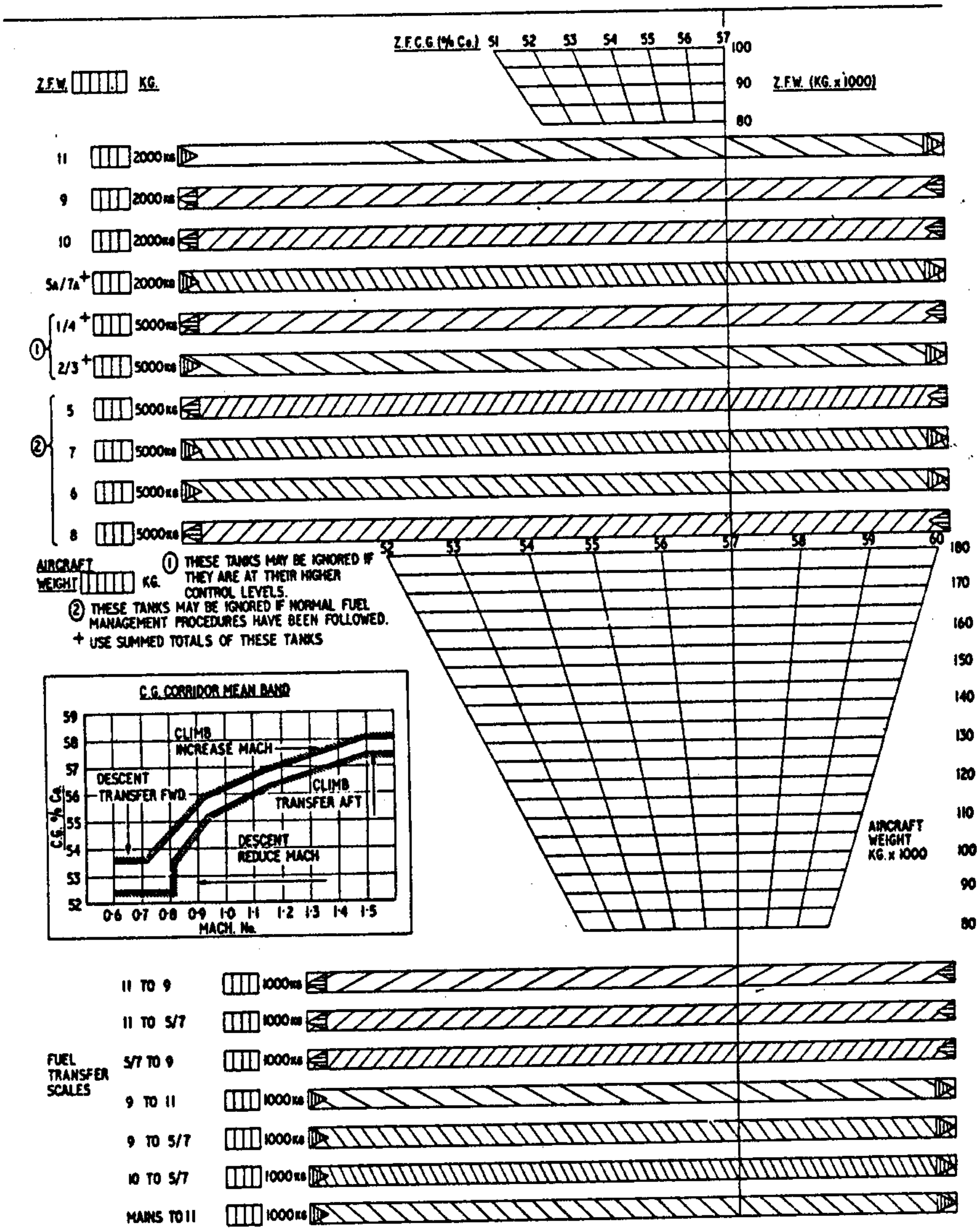
NOTE

Fuel distribution giving an elevon angle of 2° DOWN will ensure safety at M = 0.93

END//

contd. CG Computation Chart page 07 .02.16

CG COMPUTATION CHART



NOTE

The following provides a reasonably accurate guide to the fuel quantity required to achieve the specified C.G. shift.

Fuel Quantity	Tanks Affected	C.G. Shift
1% of aircraft weight	11 $\rightleftharpoons$ 9	1% Co
1% of aircraft weight	11 $\rightleftharpoons$ Collectors	½% Co

ABNORMAL CG POSITION

AFT LIMIT

MACH NO.	INCREASE IF POSSIBLE .. C
FUEL FWD TRANS sw	O/RIDE C
TRIM TRANSFER PUMPS AND VALVES	AUTO ...... E
TRIM TRANS AUTO MASTER	OFF .... E

WHEN NORMAL CG POSITION ACHIEVED
RETURN TO NORMAL TRANSFER CONTROL.

END//

FORWARD LIMIT

MACH NO.	DECREASE IF POSSIBLE .. C
FUEL FWD TRANS sw	OFF & GUARDED ... C
TRIM TRANS AUTO MASTER	OFF .... E

IF TANK 9 OR 10 CONTAINS FUEL

TRIM TRANSFER PUMPS AND VALVES	AUTO ...... E
TANKS 9 & 11 LLC	ADJUST .... E
TRIM TRANS AUTO MASTER	REARWARD .. E

WHEN NORMAL CG POSITION ACHIEVED
RETURN TO NORMAL TRANSFER CONTROL

END//

IF TANKS 9 AND 10 EMPTY

TANK 11 INLET VALVES	OPEN ...... E
TANK 2 & 3 JETTISON VALVES	OPEN ...... E

WHEN NORMAL CG POSITION ACHIEVED

TANK 11 INLET VALVES	AUTO ...... E
TANK 2 & 3 JETTISON VALVES	SHUT ...... E

RETURN TO NORMAL TRANSFER CONTROL

END//

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SERVO CONTROL SPOOL VALVE JAM

SERVO CONTROLS BLACK rty sel .... TOWARDS JAM LT C

IF THE BLACK rty sel WILL NOT MOVE
SERVO CONTROLS YELLOW rty sel .... NORMAL C
SERVO CONTROLS BLACK rty sel .... TOWARDS JAM LT C

IF SPEED GREATER THAN M = 0.93
REDUCE SPEED TO 350 KT AT CONSTANT PRESSURE ALTITUDE
THEN DESCEND AT 350 KT TO M = 0.93

END//

NOTE:

Should low pressure in the remaining main system occur, yellow system will be automatically selected to replace it.

CONTROL COLUMN JAM IN PITCH OR ROLL

CAUTION

THE EMERGENCY FLIGHT CONTROL SYSTEM IS TO BE USED ONLY IN THOSE CASES OF JAMMING WHERE FORCE ON THE CONTROL COLUMN/WHEEL PRODUCES, IN THE PARTICULAR AXIS, NO MOVEMENT OF THE COLUMN/WHEEL IN THE DIRECTION DEMANDED.

AUTOSTAB (PITCH & ROLL) ....ENGAGED............... C
CONTROL FORCES ....RELAX C
EMERGENCY FLIGHT CONTROL ....ENGAGE................ C

END//

LOSS OF BOTH ELECTRIC TRIM SYSTEMS

CAUTION

WITH BOTH ELECTRIC TRIM SYSTEMS DISENGAGED THE AUTOMATIC PITCH STABILITY CORRECTION IS LOST. HIGH INCIDENCE PROTECTION IS CONSIDERABLY REDUCED.

IF MANUAL TRIM JAMMED

PITCH ARTIFICIAL FEEL .... OFF .... P

FLY THE AIRCRAFT WITH CAUTION AS THE CONTROL FORCES ARE REDUCED.

IN SUBSONIC CRUISE, LIMIT THE AFT CG TO 55% AND THE MACH NO. TO M = 0.93

STICK WOBBLER IS LOST.

AT LANDING

MINIMUM SPEED .... V_{REF} + 10 kts... C

END//

TOTAL LOSS OF ARTIFICIAL FEEL IN ONE AXIS

FLY THE AIRCRAFT WITH CAUTION AS THE CONTROL FORCES ARE REDUCED.

● IF PITCH AXIS IS LOST

IN SUBSONIC CRUISE, LIMIT THE AFT CG TO 55% AND THE MACH NO. TO M = 0.93

STICK WOBBLER IS LOST.

END//

● IF YAW AXIS IS LOST

USE RUDDER WITH CAUTION AND ONLY SUFFICIENT TO PREVENT SIDESLIP.

END//

(Unchange

TOTAL LOSS OF AUTOSTABILIZATION IN ONE AXIS

FLY THE AIRCRAFT WITH CAUTION AS THE CONTROL FORCES ARE REDUCED. IF PITCH AXIS IS LOST, ANY MOVEMENT OF THE THROTTLES SHOULD BE MADE SLOWLY.

IF ANTI-STALL SYSTEM LTS (2) ON
ANTI-STALL SYSTEMS .... OFF .... P

AUTOSTAB .... RE-ENGAGE ONE SYSTEM ... P

IF THE AUTOSTAB REMAINS DISENGAGED IN ROLL OR YAW
MAXIMUM SPEED .... M = 1.97 C

END//

IF THE AUTOSTAB REMAINS DISENGAGED IN PITCH
MAXIMUM AFT CG .... SUBSONIC 55%
SUPERSONIC 58.5% .... E

AT LANDING
MINIMUM SPEED .... V_{REF} + 10 KTS. C

END//

NOTE
If PITCH OR ROLL autostabilization is lost the Emergency Flight Control function is lost.

(Unchanged)

LOSS OF CONTROL OF ONE INNER ELEVON

● ▶ IF FAILURE OCCURS IN SUBSONIC FLIGHT
MAXIMUM SPEED .... M = 0.93 C

END//

● ▶ IF FAILURE OCCURS BETWEEN M = 0.93 AND M = 1.7
AUTOPILOT .... DISENGAGE C

REDUCE SPEED TO 350 KT AT CONSTANT PRESSURE ALTITUDE THEN DESCENT AT 350 KT TO M = 0.93.

MAX BANK ANGLE .... 20 DEGREES C
MAXIMUM SPEED .... 350 KT C

END//

● ▶ IF FAILURE OCCURS ABOVE M = 1.7
CONTINUE WITH NORMAL FLIGHT BUT AT THE DECELERATION POINT USE THE DESCENT TECHNIQUE GIVEN ABOVE.

END//

MECH JAM LIGHT ON

CONTINUE USING NORMAL PROCEDURES

CAUTION

DO NOT SELECT MECHANICAL SIGNALLING MODE.
AVOID ANY COARSE MANOEUVRE THAT COULD CAUSE A CHANNEL CHANGEOVER.

FLYING CONTROL INVERTER FAILURE

ONE INVERTER FAILED

FAILED INVERTER .... OFF INV C

END//

TWO INVERTERS FAILED

FAILED INVERTERS .... OFF INV C
AUTOPILOT .... DISENGAGE C

FLY THE AIRCRAFT WITH CAUTION AS THE CONTROL FORCES ARE REDUCED.
MOVE THROTTLE LEVERS SLOWLY

IF FAILURE OCCURS BEFORE TRANSONIC ACCELERATION

MAXIMUM SPEED .... M = 0.93 C
MAXIMUM AFT CG .... 55% .... E

IF FAILURE OCCURS AFTER TRANSONIC ACCELERATION

MAXIMUM SPEED .... M = 1.97 C
MAXIMUM AFT CG .... 58.5% .... E

AT LANDING
MINIMUM SPEED .... V_{REF} + 10 C

END//

FLYING CONTROL SIGNALLING MODE CHANGE

SIGNALLING MODE pb .... RESET .... P

IF AN ELECTRICAL SIGNALLING MODE CANNOT BE REGAINED
AUTOPILOT .... DISENGAGE ..... P

FLY THE AIRCRAFT WITH CAUTION AS THE CONTROL FORCES ARE REDUCED. IF THE INNER ELEVONS ARE IN MECHANICAL MODE MOVE THE THROTTLE LEVERS SLOWLY.

UNDER CERTAIN CONDITIONS i.e.
WITH THE RUDDER AND/OR INNER ELEVONS IN MECHANICAL MODE.
OR
IN STABILISED FLIGHT WITH THE OUTER AND MIDDLE ELEVONS IN MECHANICAL MODE.
THE AUTOPILOT MAY BE RE-ENGAGED, HOWEVER THE AUTOPILOT PERFORMANCE SHOULD BE CAREFULLY MONITORED AND IF NOT SATISFACTORY MUST BE DISENGAGED.

IF IN MECHANICAL MODE BEFORE TRANSONIC ACCELERATION
MAXIMUM SPEED .... M = 0.93 C
MAXIMUM AFT CG .... 55% .... E

IF IN MECHANICAL MODE AFTER TRANSONIC ACCELERATION
MAXIMUM SPEED .... M = 1.97 C
MAXIMUM AFT CG .... 58.5% .... E

AT LANDING
IF OUTER & MIDDLE OR INNER ELEVONS IN MECHANICAL MODE
MINIMUM SPEED .... V_{REF} + 10 KT .. C

END//

LOW HYDRAULIC PRESSURE AT FLYING CONTROLS

SERVO CONTROLS YELLOW rty sel .... OBSERVE C

IF SERVO CONTROLS YELLOW rty sel AT NORMAL

SERVO CONTROLS YELLOW rty sel ...... TOWARDS L/PRESS LT C

FLYING CONTROL SIGNALLING MODE .... CHECK. RESET IF REQ'D C

END//

CAUTION

IF AFTER SELECTION, A FALL IN THE LEVEL OF THE YELLOW TANK IS NOTED, AWAIT AUTOMATIC ISOLATION OF THE FAILED SYSTEM BY THE FIRST LEVEL WARNING ON THE YELLOW TANK. THIS PRODUCES THE SECOND LOW PRESSURE WARNING. LEAVE THE SELECTOR IN ITS EXISTING POSITION AS IN THE FOLLOWING CASE.

IF SERVO CONTROLS YELLOW rty sel AT YELLOW BLUE OR YELLOW GREEN AND ONE L/PRESS LT ON

SERVO CONTROLS YELLOW rty sel ...... LEAVE IN EXISTING POSITION C

FLYING CONTROL SIGNALLING MODE .... CHECK, RESET IF REQ'D C

END//

IF SERVO CONTROLS YELLOW rty sel AT YELLOW BLUE OR YELLOW-GREEN AND TWO L/PRESS LTS ON

SERVO CONTROLS YELLOW rty sel .... TOWARDS OTHER L/PRESS LT C

FLYING CONTROL SIGNALLING MODE .... CHECK. RESET IF REQ'D C

END//

contd.

CAUTION

WITH THE FLYING CONTROLS POWERED BY A SINGLE HYDRAULIC SYSTEM, MANOEUVRABILITY IN THE TRANSONIC REGION IS RESTRICTED.

IF FAILURE OCCURS AT LESS THAN M = 0.93
DO NOT EXCEED M = 0.93

IF FAILURE OCCURS ABOVE M = 0.93
DECELERATE TO THE AUTHORIZED SUBSONIC REGIME USING THE FOLLOWING TECHNIQUE, AVOIDING THE CG BOUNDARIES. REDUCE SPEED TO 350 KT AT CONSTANT ALTITUDE THEN DESCEND AT 350 KT UNTIL M = 0.93.

EFFECTS OF LOSS OF HYDRAULIC SYSTEMS
page 07 04.05/06.

HYDRAULIC TANK LOW LEVEL

LOW LEVEL IN YELLOW TANK ALONE

WHEN YELLOW CONTENTS LESS THAN 1 US GALL

YELLOW PUMPS sw .... MAN .... E

END//

LOW LEVEL IN BLUE OR GREEN TANK
(with or without yellow low level)

AFFECTED AIR INTAKES HYD sel .... YELLOW .... E
ALL TANK CONTENTS .... MONITOR .... E

IF YELLOW LEVEL FALLS OR YELLOW L/LEVEL LT ON
MAXIMUM SPEED .... SUBSONIC C

IF INTAKE HYD LT ON OR
SPEED SUBSONIC
RAMP SPILL MASTER .... MAN .... E
APPLY PROCEDURE : INTAKE LIGHT ON

IF BLUE OR GREEN LEVEL CONTINUES TO FALL

RELAY JACK sel .... TOWARDS SERVICEABLE SYSTEM C

IF BLUE OR GREEN LEVEL CONTINUES TO FALL
RELAY JACK sel .... NORM C
SERVO CONTROLS YELLOW rty sel ... YELLOW BLUE OR YELLOW GREEN C

IF YELLOW LEVEL FALLS

AWAIT FLYING CONTROL SYSTEM ISOLATION
APPLY PROCEDURE : LOW HYDRAULIC PRESSURE AT FLYING CONTROLS

IF BLUE OR GREEN LEVEL CONTINUES TO FALL
HYD PUMPS OF AFFECTED SYSTEM .... OFF .... E

END//

EFFECTS OF LOSS OF HYDRAULIC SYSTEMS
page 07.04.05/06

(Unchanged)

YELLOW HYD FLUID O/HEAT AND/OR O/PRESS

PRESSURE GREATER THAN 4500 PSI

PUMP sels (2)........................ ON .... E
YELLOW PUMPS sw .... MAN .... E
LH PUMP sel.......................... AUTO ...... E

IF PRESSURE REMAINS GREATER THAN 4500 PSI

LH PUMP sel .... SHUT ...... E

IF PRESSURE REMAINS GREATER THAN 4500 PSI

LH PUMP sel .... ON .... E
RH PUMP sel .... AUTO ....E

IF PRESSURE REMAINS GREATER THAN 4500 PSI

RH PUMP sel .... SHUT ...... E

> CAUTION
>
> IF A PUMP SELECTOR HAS REMAINED AT SHUT FOR LONGER THAN 30 MINUTES - DO NOT BRING THIS PUMP BACK INTO USE.

END//

PRESSURE NORMAL (4000 PSI) OR PRESSURE GAUGE UNSERVICEABLE

YELLOW PUMPS sw .... MAN .... E
PUMP sels (2)........................ AUTO ...... E

END//

BLUE/GREEN HYD FLUID O/HEAT AND/OR O/PRESS

PRESSURE GREATER THAN 4500 PSI

LH PUMP sel .... OFF .... E

IF PRESSURE REMAINS GREATER THAN 4500 PSI

LH PUMP sel .... SHUT ...... E

IF PRESSURE REMAINS GREATER THAN 4500 PSI

LH PUMP sel .... ON .... E
RH PUMP sel .... OFF .... E

IF PRESSURE REMAINS GREATER THAN 4500 PSI

RH PUMP sel .... SHUT ...... E

> CAUTION
>
> IF A PUMP SELECTOR HAS REMAINED AT SHUT FOR LONGER THAN 30 MINUTES DO NOT BRING THIS PUMP BACK INTO USE.

END//

PRESSURE NORMAL (4000 PSI) OR PRESSURE GAUGE UNSERVICEABLE

HYD SELS FOR AFFECTED INTAKES .... YELLOW .... E
SERVO CONTROLS YELLOW rty sel .... YELLOW GREEN
OR YELLOW
BLUE C
PUMP SELS FOR AFFECTED SYSTEM .... OFF .... E

END//

EFFECTS OF LOSS OF HYDRAULIC SYSTEMS

CAUTION

AFTER LOSS OF GREEN SYSTEM:-
- WITH NOSE UP AND VISOR DOWN, LOWER NOSE BY FREE FALL SYSTEM WHEN REQUIRED.
- DURING LANDING GEAR OPERATION, USE STANDBY LOWERING SYSTEM.

AFTER LOSS OF BLUE SYSTEM AND ONE YELLOW PUMP, LOWER THE LANDING GEAR USING STANDBY SYSTEM.

AFTER LOSS OF BLUE SYSTEM WITH YELLOW 1ST LOW LEVEL WARNING, OR YELLOW 2ND LOW LEVEL CUT OFF, LOWER THE LANDING GEAR AND NOSE AND VISOR USING STANDBY SYSTEMS.

AFTER COMPLETE LOSS OF TWO SYSTEMS, LOWER LANDING GEAR AND NOSE AND VISOR BY FREE FALL.

AFTER LOSS OF BLUE SYSTEM AND TWO OTHER PUMPS (ONE GREEN AND ONE YELLOW), DO NOT USE THE EMERGENCY GENERATOR, LOWER THE LANDING GEAR USING STANDBY SYSTEM.

SYSTEM RECOVERED BY AUTOMATIC CHANGE OVER		
	Blue system lost	Green system lost
Air Intakes **	No.3 & 4 change to yellow	No.1 & 2 change to yellow
Nose wheel Steering *	-	changes to yellow

SYSTEMS RECOVERED BY MANUAL SELECTION		
	Blue system lost	Green system lost
Relay Jacks and Powered Flying Control units *	Blue side regained on Yellow-Blue selection	Green side regained on Yellow-Green selection
Normal Brakes with Anti-skid *	-	Regained on Yellow-Green selection
L/Gear, Nose and Visor lowering	-	Regained by use of standby lowering or free fall

* After auto or manual change over to yellow, the yellow supply will be isolated automatically if the 1st low level is reached on the yellow reservoir.
** If the 2nd low level is reached on the yellow reservoir, the spill door actuators are automatically isolated in Auto.

SYSTEMS LOST AND NOT RECOVERABLE		
	Blue system lost	Green system lost
Artificial feel	No.1 system lost	No.2 system lost
Tank 11 transfer pumps	Blue pump lost	Green pump lost
Emerg Generator	-	Lost
L/Gear raise	-	Lost
L/Gear door closing on lowering	-	Lost
Nose/Visor raise	-	Lost

contd.

EFFECTS OF.LOSS OF HYDRAULIC SYSTEMS

2. Consequences of the loss of two hydraulic systems

Other System Effects	Hydraulic Systems Lost		
	Blue and Yellow	Green and Yellow	Blue and Green
Powered Flying Control Jacks	All control Jacks function on one half of the jack only	All control jacks function on one half of the jack only	All control jacks function on one half of the jack only
Relay Jacks and Autopilot	Autopilot No.1 lost. Blue side of relay lost	Autopilot No.2 lost. Green side of relay lost	Autopilot No.1 available with Yellow-Blue, selection. Autopilot No.2 available with Yellow-Green selection.
Artificial Feel	No.1 system lost	No.2 system lost	No.1 and No.2 systems lost.
Tank 11 transfer pumps	Blue pump lost	Green pump lost	Blue and Green pumps lost
L/Gear	Standby lowering lost. Normal lowering available but not to be used	Raise system lost. Standby lowering lost. Only free fall system available	Raise system lost Standby lowering available but not to be used.
Brakes	Normal braking with anti-skid available, EMERG braking limited by accumulator capacity	Normal braking with anti-skid lost, EMERG braking limited by accumulator capacity	EMERG and PARK braking available. Normal braking available on Yellow Green selection.
Nose-wheel Steering	Normal system available	Lost	Normal system available via auto change over to yellow
Nose/Visor	Standby lowering lost. Normal lowering system available but not to be used	Normal and Standby lowering lost. Free fall lowering limited to 5°	Normal lowering lost. Standby lowering system available but not to be used.
Emergency Generator	Capability for operation remains.	Lost	Lost
Air Intakes	Intakes 3 and 4 control lost (See associated drill)	Intakes 1 and 2 control lost (See associated drill)	All intakes function on Yellow system

(Unchanged)

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DISCREPANCY BETWEEN ADC 1 AND ADC2

FLY ATTITUDE
STANDBY ASI/MACHMETER .... USE .... CP
ADS PROBE HEATERS .... VERIFY ON ..... E
AUTOTHROTTLE 1 & 2 .... DISENGAGE C
FAULTY SYSTEM .... IDENTIFY ...... CP

APPLY PROCEDURE : ADC FAILURE

ADC FAILURE

ASI & ALTIMETER .... STANDBY MODE .. CP
FAILED ADC .... OFF .... P
AFFECTED AUTOSTAB .... OFF .... P
AFFECTED ANTI-STALL SYSTEM .... OFF .... P
TRANSPONDER ALT RPTG .... OPERATING ADC .... P

IF A SYMMETRIC PAIR OF ENGINES EXCEED OPERATING CRUISE RATING AT STATIC TEMPERATURES COLDER THAN -51°C
THROTTLE MASTERS .... OTHER LANE ..... E

SECONDARY AIR DOORS .... ABOVE 220 KT OPEN
BELOW 220 KT SHUT ... E

MAXIMUM SPEED .... V_{MO} MINUS 10kt . C
M_{MO} MINUS .05M . C

END//

CAUTION

1. DO NOT USE AUTOPILOT IN MAX SPEED MODES DUE TO A RISK OF A DRIFT IN LIMIT SPEED DATA GOING UNDETECTED.
2. DO NOT RE-ENGAGE THE ANTI-STALL SYSTEM ASSOCIATED WITH THE FAULTY ADC.
3. AFTER LOSS OF ADC 1, NO.1 AUTOSTAB SHOULD NOT BE RE-ENGAGED UNLESS NO.2 AUTOSTAB FAILS.

EFFECT OF ADC FAILURES pages 07.05.04/07.

(Comple Revised)

LOSS OF SECOND ADC

FLY ATTITUDE
STANDBY ASI/MACHMETER .... USE .... CP
ASI & ALTIMETERS .... STANDBY MODE .. CP

IF LOSS OCCURS DURING TRANSONIC ACCELERATION
TRIM TRANSFER .... HOLD .... E
SPEED & ALTITUDE .... HOLD C

FAILED ADCs .... OFF .... P
ENGINE CONTROL SCHEDULE .... ABOVE 220 KT HI
BELOW 220 KT LO..E
SECONDARY AIR DOORS .... ABOVE 220 KT
OPEN
BELOW 220 KT
SHUT ....E
ANTI-STALL SYSTEMS .... OFF .... P
AUTOSTAB .... RE-ENGAGE
ONE SYSTEM ......P

N_2, N_1 AND EGT .... MANUAL CONTROL
TO CRUISE
RATING ....E

IF SPEED ABOVE M = 1.70
MAXIMUM SPEED .... V_{MO} MINUS 10 KT..C
M_{MO} MINUS .05M ..C

IF SPEED BETWEEN M = 0.93 AND M = 1.70
SPEED .... REDUCE TO M=0.93
$V \leqslant$ 380KT C
CG .... 53% BELOW M=0.85
55% ABOVE M=0.85.E

IF SPEED M = 0.93 OR LESS
MAXIMUM SPEED .... M=0.93/
$V \leqslant$ 380KT C
CG .... 53% BELOW M=0.85
55% ABOVE M=0.85.E

AT LANDING
CG .... 52.5% .... E
MINIMUM SPEED .... V_{REF} + 10 KT ... C

END//

EFFECT OF ADC FAILURES page 07.05.04/07

(Completely Revised)

EFFECTS OF SINGLE ADC FAILURE

SYSTEM	Single ADC failure or One ADC switched OFF.
Instruments	ADC 1 - Captain ADC 2 - First Officer.
ASI and Altimeter	Standby mode is available.
Machmeter Incidence Temperature VSI	On a monitor detected failure all information may not be lost. Complete loss if ADC is switched off.
Sideslip	Lost only if ADC is switched off.
INS	ADC 1 - CDU 1 and 3 wind information lost. ADC 2 - CDU 2 wind information lost.
ATC Transponder	ADC 1 -) loss of altitude signal to ADC 2 -) the selected transponder.
Anti-icing	ADC 1 - loss of normal control. ADC 2 - loss of alternative control.
Autopilot/ Flight Director	Associated A/P or F/D lost except in land mode below 1,500 ft when it remains engaged.
Autothrottle	ADC 1 - A/T 1 lost, autochange to A/T 2. ADC 2 - A/T 2 lost.
AUTOSTAB - ROLL	No disconnections - If ADC 1 lost - disengage STAB 1 to leave STAB 2 operative.
AUTOSTAB - PITCH, YAW	>270 kt - no disconnection, but if ADC 1 lost disengage No.1 system, If ADC 2 lost, take no action. <270 kt - both axes disconnect except in LAND or GLIDE mode after glide slope capture. NOTE: On ADC failure STABS revert to fixed gains/limits automatically as follows: <u>Cruise</u> Yaw-intermediate (M=1.4) Roll and Pitch-minimum. <u>Approach</u> Yaw-minimum Roll and Pitch-maximum.
ANTI-STALL	>270 kt - no failure indication but the associated ANTI-STALL system failed. <270 kt - associated ANTI-STALL system failed with SYST FAIL lt (amber) on. NOTE The failed ANTI-STALL system must be switched OFF to allow re-engagement of the AUTOSTAB if the other system is lost.

contd.

(completely revised)

EFFECTS OF DOUBLE ADC FAILURE

SYSTEM	Double ADC failure or Two ADCs switched OFF
Instruments	Captain and First Officer.
ASI & Altimeter	Standby mode is available.
Machmeter Incidence Temperature VSI	Loss of both systems.
Sideslip	Both lost if ADCs are switched off.
INS	Loss of all wind information.
ATC Transponder	Loss of altitude signals to both transponders.
Anti-icing	loss of both systems, override control available on alternate system. NOTE: ADCs OFF - T_T switch fails $>15^{o}C$.
Autopilot/ Flight Director	Both A/P and F/D lost except in LAND or GLIDE mode.
Autothrottle	Both A/T lost.
Autostabs	One switch of each axis may be engaged.
Anti-stall	Both ANTI-STALL systems lost. Re-engagement of AUTOSTAB is possible with associated ANTI-STALL system switched OFF.

(Completely Revised)

contd.

EFFECTS OF SINGLE ADC FAILURE

SYSTEM	Single ADC failure or One ADC switched OFF.	
ARTIFICIAL FEEL	Associated artificial feel is lost.	
ELECTRIC TRIM	Associated trim is lost.	
Warning System	Associated Overspeed audio, Landing Gear audio& stick shaker warnings lost. The above will be signalled from the other ADC.	
Ground Proximity Warning System	ADC 1 - loss of Modes 1,2 & 3 ADC 2 - No effect.	
Flight Recorder	ADC 1 - loss of altitude and speed recording. ADC 2 - loss of incidence and TOTAL temperature recording.	
Flight Controls - Outer elevon lockout	No effect, both neutralisation computers automatically use the remaining ADC.	
CG System	ADC 1 - Captain's CG indicator limit bugs and M/CG light lost also CG bugs on Machmeter if ADC switched off. ADC 2 - Flight Engineer's CG indicator bugs and First Officer's M/CG light lost also CG bugs on First Officer's Machmeter if ADC switched off.	
Power Plant NASU	E High BCU signal Air shut-off valve M = 1.2 signal.	Auto change to other NASU.
	E Mid E Flyover Temp static	Signals not cross connected.
Secondary Air Doors	ADC 1 - Automatic operation of engines 1 and 4 Secondary Air Doors lost. ADC 2 - Automatic operation of engines 2 and 3 Secondary Air Doors lost.	
ENG 4 T/O N_1 LIMITER	ADC 1 - 88% N_1 limit below 60 kt is not active.	
Ground Idle	ADC 1 - Engine 1 and 4 LO idle lost. ADC 2 - Engine 2 and 3 LO idle lost.	

(Completely Revised)

EMERGENCY/ABNORMAL DRILLS

EFFECTS OF DOUBLE ADC FAILURE

SYSTEM	Double ADC failure or Two ADCs switched OFF.
Artificial Feel	Both artificial feel systems lost.
Electric Trim	Both trim systems trip except at radio altitude less than 1500 ft with LAND or GLIDE mode engaged.
Warning System	Associated audio systems lost.
GPWS	Loss of modes 1,2 & 3.
Flight Recorder	As for ADC 1 and ADC 2.
Flight Controls-Outer elevon Lockout	System lost.
CG System	As for ADC 1 and ADC 2.
Power Plant-NASU	E High, BCU signal and ASOV M=1.2 signal lost. Buckets go to 0^{o}. E schedule goes to low but manual high is available. Bucket runaway protected by ASOV.
Secondary Air Doors	As for ADC 1 and ADC 2.
Eng 4 T/O N1 Limiter	As for ADC 1.
Ground Idle	As for ADC 1 and ADC 2.

(Completely Revised)

FAILURE OF CAROUSEL INS

STANDBY HORIZON .... USE C
FAILED INS .... IDENTIFY .... CP

IF INS 1 OR INS 2 FAILED
ATT INS sw .... ATT INS 3 .... CP

CLEAR ANY REMAINING FLAGS BY
APPROPRIATE SWITCH ACTION

CDU DATA sel .... DSRTK/STS ....
TEST pb .... PRESS AND RELEASE ....

IF ACTION CODE RETURNS
01 CODE .... OFF .... E
02 CODE) .... ATT .... E
03 CODE) .... ATT IF NAV DATA DEGRADES. E
04 CODE .... GROUND OPERATION ONLY ....
05 CODE.......................... CHECK MAL CODE .. CP

IF MAL CODE 55
NAV AID DATA .... RELOAD .... CP

06 CODE .... CHECK MAL CODE .. CP

IF MAL CODE 41 OR 43
PRESENT POSITION .... RELOAD .... CP

IF MAL CODE 49
MANUAL UPDATE .... CHECK AND FLUSH IF NECESSARY .... CP

END//

IF ACTION CODE DOES NOT RETURN
FLIGHT SYSTEM SWITCHES .... NORMAL .... CP

END//

NOTE

1. When an INS is set to ATT the Flight Director, Autopilot (except in INS and TRK modes) and Autothrottle may be used providing the associated compass coupler is supplied in INS 3 with INS 3 in NAV mode.

2. If INS 1 switched OFF — AP/FD 1, AT 1 and weather radar No.1 stabilisation are lost.

If INS 2 switched OFF — AP/FD 2, AT 2 and weather radar No.2 stabilisation are lost.

(Unchanged)

FAILURE OF FOUR MAIN GENERATORS

EMERG GEN	MANUAL	E
ENGINE FEED PUMPS	ALL ON	E
ENGINE RECIRCULATION VALVES	ALL SHUT	E
SERVO CONTROLS YELLOW rty sel	YELLOW GREEN	C
REAR EXTRACT STANDBY FAN	ON	E

F/O ASI AND ALTIMETER	STANDBY MODE	P
ADC 2	OFF	P
AC ESS BUS sws	ALL EMERG	E
AIR INTAKES LANE rty sel	1 & 3 TO A 2 & 4 TO B	E
AIR INTAKES HYD sel	1 TO GREEN 3 TO BLUE 2 & 4 TO YELLOW	E
ENGINE CONTROL SCHEDULE	ABOVE 220 KT HI BELOW 220 KT LO	E E
BATTERY sels (2)	ESS MAIN SPLIT	E
THROTTLE MASTER sels	MAIN	E
WING & INTAKE ANTI-ICING	OFF	E
GALLEYS	SHED	E
GENERATORS	RECOVER	E

<u>IF GENERATOR (S) RECOVERED</u>
APPLY APPROPRIATE PROCEDURES

<u>IF ONLY ONE GENERATOR IS RECOVERED</u>
REVIEW THE DRILL: ' FAILURE OF THREE MAIN GENERATORS

and apply as necessary

<u>IF ALL GENERATORS REMAIN OFFLINE</u>

No 3 INS MODE	ATT	E
W/SHIELD DE-ICE L sel	LOW	P
No 1 & 2 ANTI STALL	OFF	P
AUTOSTAB No.1	ENGAGE	P
ARTIFICIAL FEEL No.1	ENGAGE	P
F/O INSTRUMENT TRANSFER sws	ALL LEFT	P

PLAN TO LAND AT NEAREST SUITABLE AIRFIELD.

contd.

FAILURE OF FOUR MAIN GENERATORS (continued)

SPEED .... REDUCE TO SUBSONIC C

CAUTION
THE ENGINE RECIRCULATION VALVES MUST NOT BE OPENED UNLESS MAIN GENERATION IS RESTORED.

IF TANKS 6 AND/OR 8 CONTAIN MORE THAN 1000 KG
INTER-CON VALVES (5-8)
AND/OR (6-7) .... OPEN .... E
IF FUEL IN TANK 11
TANK 11 PUMPS BLUE AND GREEN .... ON .... E

IF FUEL REQUIRED IN TANK 9

CAUTION
ONCE FUEL IS IN TANK 9 THE ONLY METHOD OF TRANSFER OUT IS GRAVITY FEED

TANK 9 INLET VALVE O/RIDE sels ... OPEN .... E

WHEN TANK 9 FUEL AS REQUIRED.
TANK 9 INLET VALVE O/RIDE sels ... SHUT .... E

TANK 5 & 7 INLET VALVE O/RIDE sels...OPEN .... E

IF FUEL IN TANKS 5 & 7
CROSSFEED rty sels .... ALL INLINE ..... E
TANK 5 & 7 PUMPS sels .... EMERG .... E

PRIOR TO APPROACH CHECKLIST
TANK 5 & 7 PUMPS sels .... OFF .... E

LOWER VISOR/NOSE USING STANDBY LOWERING
AT SPEED FOR NOSE DOWN

LOWER LANDING GEAR USING STANDBY LOWERING
SET BRAKES TO EMERG BEFORE LANDING

END//

contd.

FAILURE OF FOUR MAIN GENERATORS (continued)

NOTE

ON EMERGENCY ELECTRICS

The following are AVAILABLE

Normal pressurisation control
Fuel TOTAL CONTENTS indications and FQIs
FASTEN SEAT BELTS and NO SMOKING signs
Standby horizon
Captain's ADF/RMI
First Officer's VOR/RMI
Voice recorder
Public address
TRK/HDG unit
Marker
Interphone audio selector panels (4)
No.1 ADC, INS, ADI, Compass Coupler and HSI
No.1 ADF, VOR, DME, ILS and Radio Altimeter
No.1 ATC Transponder, VHF and HF

The engine operating schedule will be MID with HI selected and gear up:
it will be LO with any other selection

The following are NOT AVAILABLE

Autopilot
Autothrottle
Normal landing gear operation
Normal visor/nose operation
Visor/nose position indicator
Reverse thrust
Nosewheel steering
Landing lights
Reheat
Normal brakes

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FAILURE OF THREE MAIN GENERATORS

WING & INTAKE ANTI-ICING .... OFF .... E
GALLEYS .... SHED .... E
EMERG GEN .... MANUAL
CHECK VOLTS
& FREQUENCY .. E

F/O ASI AND ALTIMETER .... STANDBY MODE . P
F/O INSTRUMENT TRANSFER sws .... ALL LEFT ..... P
ADC 2 .... OFF .... P
SERVO CONTROLS YELLOW rty sel .... YELLOW GREEN . C
AC ESS BUS sws .... ALL EMERG .... E
No 1 & 2 ANTI STALL .... OFF .... P
AUTOSTAB No.1 .... ENGAGE .... P
ARTIFICIAL FEEL No.1 .... ENGAGE .... P
RADAR .... SYSTEM 2 ..... P
GENERATORS .... RECOVER ...... E

IF THREE GENERATORS REMAIN OFFLINE
KW/KVAR .... MONITOR ...... E

END//

NOTE:
WING & INTAKE ANTI-ICING may be used if necessary but should be kept to a minimum.

The following major services are NOT AVAILABLE with

No.2 AC ESS BUS switch at EMERG	No.3 AC ESS BUS switch at EMERG
No.1 - AFCS - Autothrottle - Electric Trim - Safety Flight Control - Radar Blue & Green Hydraulic contents gauges Nosewheel Steering No.2 Compass standby supply	No.2 - AFCS - Autothrottle - Electric Trim - Autostabs - Artificial Feel - Safety Flight Control - ADC, ADI & HSI - ILS, VOR, DME & ADF - Captains VOR/RMI - Co-pilots ADF/RMI - Radio Altimeter Yellow Hydraulic contents gauge No.2 compass normal supply

NOTE

No.2 compass will only be inoperative if both No.2 and No.3 switches are at EMERG.

AC MAIN BUS LIGHT ON

ENGINE FEED PUMPS .... ALL ON .... E
BTB sel .... TRIP .... E
GENERATOR .... TEST
CHECK VOLTS
& FREQUENCY ... E

IF VOLTS AND/OR FREQUENCY ARE ABNORMAL
GENERATOR .... OFF .... E
SSB sw .... OPEN .... E
BTB sel .... RESET .... E

IF AC MAIN BUS LT ON, BTB MI CROSSLINE
BTB sel .... TRIP .... E
SSB sw .... CLOSE .... E

IF NO.3 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 2 TO B
3 TO A .... E

IF NO.4 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 1 TO A
4 TO B .... E

END//

IF AC MAIN BUS LT OFF, BTB MI INLINE
SSB sw .... CLOSE .... E
EMERG GEN NORM/ISOL sw .... ISOL THEN NORM. E
ENGINE FEED PUMPS .... AS REQUIRED ... E

END//

contd.

(Unchanged)

AC MAIN BUS LIGHT ON (continued)

IF VOLTS AND FREQUENCY ARE NORMAL
GENERATOR .... ON .... E

IF AC MAIN BUS LT ON
GENERATOR .... OFF .... E
SSB sw .... OPEN .... E
BTB sel .... RESET .... E

IF AC MAIN BUS LT ON, BTB MI CROSSLINE
BTB sel .... TRIP .... E
SSB sw .... CLOSE .... E

IF NO.3 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 2 TO B
3 TO A .... E

IF NO.4 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 1 TO A
4 TO B .... E

END//

IF AC MAIN BUS LT OFF, BTB MI INLINE
SSB sw .... CLOSE .... E
EMERG GEN NORM/ISOL sw .... ISOL THEN NORM..E
ENGINE FEED PUMPS .... AS REQUIRED ... E

END//

IF AC MAIN BUS LT OFF, GCB MI INLINE
EMERG GEN NORM/ISOL sw .... ISOL THEN NORM..E
ENGINE FEED PUMPS .... AS REQUIRED ... E

END//

CAUTION
WHEN GENERATOR SUPPLY HAS BEEN RE-
COVERED AFTER AN AC MAIN BUS FAILURE
THE BTB SHOULD NOT BE RESET

CAUTION
WHEN BUSBAR SUPPLY HAS BEEN RECOVERED
BY BTB SWITCH ACTION THE ASSOCIATED
GENERATOR MUST NOT BE RESELECTED

(Unchanged)

AC ESS BUS LIGHT ON

AC ESS BUS sw .... EMERG .... E

IF No 3 ESS BUS SW AT EMERG
ADC 2 .... OFF .... P

IF AC ESS BUS LT REMAINS ON
EMERG GEN .... MANUAL .... E

END//

The following major services are NOT AVAILABLE with

No.2 AC ESS BUS switch at EMERG	No.3 AC ESS BUS switch at EMERG
No.1 - AFCS - Autothrottle - Electric Trim - Safety Flight Control - Radar Blue & green Hydraulic contents gauges Nosewheel steering No.2 Compass standby supply	No.2 - AFCS - Autothrottle - Electric Trim - Autostabs - Artificial Feel - Safety Flight Control - ADC, ADI & HSI - ILS, VOR, DME & ADF - Captains VOR/RMI - Co-pilots ADF/RMI - Radio Altimeter Yellow Hydraulic Contents gauge No.2 compass normal supply

NOTE

No.2 compass will only be inoperative if both No.2 and No.3 switches are at EMERG.

EMERG GEN O/HEAT LIGHT ON

EMERG GEN
NORM/ISOL sw .... ISOL .... E

END//

EMERG GEN FAIL LIGHT ON

FAIL LT .... PRESS AND RELEASE .... E

IF FAIL LT REMAINS ON
EMERG GEN .... CHECK VOLTS & FREQUENCY .... E

IF OFF SCALE OR ZERO
EMERG GEN
NORM/ISOL sw .... ISOL .... E

SYSTEMS POWERED BY THE
AFFECTED AC ESSENTIAL BUSBARS .... MONITOR .... E

END//

FAILURE OF ONE OR TWO GENERATORS

GENERATOR .... TEST
CHECK VOLTS & FREQUENCY .... E

IF VOLTS AND FREQUENCY ARE ABNORMAL
GENERATOR .... OFF .... E

IF KW INDICATIONS ON REMAINING GENERATORS ARE ABOVE LIMITS
ELECTRICAL LOADS .... REDUCE .... E

END//

IF VOLTS AND FREQUENCY ARE NORMAL
GENERATOR .... ON .... E

END//

NOTE

If two main generators are off-line and WING & INTAKE ANTI-ICING is selected, monitor loads and shed galley if necessary.

DC ESS BUS LIGHT ON

BATTERY sel .... BATT ON .... E

IF BATTERY AMMETER OFF SCALE
BATTERY sel .... BATT OFF ...... E

TRU sws .... ALL NORM ...... E
DC VOLTS sel .... AFFECTED BUSBAR .... E

IF ESS B VOLTAGE NOT ACCEPTABLE
EMERG GEN .... MANUAL .... E

END//

DC MAIN BUS LIGHT ON

IF ESSENTIAL MAIN SPLIT MIS NOT INLINE
BATTERY sels (2) .... BATT ON .... E

DC VOLTS sel .... MAIN A .... E

IF VOLTMETER READING IS 0
NO 2 TRU sw .... NORM .... E

REPEAT OPERATION FOR MAIN B (No 3 TRU) .... E

END//

CSD LIGHT ON

CSD .... DISC .... E
GENERATOR .... OFF .... E

IF KW INDICATIONS ON REMAINING GENERATORS ARE ABOVE LIMITS
ELECTRICAL LOADS .... REDUCE .... E

END//

CSD OIL INLET TEMP LIGHT ON

CSD OIL INLET TEMPERATURE .... MONITOR .... E

IF CSD OIL INLET TEMPERATURE EXCEEDS 155°C
ENGINE FUEL TEMPERATURE
(SECONDARY INSTRUMENTS PANEL) .... OBSERVE .... E

IF ENGINE FUEL TEMPERATURE ABOVE 70°C
FUEL HEATER .... OFF .... E

ELECTRICAL LOADS .... REDUCE IF PRACTICABLE .... E

IF CSD OIL INLET TEMPERATURE REMAINS ABOVE 155°C FOR 5 MINS

CSD .... DISC .... E
GENERATOR .... OFF .... E

END//

CSD HIGH DIFFERENTIAL TEMPERATURE

IF THE CSD OIL DIFF TEMPERATURE EXCEEDS:-
20°C FOR ELECTRICAL LOADS UP TO 30 KW
OR
30°C FOR ELECTRICAL LOADS ABOVE 30 KW

GENERATOR .... OFF .... E

IF CSD OIL DIFF TEMPERATURE REMAINS ABOVE 20°C
CSD .... DISC .... E

END//

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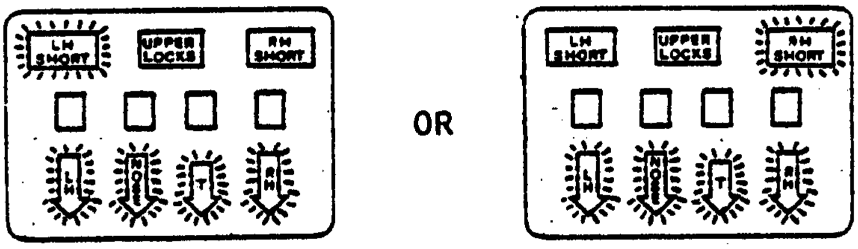
LANDING WITH ABNORMAL LANDING GEAR CONFIGURATION

ONE MAIN LANDING GEAR LOCKED DOWN BUT EXTENSION ABNORMAL



CAUTION

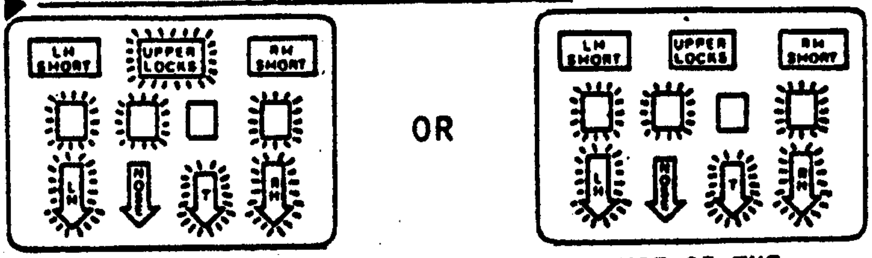
DO NOT ATTEMPT TO CORRECT THIS CONDITION BY APPLICATION OF THE LANDING GEAR STANDBY LOWERING OR MAIN GEAR-FREE FALL PROCEDURES.

HANDLING

The approach and landing should be normal keeping as much weight as possible off the shortened leg.

END//

NOSE LANDING GEAR NOT LOCKED DOWN



THIS DRILL IS TO BE USED ONLY AFTER USE OF THE LANDING GEAR STANDBY LOWERING AND RELEVANT FREE FALL DRILLS HAVE BEEN UNSUCCESSFUL.

REVIEW THE DRILL : PASSENGER EVACUATION
ON LANDING

JETTISON AS MUCH FUEL AS POSSIBLE

GPW C/B .... TRIP .... E
L/GEAR WARN C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4
AUDIO WARN SYS SUP 1	1-213	M21

AT 180 KTS
AUDIO .... CANCEL .... E

NOTE

With the GPW circuit breaker tripped all modes of operation will be inhibited.

With the L/GEAR WARN circuit breaker tripped the audio will operate at 180 knots.

contd.

(Unchanged)

LANDING CHECKLIST

JETTISON	TERMINATED	E
DRAIN MAST HTRS	OFF	E
L/GEAR NORMAL LEVER	DOWN	P
STANDBY LOWERING LEVER	WHEELS	E
CG	53%	E
NOSE	DOWN, GREEN	E.P
VISOR NOSE STBY CONTROL	VISOR DOWN	E
BRAKES LEVER	EMERG	P
SECONDARY AIR DOORS	SHUT	E
RADAR	STANDBY	E
YELLOW PUMPS	ON/PRESSURE NORMAL	E
AUX INLET MIs	OPEN/CROSS-HATCHED	E
SEAT	LOCKED/PWR OFF	E
LANDING CHECKLIST	COMPLETED	E

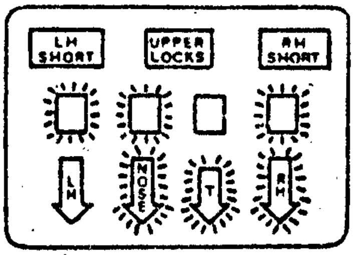
HANDLING

Following a normal approach and flare reverse idle should be selected at touchdown.
The nose up attitude at touchdown should be maintained and normal reverse selected as soon as possible, bearing in mind the aircrafts tendency to pitch up with increasing reverse thrust.
Braking should be gentle and cease at 120 knots. At 110 knots the attitude should be reduced to touchdown on the nosewheel as gently as possible. At approximately 85 knots: Reverse idle should then be reselected.

AT REST
IF NECESSARY APPLY PROCEDURE: PASSENGER EVACUATION ON LANDING

(Deletion)

ONE MAIN LANDING GEAR DOWN BUT NOT LOCKED (the other leg locked down)



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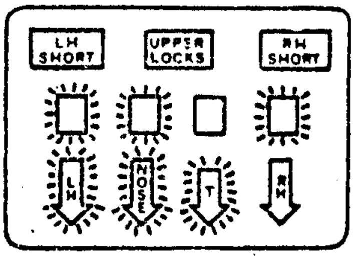

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REVIEW THE DRILL : PASSENGER EVACUATION ON LANDING

JETTISON AS MUCH FUEL AS POSSIBLE ON THE SIDE NOT LOCKED DOWN

GPW C/B .... TRIP .... E
L/GEAR WARN C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4
AUDIO WARN SYS SUP 1	1-213	M21

AT 180 KTS
AUDIO .... CANCEL .... E

NOTE

With the GPW circuit breaker tripped all modes of operation will be inhibited.

With the L/GEAR WARN circuit breaker tripped the audio will operate at 180 knots.

contd.

(Unchanged)

LANDING CHECKLIST

JETTISON	TERMINATED	E
DRAIN MAST HTRS	OFF	E
L/GEAR NORMAL LEVER	DOWN	P
STANDBY LOWERING LEVER	WHEELS	E
NOSE	DOWN, GREEN	E.P
BRAKES	CHECKED/NORM	P
SECONDARY AIR DOORS	SHUT	E
RADAR	STANDBY	E
YELLOW PUMPS	ON/PRESSURE NORMAL	E
AUX INLET MIs	OPEN/CROSS HATCHED	E
SEAT	LOCKED/PWR OFF	E
LANDING CHECKLIST	COMPLETED	E

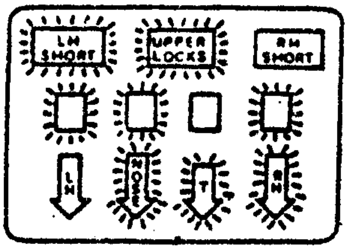
HANDLING

The approach and landing should be normal with slight side slip towards the side with the leg locked down.

AT TOUCHDOWN
IF NECESSARY SHUT DOWN ENGINE(S) USING THE ENGINE SHUT DOWN HANDLES. WAIT SEVEN SECONDS THEN PRESS 2 SHOT EXTINGUISHER.

AT REST
IF NECESSARY APPLY PROCEDURE: PASSENGER EVACUATION ON LANDING

● ONE MAIN LANDING GEAR NOT FULLY LOWERED OR REMAINS LOCKED UP



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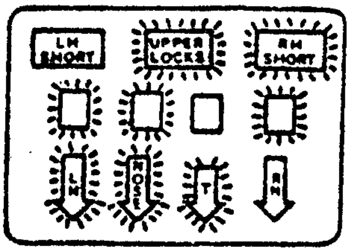

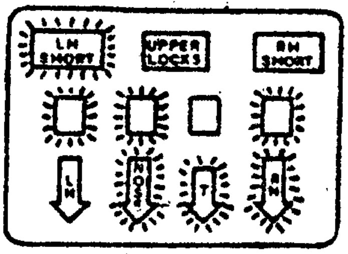

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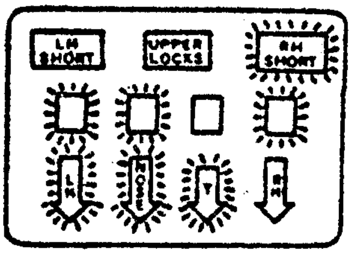

THIS DRILL IS TO BE USED ONLY AFTER USE OF THE LANDING GEAR STANDBY LOWERING AND RELEVANT FREE FALL DRILLS HAVE BEEN UNSUCCESSFUL.

REVIEW THE DRILL : PASSENGER EVACUATION ON LANDING

GPW C/B .... TRIP ....E
L/GEAR WARN C/B .... TRIP ....E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4
AUDIO WARN SYS SUP 1	1-213	M21

AT 180 KTS
AUDIO .... CANCEL ....E

NOTE

With the GPW circuit breaker tripped all modes of operation will be inhibited.

With the L/GEAR WARN circuit breaker tripped the audio will operate at 180 knots.

contd.

ATTEMPT TO RETRACT THE LANDING GEAR AND THEN TO LOWER THE NOSE GEAR AS FOLLOWS

L/GEAR NORMAL LEVER .... NEUTRAL .... P
STANDBY LOWERING LEVER .... NEUTRAL .... E
MAIN GEAR .... FREE FALL .... E
FREE FALL CONTROLS .... NORMAL/PNEUMATICS DISCONNECTED .... E
YELLOW PUMPS .... ON .... E
STANBY LOWERING LEVER .... DOORS .... E
L/GEAR NORMAL LEVER .... UP .... E
STANDBY LOWERING LEVER .... WHEELS THEN DOORS ...... E

WAIT 10 SECONDS
L/GEAR RAISE C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
L/GEAR RAISE	15-215	A6

STANDBY LOWERING LEVER .... NEUTRAL .... E

WAIT 30 SECONDS
L/GEAR RAISE C/B .... RESET .... E

JETTISON AS MUCH FUEL AS POSSIBLE

L/GEAR NORMAL LEVER .... NEUTRAL.......... E

NOSE GEAR .... FREE FALL .... E

DO NOT PUT L/GEAR NORMAL LEVER TO DOWN

EMERGENCY RELEASE OPERATION

1. PULL OUT PIN
2. LOCATE HAND WHEEL
3. TURN HAND WHEEL FULLY CLOCKWISE
4. CHECK DOWN LOCK VISUAL INDICATION

UNLOCKED	LOCKED
RED	RED
	WHITE

L/GEAR NORMAL LEVER .... UP .... E

contd.

LANDING CHECKLIST

JETTISON .... TERMINATED ... E
DRAIN MAST HTRS .... OFF .... E
NOSE .... DOWN, GREEN .. E.P
SECONDARY AIR DOORS sels .... SHUT .... E
RADAR .... STANDBY .... E
AUX INLET MIs .... OPEN/CROSS HATCHED .... E
SEAT .... LOCKED/PWR OFF .... E
LANDING CHECKLIST .... COMPLETED ...... E

HANDLING

Following a normal approach and flare touch down as gently as possible on the nosewheels and nacelles.

AT TOUCHDOWN
ENGINE SHUTDOWN HANDLES .... PULL .... E

SEVEN SECONDS AFTER PULLING HANDLES
2 SHOT .... PRESS .... E

AT REST
APPLY PROCEDURE : PASSENGER EVACUATION ON LANDING

EMERG GEN O/HEAT LIGHT ON

EMERG GEN
NORM/ISOL sw .... ISOL .... E

END//

EMERG GEN FAIL LIGHT ON

FAIL LT .... PRESS AND RELEASE .... E

IF FAIL LT REMAINS ON
EMERG GEN .... CHECK VOLTS & FREQUENCY .... E

IF OFF SCALE OR ZERO
EMERG GEN
NORM/ISOL sw .... ISOL .... E

SYSTEMS POWERED BY THE
AFFECTED AC ESSENTIAL BUSBARS .... MONITOR .... E

END//

FAILURE OF ONE OR TWO GENERATORS

GENERATOR .... TEST
CHECK VOLTS & FREQUENCY .... E

IF VOLTS AND FREQUENCY ARE ABNORMAL
GENERATOR .... OFF .... E

IF KW INDICATIONS ON REMAINING GENERATORS ARE ABOVE LIMITS
ELECTRICAL LOADS .... REDUCE .... E

END//

IF VOLTS AND FREQUENCY ARE NORMAL
GENERATOR .... ON .... E

END//

NOTE

If two main generators are off-line and WING & INTAKE ANTI-ICING is selected, monitor loads and shed galley if necessary.

DC ESS BUS LIGHT ON

BATTERY sel .... BATT ON .... E

IF BATTERY AMMETER OFF SCALE
BATTERY sel .... BATT OFF ...... E

TRU sws .... ALL NORM ...... E
DC VOLTS sel .... AFFECTED BUSBAR .... E

IF ESS B VOLTAGE NOT ACCEPTABLE
EMERG GEN .... MANUAL .... E

END//

DC MAIN BUS LIGHT ON

IF ESSENTIAL MAIN SPLIT MIS NOT INLINE
BATTERY sels (2) .... BATT ON .... E

DC VOLTS sel .... MAIN A .... E

IF VOLTMETER READING IS 0
NO 2 TRU sw .... NORM .... E

REPEAT OPERATION FOR MAIN B (No 3 TRU) .... E

END//

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LANDING GEAR STANDBY LOWERING

L/GEAR NORMAL LEVER	NEUTRAL	P
YELLOW HYD PUMPS	ON	E
STANDBY LOWERING LEVER	DOOR FOR 4 SEC THEN WHEELS	E
L/GEAR NORMAL LEVER	DOWN	P
ENGINES	SHUT DOWN NO.4 LAST	E

NOTE
The landing gear doors remain open
Avoid large side slip angles

(Unchanged)

MAIN GEAR – FREE FALL

L/GEAR NORMAL LEVER .... NEUTRAL .... P
STANDBY LOWERING LEVER .... NEUTRAL .... E

AT EMERGENCY CONTROL POSITION

EMERGENCY RELEASE OPERATION

1-MOVE OPEN INDEX ON KNURLED KNOB TO RED LINE

2-REMOVE PIN FROM BELLCRANK

3-OPERATE BELLCRANK TO RIGHT HAND BY USE OF CONTROL LEVER

4-CHECK DOWNLOCK VISUAL INDICATION

UNLOCKED	LOCKED
○ RED	○ RED
	▭ WHITE

5-IF DOWNLOCK IS NOT OBTAINED USE PNEUMATIC AID (LOCATED BETWEEN TWO CENTRE CROSSBEAMS)

(AFTER USE OF PNEUMATIC SYSTEM CLOSE COCK REMOVE AIR LINE)

L/GEAR NORMAL LEVER .... DOWN .... P

END//

NOTE

The landing gear doors remain open.
Avoid large side slip angles.
If the green hydraulic system is not pressurised the tail wheel will not lower.

The above procedure takes approx. 3½ minutes.

NOSE GEAR – FREE FALL

L/GEAR NORMAL LEVER .... NEUTRAL .... P
STANDBY LOWERING LEVER .... NEUTRAL .... E

AT EMERGENCY CONTROL POSITION

EMERGENCY RELEASE OPERATION

1. PULL OUT PIN
2. LOCATE HAND WHEEL
3. TURN HAND WHEEL FULLY CLOCKWISE
4. CHECK DOWN LOCK VISUAL INDICATION

UNLOCKED	LOCKED
RED	RED WHITE

L/GEAR NORMAL LEVER .... DOWN .... P

END//

NOTE
The landing gear doors remain open.
Avoid large side slip angles.

WHEELS O/HEAT LIGHT ON IN FLIGHT

WITH LANDING GEAR UP

VISOR .... DOWN .... P
LANDING GEAR .... DOWN .... P
BRAKE FANS .... CONFIRM ON .... E

WHEN BRAKES TEMP LESS THAN 150°C
LANDING GEAR .... UP: LTS OFF: NEUTRAL.... PE
BRAKE FANS .... OFF .... E
ENG RATING MODE .... FLIGHT .... E

END//

WITH LANDING GEAR DOWN

PROVIDING SAFETY CONSIDERATIONS PERMIT
LEAVE LANDING GEAR DOWN UNTIL BRAKES
TEMP LESS THAN 150°C

BRAKE FANS .... CONFIRM ON .... E

END//

(Deletion)

USE OF BRAKES IN EMERG

THIS DRILL IS USED IF THE BRAKES FAIL LIGHT IS ON OR IF FOUR OR MORE R LIGHTS ARE OFF IN THE LANDING CHECKS

BRAKES PEDALS .... RELEASE C

BRAKES LEVER .... EMERG C

ANTI-SKID IS NOT AVAILABLE. USE THE BRAKES WITH CARE, APPLYING PRESSURE GENTLY AND MONITORING THE PRESSURE WITH REFERENCE TO THE BRAKES PRESSURE GAUGE.

ON A WET RUNWAY THE BRAKES MUST BE RELEASED EVERY 5 SECONDS AND THE FOLLOWING MAXIMUM PRESSURES MUST NOT BE EXCEEDED.

450 PSI AT SPEEDS ABOVE 75 KNOTS
900 PSI AT SPEEDS BELOW 75 KNOTS

ON A DRY RUNWAY CONTINUOUS BRAKING TO A MAXIMUM OF 1100 PSI IS PERMITTED.

IF AIRCRAFT IS NOT BRAKED

BRAKES LEVER .... PARK .... P

CAUTION

PARK SHOULD ONLY BE USED WHEN ABSOLUTELY NECESSARY. NO MODULATION OF THE BRAKE PRESSURE IS AVAILABLE, BECAUSE AT PARK POSITION ALL AVAILABLE BRAKE ACCUMULATOR PRESSURE IS DELIVERED TO THE BRAKES.

END//

VISOR/NOSE UNLOCK LIGHT ON

● ▶ WITH THE VISOR/NOSE UP

SPEED .... REDUCE TO LESSER OF 325 KT/M = 0.95 C

END//

● ▶ WITH NOSE AT 5° OR DOWN AND NOSE MI READING UP

BEFORE LANDING

GPW C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4

AT LANDING

CG .... 52.5% .... E

MINIMUM SPEED .... V_{REF} + 10 KTS C

NOTE

With nose at 5°, the indicated incidence will be approx. 4° low. With nose at DOWN, the indicated incidence will be approx. 11° low.

END//

● ▶ **IF 5°L LT ON**

APPLY PROCEDURE

NOSE 5°L LIGHT ON

NOSE 5° L LIGHT ON

CAUTION

WITH UNSAFE 5° LOCKS THE NOSE MAY, DURING THE LOWERING SEQUENCE, PASS THE 5° POSITION TOWARD THE DOWN POSITION. THEREFORE BEFORE SELECTING 5° REDUCE SPEED TO 270 KTS AND ALTITUDE BELOW 20,000 FT.

● ▶ WITH THE NOSE UP

CONTINUE WITH NORMAL FLIGHT.

OBSERVE CAUTION BEFORE LOWERING NOSE

END//

● ▶ WITH NOSE AT 5°

NOSE .... SELECT UP .... P

OBSERVE CAUTION BEFORE LOWERING NOSE

END//

VISOR/NOSE STANDBY LOWERING (VISOR UP TO NOSE 5°)

IF GREEN TANK LEVEL HAS FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR
APPLY PROCEDURE: VISOR NOSE FREE FALL

IF GREEN TANK LEVEL HAS NOT FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR
STBY CONTROL sw ....VISOR LOWER ..... P

- **IF 5°L LT ON**
  SPEED ....REDUCE TO 270 KT C
  ALTITUDE ....BELOW 20000 FT .. C

STBY CONTROL sw ....NOSE 5° .... P

- **IF NOSE WILL NOT LOWER TO 5°**
  APPLY PROCEDURE: VISOR/NOSE FREE FALL

IF NOSE LOWERS TO 5°

WHEN REQUIRED

APPLY PROCEDURE: NOSE STANDBY LOWERING 5° TO DOWN

(Unchanged)

NOSE STANDBY LOWERING (5° TO DOWN)

● ▶ IF GREEN TANK LEVEL HAS FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR

PREPARE TO LAND WITH NOSE AT 5° AND EXISTING VISOR POSITION C
GPW C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4

END//

● ▶ IF GREEN TANK LEVEL HAS NOT FALLEN SINCE FIRST ATTEMPT TO LOWER VISOR

STBY CONTROL sw .... NOSE DOWN ..... P

IF NOSE WILL NOT LOWER TO DOWN

PREPARE TO LAND AS PRESENTLY CONFIGURED C
GPW C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4

END//

NOTE
With the GPW circuit breaker tripped all modes of the ground proximity warning system are inhibited

VISOR/NOSE FREE FALL

GPW C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GRND PROXIMITY WARN AC SUP	13-215	G4

IF 5°L LT ON

SPEED .... REDUCE TO 270 KT C

ALTITUDE .... BELOW 20000 FT C

EMERGENCY NOSE/VISOR UPLOCK RELEASE .... OPERATE FULLY TO ENGAGE LATCH .... P

PREPARE TO LAND AS PRESENTLY CONFIGURED C

END//

NOTE

With the GPW circuit breaker tripped all modes of the ground proximity warning system are inhibited.

RAPID DEPRESSURIZATION

AUDIO	CANCEL	E
OXYGEN	ON 100%	ALL
CREW COMMUNICATION	ESTABLISH	ALL
CABIN ALTITUDE	CONFIRM WARNING	E
PASSENGER OXYGEN	CONFIRM ON	E
DISCHARGE VALVES	IF OPEN SELECT THE OTHER SYSTEM AND CLOSE MANUALLY IF NECESSARY	E
GROUND PRESSURE RELIEF VALVE .	SHUT	E

IF CABIN ALTITUDE CANNOT BE CONTROLLED
APPLY PROCEDURE: EMERGENCY DESCENT

ngea)

EMERGENCY DESCENT

THROTTLES	IDLE	C
FUEL FWD TRANS sw	O/RIDE	C
TANK 9 & 10 PUMP sels	VERIFY OFF	E
PRESSURIZATION	MAX RATE OF DESCENT	E
CABIN ALTITUDE sel	ZERO	E
ATC TRANSPONDER	A7700	C
SAFETY HEIGHT	CHECK	P

TANK 9 INLET VALVES MAIN sel	AUTO	E
TANK 11 PUMPS	ALL AUTO	E
TANKS 9 & 10 LLC	8000 KG	E
TANK 11 LLC	ZERO	E
TRIM TRANS AUTO MASTER sel	FORWARD	E
FUEL FWD TRANS sw	GUARD	C
FWD EMERGY RELIEF sw	OPEN	E
FWD EXTRACT FANS	ALL ON	E

IF OXYGEN HAS BEEN IN USE
WHEN CABIN ALTITUDE DESCENDS TO 15000 FT OR BELOW

NO SMOKING SIGNS	ON	E
CREW OXYGEN	SELECT N USE AS REQD	ALL

PASSENGER OXYGEN SHOULD RETURN TO NORMAL FLOW AUTOMATICALLY BUT IF MANUAL OVERRIDES HAVE BEEN USED THEY SHOULD BE RESET.

IF NORMAL CABIN PRESSURE CANNOT BE RESTORED

CABIN & FLIGHT DECK TEMPERATURE SELECTORS	COOLEST AUTO SETTING	E

END//

(Deleti

SHUT DOWN OF AIR CONDITIONING GROUPS

BLEED VALVE .... SHUT .... E
COND VALVE .... OFF .... E
ASSOCIATED GROUP sw .... FAILED .... E
COND VALVES FOR OTHER GROUPS .... BOOST .... E

AFTER SHUT DOWN OF A SECOND GROUP

DISCHARGE VALVE sw FOR
SYSTEM IN USE .... AFT SHUT .... E
FWD EMERGY RELIEF sw .... OPEN .... E
FWD EXTRACT FANS .... ALL ON .... E
SPEED .... OBSERVE
MAX TAT
100°C C

END//

AFTER SHUT DOWN OF A THIRD GROUP

TEMPERATURE SELECTOR .... COOLEST AUTO
SETTING .... E
SPEED .... SUBSONIC C

END//

NOTE

If STANDBY temperature control system is used, COLD or negative settings may only be used at altitude greater than 30,000 ft.

(Unchanged)

BOTH FWD EXTRACT FLOW LIGHTS ON

● ▶ WITH THE CONTROLLING FWD DISCHARGE VALVE SHUT

DISCHARGE VALVES sws .... NORM .... E
SYSTEM SELECT sws .... OTHER SYSTEM .. E

IF FWD DISCHARGE VALVES REMAIN SHUT AND FWD FLOW LTS ON

FWD EMERGY RELIEF sw .... OPEN .... E
FWD EXTRACT FANS .... ALL ON .... E

IF FWD FLOW LTS STILL REMAIN ON

CABIN & FLIGHT DECK
TEMPERATURE SELECTORS .... COOLEST AUTO SETTING .... E

AIR INTAKES, INS &
WEATHER RADAR .... MONITOR .... E

END//

CAUTION
IF AIR INTAKE FAILURE OCCURS REDUCE SPEED TO SUBSONIC AND APPLY APPROPRIATE PROCEDURES.

● ▶ WITH THE CONTROLLING FWD DISCHARGE VALVE REGULATING NORMALLY

FWD EMERGY RELIEF sw .... SHUT .... E

IF FWD FLOW LTS REMAIN ON

FWD EMERGY RELIEF sw .... OPEN .... E
FWD EXTRACT FANS .... ALL ON .... E

IF FWD FLOW LTS STILL REMAIN ON

CABIN & FLIGHT DECK
TEMPERATURE SELECTORS .... COOLEST AUTO SETTING ....E

AIR INTAKES, INS &
WEATHER RADAR .... MONITOR .... E

END//

CAUTION
IF AIR INTAKE FAILURE OCCURS REDUCE SPEED TO SUBSONIC AND APPLY APPROPRIATE PROCEDURES.

RH OR LH FWD EXTRACT FLOW LIGHT ON

CABIN & FLIGHT DECK
TEMPERATURE SELECTORS .... COOLEST AUTO SETTING ...... E

AIR INTAKES, INS &
WEATHER RADAR .... MONITOR ...... E

END//

CAUTION
IF AIR INTAKE FAILURE OCCURS, REDUCE SPEED TO SUBSONIC AND APPLY APPROPRIATE PROCEDURES.

REAR EXTRACT FLOW LIGHT ON

REAR EXTRACT STANDBY FAN .... ON .... E

IF FLOW LT REMAINS ON
SPEED .... SUBSONIC C
HF & ADF .... MINIMUM USE ... C
REAR CABIN
TEMPERATURE SELECTORS .... COOLEST AUTO SETTING .... E

IMMEDIATELY THE AIRCRAFT SPEED FALLS BELOW M ≑ 1.30

RAMP/SPILL MASTER sws .... ALL MAN .... E
AICU C/BS .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
AICU 1B SUP	14-216	A5
AICU 4A SUP	14-216	B5
AICU 2A SUP	13-216	A3
AICU 3B SUP	13-216	B3
AICU 4B SUP	2-213	B14
AICU 1A SUP	2-213	D14
AICU 3A SUP	2-213	H13
AICU 2B SUP	2-213	H14

FAILURE OF WINDOWS

NOTE

For electrical faults, arcing, or interlayer bubbling, the faulty circuit should be switched off.

● FLIGHT DECK FORWARD WINDSCREEN

IF CRACKED GLASS

REDUCE CABIN DIFFERENTIAL PRESSURE TO GIVE MINIMUM ACCEPTABLE PRESSURE LEVEL AT OPERATING ALTITUDE .... E

END//

IF DELAMINATION

CONTINUE FLIGHT IF VISION IS ACCEPTABLE C

END//

● FLIGHT DECK SIDE WINDOWS (SLIDING AND AFT)

IF INNER PANEL

TYPE OF FAILURE .... OBSERVE . ALL

IF CRACKED GLASS

REDUCE CABIN DIFFERENTIAL PRESSURE TO GIVE MINIMUM ACCEPTABLE PRESSURE LEVEL AT OPERATING ALTITUDE .... E

END//

IF DELAMINATION

CONTINUE FLIGHT

END//

IF OUTER PANEL IS CRACKED

SPEED .... LIMIT TO M = 1.90 .. C

END//

● VISOR WINDOWS

IF CRACKED GLASS OR DELAMINATION

CONTINUE FLIGHT

END//

IF COMPLETE FAILURE OF PANEL

SPEED .... LIMIT TO 325 kt C

END//

contd.

FAILURE OF WINDOWS (continued)

CABIN WINDOWS

IF INNER PANEL
TYPE OF FAILURE .... OBSERVE .. E

IF CRACKED GLASS
REDUCE CABIN DIFFERENTIAL PRESSURE TO GIVE
MINIMUM ACCEPTABLE PRESSURE LEVEL AT
OPERATING ALTITUDE .... E

END//

IF DELAMINATION
CONTINUE FLIGHT

END//

IF OUTER PANEL IS CRACKED
SPEED .... LIMIT TO
M = 1.90 ... C

END//

CABIN EXCESS PRESSURE

CABIN DIFF PRESSURE .... CONFIRM WARNING .... E

CABIN ALT sel .... CONFIRM SETTING, IF NECESSARY SWITCH TO OTHER SYSTEM .... E

END//

NAC/WING O/HEAT LIGHT ON

BLEED VALVE .... SHUT .... E

FOR AFFECTED SYSTEM
APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS

NOTE

If the warning light remains on 2 minutes after selecting the Bleed Valve shut, this indicates a possible hot air leak within the nacelle. Continued operation of the affected engine is permitted.

DUCT LIGHT ON

CAUTION
DO NOT ATTEMPT TO RESET THE DUCT DETECTION SYSTEM BY PRESSING THE DUCT LIGHT

COND VALVE .... OFF .... E

IF THE COND VALVE, BLEED VALVES AND CROSS BLEED MIs SHOW CROSSLINE
CROSS BLEED VALVES sws .... SHUT .... E
APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS (SHUT DOWN OF ONE GROUP)

CAUTION
UNDER NO CIRCUMSTANCES MAY THE AFFECTED BLEED VALVE AND CROSS BLEED VALVES BE OPENED

IF THE BLEED VALVE MIs SHOW INLINE
DUCT LT .... MONITOR .... E

IF THE DUCT LT REMAINS ON
APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS (SHUT DOWN OF ONE GROUP)

IF THE DUCT LT GOES OFF
FUEL EXCH LT .... OBSERVE .... E

IF THE FUEL EXCH LT ON
FUEL VALVE .... OPEN .... E
FUEL VALVE .... AS REQ'D .... E

IF THE FUEL EXCH LT OFF
TEMPERATURE SELECTOR .... STANDBY .... E

COND VALVE .... ON .... E

END//

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ANTI-ICING LEFT & RIGHT INT & CYCLIC LIGHTS ON

● TOTAL TEMPERATURE IS GREATER THAN + 15°C

WING & INTAKE ANTI-ICING
rty sels (2) .... OFF .... E

END//

● TOTAL TEMPERATURE IS LESS THAN + 15°C

WING & INTAKE ANTI-ICING
SELECTED rty sel .... OFF .... E
WING & INTAKE ANTI-ICING
OTHER rty sel .... 4 SECS ON ..... E

IF LEFT OR RIGHT INT LT ON

LE//

IF CYCLIC LT ON

APPLY PROCEDURE: ANTI-ICING CYCLIC LIGHT ON

IF LEFT AND RIGHT INT & CYCLIC LTS REMAIN ON

WING & INTAKE ANTI-ICING
ALTERN rty sel .... 4 SECS ON ..... E
TEMP O/RIDE pb .... PRESS .... E

IF LEFT AND RIGHT INT & CYCLIC LTS REMAIN ON

LEAVE ICING CONDITIONS

END//

ANTI-ICING INT LIGHT ON

● ▶ WITH WING & INTAKE ANTI-ICING MAIN OR ALTERN rty sel AT 4 SECS ON
LE//

END//

● ▶ WITH WING & INTAKE ANTI-ICING rty sels (2) AT OFF
CONTINUOUS DE-ICING AC POWER C/B's . TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
LH WING CONTN IND	15-216	B15
INT 4 REAR RAMP HTR SUP	14-216	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	A15
RH WING SECT 13.7, 15.3 HTRS CONTN SUP	14-216	B12
RH WING SECT 14.1, 14.2 HTRS CONTN SUP	14-216	B13
RH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-216	B15
RH WING SECT 13.5, 13.6 HTRS CONTN SUP	14-216	C12
RH WING SECT 15.1, 15.2 HTRS CONTN SUP	14-216	C13
RH WING SECT 13.2, 13.3 & 13.4 HTRS CONTN SUP	14-216	C15
INT 3 AUX DOOR D BOX HTR SUP	13-216	A10
INT 3 REAR RAMP HTR SUP	13-216	A11
INT 2 AUX DOOR D BOX HTR SUP	13-215	A9
INT 2 REAR RAMP HTR SUP	13-215	A10
INT 1 REAR RAMP HTR SUP	14-215	B6
INT 1 AUX DOOR D BOX HTR SUP	14-215	B7
LH WING SECT 13.7, 15.3 HTRS CONTN SUP	14-215	C6
LH WING SECT 14.1, 14.2 HTRS CONTN SUP	14-215	C7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	C8
LH WING SECT 13.5, 13.6 HTRS CONTN SUP	14-215	D6
LH WING SECT 15.1, 15.2 HTRS CONTN SUP	14-215	D7
LH WING SECT 13.2, 13.3 & 13.4 HTRS CONTN SUP	14-215	D8
RH WING CONTN IND	15-215	B11

END//

ANTI-ICING CYCLIC LIGHT ON

● ▶ WING & INTAKE ANTI-ICING rty sels (2) AT OFF

WING & INTAKE ANTI-ICING
DC C/BS .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
LH WING CONTN IND	15-216	B15
RH CYCLIC TIMER CONT	15-216	D14
RH WING CONTN IND	15-215	B11
LH CYCLIC TIMER CONT	3-213	B11

END//

● ▶ WING & INTAKE ANTI-ICING MAIN OR ALTERN rty sel AT 4 SECS ON

CYCLIC LT .... OBSERVE .... E

▶ IF CYCLIC LT ON STEADY FOR MORE THAN 16 SECS

WING & INTAKE ANTI-ICING
rty sel .... OFF .... E

▶ IF CYCLIC LT REMAINS ON

WING & INTAKE ANTI-ICING
DC C/BS .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
LH WING CONTN IND	15-216	B15
RH CYCLIC TIMER CONT	15-216	D14
RH WING CONTN IND	15-215	B11
LH CYCLIC TIMER CONT	3-213	B11

LEAVE ICING CONDITIONS AS SOON AS POSSIBLE

END//

IF CYCLIC LT OFF

WING & INTAKE ANTI-ICING
rty sel .... 4 SECS ON ..... E
CYCLIC LT .... PRESS AND
RELEASE .... E

IF CYCLIC LT ON

LEAVE ICING CONDITIONS
END//

CAUTION
RESET OF THE CYCLIC DE-ICING SYSTEM MUST NOT BE REPEATED.

IF CYCLIC LT OFF AFTER A MAXIMUM OF 16 SEC

FAULTY AREA .... LOG .... E

END//

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SMOKE WARNING

- IF SMOKE LTS A,B,D,E,F,H,J OR K ON
  APPLY PROCEDURE : ELECTRICAL SMOKE OR FIRE
- IF SMOKE LT C OR G ON
  APPLY PROCEDURE : FREIGHT HOLD FIRE
- IF SMOKE LTS 1,2,3 OR 4 ON
  APPLY PROCEDURE : AIR CONDITIONING SMOKE

FREIGHT HOLD FIRE

REVISE FLIGHT PLAN TO LAND AS SOON AS POSSIBLE

REQUEST GROUND SERVICES STANDBY ON LANDING AND ADVISE ON AFFECTED FREIGHT HOLD ETC.

AIR CONDITIONING SMOKE

OXYGEN (IF REQ'D) .... ON 100% ..... ALL
CREW COMMUNICATION .... ESTABLISH ... ALL
SMOKE GOGGLES (IF REQ'D) .... ON .... ALL
COND VALVE .... OFF .... E
AIR GENERATION SMOKE rty sel .... INHIB .... E

WAIT 5 MINUTES THEN
COND VALVE ....ON.............. E

IF SMOKE IS DETECTED
COND VALVE .... OFF .... E
AIR GENERATION SMOKE rty sel .... NORM .... E
APPLY PROCEDURE: SHUT DOWN OF AIR CONDITIONING GROUPS

CABIN FIRE

CABIN STAFF WILL REPORT ALL CABIN FIRES TO THE FLIGHT DECK AND ATTEMPT TO EXTINGUISH THE FIRE.

PORTABLE OXYGEN BOTTLES MUST NOT BE USED AS BREATHING APPARATUS WHEN FIRE FIGHTING.

ALL PASSENGER OXYGEN .... OFF .... E
CHECK PASSENGER OXYGEN LTS .... OUT .... E

ALLOW NORMAL AIR CONDITIONING TO CLEAR SMOKE. FLIGHT ENGINEER SHOULD INSPECT FOR DAMAGE AT THE EARLIEST OPPORTUNITY.

CAUTION

PORTABLE OXYGEN BOTTLES AND MASKS ARE NOT CLOSED CIRCUIT AND THEREFORE GIVE NO PROTECTION AGAINST SMOKE OR TOXIC GASES. OXYGEN LEAKAGE FROM THE MASK MAY INCREASE THE HAZARD.

END//

ELECTRICAL SMOKE OR FIRE

OXYGEN (IF REQ'D)	ON 100%	ALL
CREW COMMUNICATION	ESTABLISH	ALL
SMOKE GOGGLES (IF REQ'D)	ON	ALL

IF SMOKE ORIGIN LOCATED AND CAN BE SAFELY ISOLATED, OR IF SYSTEM MALFUNCTION OBSERVED

REMOVE RELEVANT POWER SUPPLY

END//

IF SMOKE ORIGIN NOT LOCATED AND FLIGHT DECK OR CABIN VISIBILITY REDUCED

EMERG GEN	MANUAL CHECK VOLTS & FREQUENCY	E
ENGINE FEED PUMPS	ALL ON	E
ENGINE RECIRCULATION VALVES	ALL SHUT	E
SERVO CONTROLS YELLOW rty sel	YELLOW GREEN	C
REAR EXTRACT STANDBY FAN	ON	E
F/O ASI AND ALTIMETER	STANDBY MODE	P
ADC 2	OFF	P
AC ESS BUS sws	ALL EMERG	E
AIR INTAKE LANE rty sel	1 AND 3 TO A 2 AND 4 TO B	E
AIR INTAKE HYD sel	1 TO GREEN 3 TO BLUE 2 AND 4 TO YELLOW	E
ENGINE CONTROL SCHEDULE	ABOVE 220 KT HI. BELOW 220 KT LO.	E E

> **CAUTION**
> INS No.2 AND NO.3 WILL AUTOMATICALLY REVERT TO BATTERY POWER. THEIR LIFE IN NAV MODE IS 15 MINUTES.

GENERATORS	ALL OFF	E
BATTERY sels (2)	ESS MAIN SPLIT.	E
THROTTLE MASTERS	MAIN	E
WING & INTAKE ANTI-ICING	OFF	E
NO.1 & 2 ANTI-STALL	OFF	P
NO.1 AUTOSTAB	ENGAGE	P
NO.1 ARTIFICIAL FEEL	ENGAGE	P
SSB sw	OPEN	E
BTB sels (4)	TRIP	E

contd.

ELECTRICAL SMOKE OR FIRE (continued)

WHEN SMOKE, CABIN & FREIGHT HOLD LTS ARE OFF AND/OR SMOKE CLEARED.

RESET MAIN GENERATORS IN TURN TO IDENTIFY THE BUSBAR SUPPLYING THE DEFECTIVE EQUIPMENT. ALLOW APPROXIMATELY 1 MINUTE BETWEEN EACH SELECTION.

WHEN THE DEFECTIVE SUPPLY IS IDENTIFIED

AFFECTED GENERATOR .... OFF .... E

CAUTION
LEAVE ASSOCIATED BTB TRIPPED
LEAVE ASSOCIATED AC ESS BUS SWITCH AT EMERG

SERVICEABLE CHANNELS .... MANUAL PARALLEL .... E
SSB sw .... CLOSE .... E
AC ESS BUS sw(s) (SERVICEABLE CHANNELS) .... NORM .... E

IF NO 3 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 2 TO B
3 TO A .... E

IF NO 4 AC MAIN BUS LT ON
AIR INTAKE LANE rty sels .... 1 TO A
4 TO B .... E

BATTERY sels (2) .... BATT ON .... E

CAUTION
EMERGENCY GENERATOR MUST BE LEFT ON LINE WITH ONE OR MORE AC ESS BUS SWITCHES AT EMERG

IF EMERGENCY GENERATOR NOT REQUIRED
EMERG GEN .... AUTO .... E
EMERG GEN NORM/ISOL sw .... ISOL
THEN NORM ...... E

END//

contd.

ELECTRICAL SMOKE OR FIRE (CONTINUED)

NOTE

ON EMERGENCY ELECTRICS

The following are AVAILABLE

Normal pressurisation control
Fuel TOTAL CONTENTS indications & FQIs
FASTEN SEAT BELTS and NO SMOKING signs
Standby horizon
Captain's ADF/RMI
First Officer's VOR/RMI
Voice recorder
Public address
TRK/HDG Unit
Marker
Interphone audio selector panels (4)
No.1 ADC, INS, ADI, Compass Coupler and HSI.
No.1 ADF, VOR, DME, ILS and Radio Altimeter.
No.1 ATC Transponder, VHF and HF.

The engine operating schedule will be MID with HI selected and gear up:
it will be LO with any other selection

The following are NOT AVAILABLE

Autopilot
Autothrottle
Normal landing gear operation
Normal visor/nose operation
Visor/nose position indicator
Reverse thrust
Nosewheel steering
Landing lights
Reheat
Normal brakes

WHEEL BRAKE FIRE

ATC .... INFORM .... P
AIRCRAFT .... STOP, USING MINIMUM BRAKE PRESSURE C
BRAKES .... EMERG C
ALL ENGINES .... SHUT DOWN ...... E
UNAFFECTED WHEELS .... CHOCKED .... G
BRAKES .... RELEASE .... P

IF NECESSARY
APPLY PROCEDURE : PASSENGER EVACUATION ON LANDING

END//

FLAME SENSOR LIGHT ON

CAUTION
DURING THE INITIAL DIAGNOSTIC ACTIONS OF THE DRILL THE RED ENG MWS AND ENGINE SHUT DOWN HANDLE LIGHTS MAY BE ON.
DO NOT CARRY OUT AN ENGINE SHUT DOWN AT THIS STAGE.

SET ASSOCIATED FLAME SENSORS sel TO A THEN B.
LEAVE sel IN POSITION WHERE THE ENG O/HEAT LT IS OFF.

SET THE ENG O/HEAT TEST rty sel TO TEST POSITIONS F1, F2 AND F3 IN TURN, THEN OFF.

IF THE ENG O/HEAT LT IS ON AT F1, F2 AND F3
CONTINUE NORMAL FLIGHT USING THE SINGLE SELECTED LOOP

END//

IF THE ENG O/HEAT LT IS OFF AT ONE OR MORE TEST POSITIONS F1, F2 OR F3

FLAME SENSORS sel .... ALTERNATIVE A OR B POSN ....E

ON ILLUMINATION OF THE RED ENG MWS AND ENGINE SHUT DOWN HANDLE LTS FOR THE AFFECTED ENGINE
APPLY PROCEDURE : ENGINE FIRE, OVERHEAT OR SEVERE DAMAGE

END//

(Unchanged)

EMERGENCY LANDING

ATC TRANSPONDER	A7700 .... P
DISTRESS MESSAGE	TRANSMIT ...... P
CABIN CREW AND PASSENGERS	BRIEF C
FUEL JETTISON	AS REQUIRED .. CE
HARNESS	SECURE ...... ALL
CABIN	DEPRESSURISE BELOW 10,000 FT. E

APPROACH CHECKLIST

EMERGENCY LANDING BRIEFING	UPDATED C
F/D DOOR sw	OPEN .... E
SEAT BELT SIGNS	ON .... E
NO SMOKING SIGNS	ON .... E
EMERGENCY LTS	ARM .... E
DRAIN MAST HTRS	OFF .... E
ALTIMETERS	SET/CROSS CHECKED ......ALL
RADIO ALTIMETERS	DH SET ...... ALL
ENG RATING MODE	TAKE-OFF ...... E
RAD/INS sws	RAD .... ALL
VISOR	DOWN 5º LT OFF .... EP
NOSE	5 DEG .... EP
FUEL/WEIGHT/CG	CHECKED .... E
TARGET THRESHOLD SPEED	BUGGED ....ALL
ENGINE FEED PUMPS	ALL ON .... E
FUEL CROSSFEED VALVES	SHUT .... E
ENGINE RECIRCULATION VALVES	SHUT .... E
APPROACH CHECKLIST	COMPLETED ..... E

LANDING CHECKLIST

LANDING GEAR	DOWN 4 GREENS .... ALL
NOSE	DOWN, GREEN .. EP
VISOR STBY CONTROL	VISOR LOWER ... P
BRAKES	CHECKED/NORM .. P
ANTI-SKID	CHECKED .... P
SECONDARY AIR DOORS	SHUT .... E
BRAKE FANS	ON .... E
RADAR	STANDBY .... E
YELLOW PUMP	ON/PRESSURE NORMAL .... E
AUX INLETS MIS	OPEN/CROSS-HATCHED .... E
SEATS	LOCKED/PWR OFF .... ALL
LANDING CHECKLIST	COMPLETED ..... E

AT 1,000 FT-CALL ON PA
"TAKE UP EMERGENCY POSITION"........................... P

AT 200 FT-CALL ON PA
"BRACE BRACE".. P

END//

PASSENGER EVACUATION ON LANDING

ADVISE CABIN CREW AND PASSENGERS OF INTENTION
TO EVACUATE C

NOTIFY CABIN CREW OF ANY CONDITIONS THAT MAY AFFECT
EVACUATION C

TOWER/GROUND CREW .... NOTIFY .... P
BRAKES LEVER .... PARK C
ENGINE SHUT DOWN HANDLES .... PULL .... CE
CONTROL COLUMN .... PUSH FULLY FWD
AND RELEASE C

SEVEN SECONDS AFTER PULLING ENGINE SHUT DOWN HANDLES
2 SHOT .... PRESS .... E

PASSENGER EVACUATION .... INITIATE C
BATTERY sels .... BATT OFF .... E

CAUTION
AT LEAST 10 SECONDS MUST ELAPSE BETWEEN PULLING THE ENGINE SHUT DOWN HANDLES AND TURNING OFF THE BATTERY CONTROL SELECTORS TO ALLOW THE LP VALVES TO SHUT

EVACUATION .... EVACUATE
AIRCRAFT.ASSIST
CABIN CREW .... ALL

END//

NOTE
If neither of the forward slides are available at least one flight crew member is to use the forward vestibule escape rope and align any retrievable slides.

DITCHING

ATC TRANSPONDER .... A7700 .... P
DISTRESS MESSAGE .... TRANSMIT .... P
CABIN CREW AND PASSENGERS .... BRIEF .... P
FUEL JETTISON .... AS REQUIRED ... CE
GPW C/B .... TRIP .... E
L/GEAR WARN C/B .... TRIP .... E

CIRCUIT BREAKER	PANEL	GRID REF
GROUND PROXIMITY WARN AC SUP	13-215	G4
AUDIO WARN SYS SUP 1	1-213	M21

AT 180 KNOTS
AUDIO .... CANCEL .... E

NOTE

With the GPW circuit breaker tripped all modes of operation of the ground proximity system will be inhibited.

With the L/GEAR WARN circuit breaker tripped the audio will operate at 180 knots.

HARNESS .... SECURE .... ALL
DISCHARGE VALVE sws (2) .... NORMAL .... E
CABIN .... DEPRESSURISE BELOW 10,000 FT ...... E

APPROACH CHECKLIST

DITCHING BRIEFING .... UPDATED C
F/D DOOR sw .... OPEN .... E
SEAT BELT SIGNS .... ON .... E
NO SMOKING SIGNS .... ON .... E
EMERGENCY LTS .... ARM .... E
ALTIMETERS .... SET/CROSS CHECKED ...... ALL
RADIO ALTIMETERS .... DH.SET .... ALL
ENG RATING MODE .... TAKE-OFF .... E
RAD/INS sws .... RAD .... ALL
CG .... 53.5% .... E
TARGET THRESHOLD SPEED .... BUGGED .... ALL
ENGINE FEED PUMPS .... ALL ON .... E
FUEL CROSSFEED VALVES .... SHUT .... E
ENGINE RECIRCULATION VALVES .... SHUT .... E
APPROACH CHECKLIST .... COMPLETED ...... E

contd.

DITCHING (continued)

LANDING CHECKLIST

LANDING GEAR	UP	ALL
NOSE	UP	ALL
VISOR	UP	ALL
RAMP/SPILL MASTERS	MAN	E
RAMPS	0%	E
BLEED VALVES	SHUT	E
DITCHING VALVES	SHUT	E
SEATS	LOCKED/ PWR OFF	ALL
LANDING CHECKLIST	COMPLETED	E

AT 1,000 FT-CALL ON PA
"TAKE UP DITCHING POSITION" .... P

APPROACH FOR TOUCHDOWN

ON LEAVING 1000 FT ALTITUDE

AUTOPILOT	ENGAGED	C
AUTOTHROTTLE	ENGAGED	C
APPROACH SPEED	VREF	C
RATE OF DESCENT	300 FT/MIN	C

AT 200 FT-CALL ON PA
"BRACE BRACE"

AT 50 FT
AUTOTHROTTLE .... DISENGAGE MAINTAIN EXISTING POWER SETTINGS C

REDUCE RATE OF DESCENT FOR TOUCHDOWN AT A PITCH ATTITUDE OF APPROXIMATELY 15°

ON TOUCHDOWN
ENGINE SHUT DOWN HANDLES .... PULL .... CE

HOLD PITCH ATTITUDE AS LONG AS POSSIBLE

PASSENGER EVACUATION	INITIATE	C
EVACUATION	EVACUATE AIRCRAFT ASSIST CABIN CREW	ALL

END//

NOTE
Disconnection of Autopilot during the approach for touchdown is left to the discretion of the pilot.

GROUND PROXIMITY PULL-UP WARNING

CALL	"PULL-UP WARNING"	P
AUTOPILOT	DISCONNECT	C
FULL POWER	APPLY	E
ATTITUDE	ADJUST	C
LANDING GEAR	UP	P

CAUTION

1. DO NOT DISREGARD SHORT DURATION WARNING-TAKE IMMEDIATE ACTION.
2. AFTER WARNING CEASES,
   (a) CHECK AIRCRAFT POSITION
   (b) CHECK RADIO AND PRESSURE ALTIMETERS
   (c) CHECK ALTIMETER SETTINGS
   (d) DETERMINE MINIMUM SAFE ALTITUDE

END//

AMBER RADIATION LIGHT ON

OBTAIN PROVISIONAL ATC CLEARANCE FOR DESCENT IN THE EVENT THAT RADIATION REACHES THE "ACTION" LEVEL (RED RADIATION LIGHT ON)

RED RADIATION LIGHT ON

CONFIRM ATC CLEARANCE AND ADVISE DESCENDING.

DESCEND TO AN ALTITUDE SUCH THAT THE INTENSITY IS BELOW "ACTION" LEVEL I.E. THE RED RADIATION LIGHT OFF.

IF WARNING PERSISTS BELOW FL 470
NO FURTHER ACTION

END//

NOTE

If due to communication failure descent clearance cannot be obtained, descent is at the captain's discretion.

(Completely Revised)

LIST OF CONTENTS

NORMAL CHECKLIST

Left blank intentionally

(Uncha..ed)

SAFETY CHECKLIST

GROUND SERVICE sw . . . . ON
BOARDING, RACKING AREA
AND ROOF lts . . . . ON
L/GEAR STANDBY LOWERING lever . . . . GUARDED
TRANSPONDER . . . . STBY
RADAR . . . . OFF
EMERGENCY NOSE/VISOR UPLOCK
RELEASE . . . . DOWN/PIN ENGAGED
NOSE AND VISOR STBY CONTROL . . . . OFF/GUARDED
L/GEAR NORMAL lever . . . . DOWN
GEAR O/RIDE . . . . GUARDED
VISOR/NOSE lever . . . . AS CONFIGURATION
AUTO IGNITION sws . . . . OFF
ADS/ENGINE PROBE HEATERS . . . . OFF
WING INTAKE ANTI-ICING TEST . . . . OFF
FUEL FWD TRANS sw . . . . GUARDED
TRIM TRANS AUTO MASTER sel . . . . OFF/GUARDED
TANK 11 INLET VALVES sels . . . . AUTO/OFF
STANDBY INLET VALVES sws . . . . SHUT
TRIM PIPE DRAIN sw . . . . SHUT
JETTISON PANEL COVER . . . . CLOSED
RAM AIR TURBINE sels . . . . GUARDED
W/SHIELD EMERG DE-ICE sws . . . . OFF/GUARDED
CIRCUIT BREAKERS . . . . SET

PRELIMINARY COCKPIT CHECKLIST

TECHNICAL LOG . . . . CHECK
GROUND POWER . . . . ON
EQUIPMENT BAY COOLING PANEL . . . . CHECK/SET
OXYGEN PANEL . . . . CHECK/SET
DRAIN MAST HEATERS . . . . CHECK/SET
INS 1,2 & 3 . . . . SELECT ALIGN, TEST & PRESENT POSITION
AIR DATA COMPUTERS . . . . ON
COCKPIT EMERGENCY EQUIPMENT . . . . CHECK
Fire axe, asbestos gloves, portable oxygen mask and pack, life jackets (5), eye wash kit, fire extinguisher, smoke goggles (3) and escape ropes (2)

FLIGHT ENGINEER'S DOCUMENTATION
STOWAGES . . . . CHECK

Unchanged

BEFORE START CHECKLIST

MASTER CBs	SET/CHECKED	ALL
COCKPIT PREPARATION	COMPLETE	ALL
OXYGEN	CHECKED 100%	ALL
DV WINDOWS	CLOSED	CP
FLIGHT CONTROL INVERTERS	ON	P
ANTI-STALL SYSTEMS	ON	P
RAD/INS sws	RAD	CP
INSTRUMENT TRANSFER sws	SET	CP
ALTIMETERS	CHECKED/SET	ALL
NAV RADIOS	SET	ALL
BRAKES	PARK/CHECKED	PE
THROTTLES	IDLE	E
NAV LIGHTS	AS REQUIRED	E
THROTTLE MASTERS	ON	E
GROUND HYD. CHECK OUT	YELL, YELL/OFF	E
FUEL HEATERS	AUTO	E
ENGINE RECIRC VALVES	SHUT	E
SECONDARY AIR DOORS	AUTO	E
BATTERIES	ON	E
INS 1, 2 & 3	LOADING CHECKED NAV MODE/MIX	ALL
ASI BUGS & PITCH INDEX	SET	ALL
CLOCK ENG & TLA BUGS	SET	ALL
BRIEFING	STATED	C

LOADSHEET	CHECKED	ALL
ZFW & ZFCG	SET/CHECKED	EC
FUEL REM. & A/C WEIGHT	SET/CHECKED	ALL
LOAD LIMITS	SET	E
ASI BUGS & PITCH INDEX	UPDATE	AL
CLOCK ENG AND TLA BUGS	UPDATE	ALL
START CLEARANCE	OBTAIN	P
DOOR LIGHTS	CHECKED	E
MASTER WARNING	RECALL	C
ANTI-COLLISION LIGHTS	ON	E
ENGINE FEED PUMPS	ON	E
CLEARANCE TO START	OBTAIN	EG
START ENGINES	AS REQUIRED	EG

PUSHBACK CHECKLIST

NOs 3 & 2 ENGINES	START	E
BRAKE FANS	ON	E
HYDRAULICS	CHECKED	E
CROSSBLEED VALVES 2 & 3	OPEN	E
GROUND EQUIPMENT	CLEAR	P.G

PUSHBACK

NOs 4 & 1 ENGINES	START	E
PUSHBACK CHECKLIST	COMPLETED	P

AFTER START CHECKLIST

NOSEWHEEL STEERING	CHECKED	P
FLT.CONTROL, AFCS & TRIMS	CHECKED	C
STAB & FEEL	ENGAGED	P
ENGINE ANTI-ICE	AS REQUIRED	E
BRAKE FANS	ON	E
GROUND IDLE	LOW	E
DOOR WARNINGS	TESTED/OFF	E
ENGINE FEED PUMPS	ALL ON	E
HYDRAULICS	CHECKED	E
ELECTRICS	CHKD: GRD BYPASS	E
GROUND EQUIPMENT	CLEAR	P.G.
AFTER START CHECK	COMPLETE	P

TAXY CHECKLIST

NOSE/VISOR	DOWN/5 DEG	P
BRAKES	CHECKED/NORM	C
FLIGHT INSTRUMENTS	CHKD/NO FLAGS	ALL
FLIGHT CONTROLS/EFC	CHECKED/LIGHT OFF	C
TRIMS	SET	ALL
ENGINE RATING MODE	TAKE-OFF	E
AUTO IGNITION	ON	E
THROTTLES	CHECKED	E
DRAIN MAST HEATERS	ON	E
ENGINE FLIGHT RATING	CLIMB	E
PRESS STATIC HEATERS	ON	E
ADS & STBY HEATERS	Tt INHIB/ON	E
AIR INTAKES	CHECKED/SET	E
ENGINE CONTROL SCHEDULE	CHECKED	E
ENG 4 T/O N_1 LIMITER	88%	E
AIR CONDITIONING	CHECKED/SET	E
FUEL LP PROTECTION sw	ARMED	E
DE-AIR PUMPS	ON	E
FUEL CONSUMED INDICATORS	CHECKED	E
ENGINE FEED PUMPS	ALL ON	E
CROSSFEED VALVES	SHUT	E
REVERSE ASOVs	CHECKED/18-24 DEG	EC
ENGINE O/HEAT	CHECKED	E
SEATS & HARNESS	LOCKED, PWR OFF & SEC	ALL
CABIN/SLIDES	SECURE/ARMED	S
TRIM TANK CONTENTS	CHECKED	E
TAKE-OFF CG sw	AS REQD	CE
CG POSITION	CHECKED	ALL
MAIN TRANSFER PUMPS	FOUR ON	E
TAXY CHECK	COMPLETE	E

BEFORE TAKE-OFF CHECKLIST

BRIEFING	UPDATED	C
CABIN CREW CALL	3 PRESSES	E
LANDING LIGHTS	AS REQUIRED	P
TRANSPONDER	SET	P
WHEEL O/HEAT LIGHT	OFF	PE
OVERLOAD MI	BLACK	E
GROUND IDLE	HIGH	E
MASTER WARNING	RECALL/INHIBIT	C
T/O MONITOR	ARMED	P
REHEAT	ON	E
PITCH INDEX	CHECKED	ALL
BEFORE TAKE-OFF CHECK	COMPLETE	E

AFTER TAKE-OFF CHECKLIST

LANDING GEAR	UP: LIGHTS OFF NEUTRAL	PE
LANDING LIGHTS	OFF/RETRACT	P
MASTER WARNING	RECALL	P
ADS & STBY HEATERS	ON	E
NO SMOKING SIGNS	OFF	E
ENGINE RATING MODE	FLIGHT	E
PRESSURIZATION	CHECKED	E
NOSE/VISOR	UP/LOCKED	PE
ALTIMETERS	SET	ALL
AFTER TAKE-OFF CHECK	COMPLETE	E

At M = 0.7 CLIMB CHECK

FUEL TRANSFER	AFT	E
TAKE-OFF CG sw	NORMAL	E
BRAKE FANS	OFF	E
ENGINE CONTROL SCHEDULE	NORMAL	E
SECONDARY AIR DOORS	OPEN	E
FLIGHT DECK DOOR	NORMAL	E
SEAT BELT SIGNS	AS REQUIRED	E
TAXI TURN LTS	OFF	P
CLIMB CHECK	COMPLETE	E

TRANSONIC CHECKLIST

AUXILIARY INLETS	SHUT	E
SECONDARY NOZZLES	<15 DEG	E
REHEAT	ON	E
FUEL TRANSFER	TRANSFER AFT	E

At M = 1.0

PRESS STATIC HEATERS	OFF	E
ENGINE ANTI-ICING	OFF	E
WING & INTAKE ANTI-ICING	OFF	E
TRANSPARENCY DE-ICE, DEMIST.	OFF	P

At M = 1.1

SECONDARY NOZZLES	0-5 DEG	E
INTAKE LANES	1 & 2 AUTO A 3 & 4 AUTO B	E

At M = 1.7

REHEAT	OFF	E
AFCS	SET	E

When Fuel Transfer Is Complete

FUEL TANK PRESSURE	CHECKED	E
DE-AIR PUMPS	OFF	E

At 500

ENGINE FLIGHT RATING	CRUISE	E
INTAKE LANES	ALL AUTO A OR B	E
TRANSONIC CHECK	COMPLETE	E

(Unchanged)

DECELERATION AND DESCENT CHECKLIST

WARNING AND LDG DISPLAY	CHECKED	CP
BRIEFING	STATED	C
SAFETY HEIGHT	CHECKED	ALL
ASI BUGS	SET	ALL
HARNESS	SECURE	ALL

At Deceleration Point

ENGINE RECIRC VALVES	OPEN	E
THROTT ISA-10°C OR WARMER	18°	CE
ISA-11°C OR COLDER	24°	
TANKS 1 & 4	NORM	E
TANK 11 HYDRAULIC PUMPS	OFF	E
FUEL TRANSFER	TRANSFER FWD	E
ENG FLIGHT RATING	CLIMB	E

At M = 1.6

THROTTLES	34°	CE

At M = 1.0

THROTTLES	IDLE	CE
PRESSURISATION	SET	E
PRESS STATIC HEATERS	ON	E
TRANSPARENCY DE-ICE, DEMIST	ON	P
DECELERATION AND DESCENT CHECKLIST	COMPLETED	E

APPROACH CHECKLIST

LANDING BRIEFING	UPDATED	C
TAXI TURN LTS	ON	P
RAD/INS sws	RAD	ALL
ALTIMETERS	SET/CROSS CHECKED	ALL
RADIO ALTIMETERS	DH SET	ALL
FLIGHT DECK DOOR sw	OPEN	E
CABIN SIGNS	BOTH ON	E
EMERGENCY LIGHTS	ARM	E
ENGINE RATING MODE	TAKE OFF	E
VISOR/NOSE	DOWN/5 DEG	EP
BRAKE FANS	ON	E
ENGINE RECIRC VALVES	SHUT	E
ENGINE CONTROL SCHEDULE	APPROACH	E
FEED PUMPS	ALL ON	E
CROSS FEED VALVES	SHUT	E
SSB	AS REQUIRED	E
BATT sels	AS REQUIRED	E
FUEL/WEIGHT/CG	CHECKED	E
ASI BUGS	UPDATE	ALL
SEATS	LOCKED: PWR OFF	ALL
QNH	SET	ALL
AUTO PILOT CHANGEOVER	CHECKED	C
APPROACH CHECK	COMPLETE	E

EMERGENCY/ABNORMAL DRILLS

LANDING CHECKLIST

LANDING GEAR	4 GREENS	ALL
CABIN CREW CALL	3 PRESSES	E
NOSE	DOWN & GREEN	PE
BRAKES	CHECKED/NORMAL	P
ANTI-SKID	CHECKED	E
RADAR	STANDBY	E
AUX INLETS	OPEN/X-HATCH	E
SECONDARY AIR DOORS	SHUT	E
YELLOW SYSTEM	CHECKED	E
LANDING CHECK	COMPLETE	E

LAND WEIGHT (1000kg)	VREF KTS
96	150
98	152
100	154
102	155
104	157
106	158
108	160
110	161
111	162
115	165
120	168
125	172
130	175
135	179
140	182
145	185
150	188
155	191
160	194
165	197
170	201
175	204
180	207

NOTE: When calculating the RELAND reference speed for the data card use a landing weight equal to take-off weight minus 3500 kg.

CONFIGURATION	ABNORMAL INCREMENT	VT MAX
3 ENGINE	5	10
2 ENGINE	7	17
NO AUTOTHROTTLE	7	17
TOTAL LOSS OF:- ELECTRIC TRIM OR PITCH AUTOSTAB OR ELECT.FLIGHT CONTROL	10	10

EMERGENCY/ABNORMAL DRILLS

AFTER LANDING CHECKLIST

MASTER WARNING	INHIBIT	C
GROUND IDLE sws	LOW	E
RAMP SPILL MASTER sws	MAN	E
AUTO IGNITION	OFF	E
PRESS STATIC HEATERS	OFF	E
ADS AND STBY HEATERS	OFF	E
DRAIN MAST HTRS	AS REQUIRED	E
WING & INTAKE ANTI-ICING . . .	OFF	E
W/SHIELD EMERG DE-ICE sws . .	OFF/GUARDED	E
FLIGHT CONTROL INVERTERS . . .	OFF INV	P
NOSE	5 DEG	E.P
TRANSPONDER	STANDBY	E
PRESSURISATION	CHECKED	E
SSB	CLOSED	E
BATTERY SWS	ON	E
BRAKES TEMP lts	CHECKED	E
SLIDES	DISARMED	E
TANK 9 SHUT DOWN FUEL	4,000 KG	E
AFTER LANDING CHECKLIST . . .	COMPLETED	E

PARKING CHECKLIST

BRAKES	PARK	C
LANDING LIGHTS	OFF/RETRACT	C
EMERG GENERATOR sel	AUTO	E
VISOR NOSE	AS REQUIRED	P
GROUND POWER	ON	E
HP VALVES	SHUT	E
THROTTLE MASTERS	OFF	E
ANTI-COLLISION lts	OFF	E
FASTEN SEAT BELTS	OFF	E
ENGINE ANTI-ICING	OFF	E
IGNITION	OFF	E
GROUND CONDITIONING	AVAILABLE	E.G
TRANSPARENCY DE-ICE, DEMIST .	OFF	C
FUEL PANEL	GROUND STATE	E
BATTERIES	BATT OFF	E
INS	POST FLT INTO	P
CHOCKS	IN POSITION	G
BRAKES	NORM	C
BRAKE FANS	AS REQUIRED	E
RADIATION METER	NOTED	E
ITEM	CHECKED	E
INS	RELOAD (TRANSIT) . .	PE
PARKING CHECKLIST	COMPLETED	E

(Unchanged)

STOPOVER CHECKLIST

AIR DATA COMPUTERS	OFF	E
INS	OFF	E
RADAR	OFF	E
FLIGHT CONTROL INVERTERS	PWR OFF	P
EMERGENCY lts	OFF	E
ENGINE VIBRATION SUPPLY	OFF	E
OXYGEN	OFF	E
GROUND POWER	AS REQUIRED	E
MASTER C/Bs	TRIP	E
STOPOVER CHECKLIST	COMPLETED	E

FLIGHT ENGINEER'S LEAVING PANEL CHECK

CABIN TEMPERATURE	AUTO AND STABLE	E
CG	CHECKED	E
TRIM TRANSFER	CHECKED	E
FUEL TRANSFER	SAFE	E
ENGINE FEED PUMPS	ALL ON	E
CROSSFEED	SHUT	E
JETTISON SYSTEM	VALVES SHUT/ COVER CLOSED	E
EMERGENCY GENERATOR	NORM/AUTO	E

CREW TRAINING

Controls - The flight control system is fully powered without manual reversion. To ensure maximum safety a split surface design is incorporated with separate sources of power for each. Control inputs are via either of two electrical signalling channels or a mechanical channel. (Mechanical requires hydraulic pressure for the relay jacks and does not have autostab).

There is an Emergency Flight Control system which operates from strain sensors if the control runs jam such that the pilot cannot move the control column.

Under normal operating conditions the controls are excellent and precise, allowing the pilot to fly easily and accurately. Automatic trim devices (Mach trim, incidence trim, and speed trim) ensure that Concorde behaves with normal stability characteristics throughout the envelope.

Induced Drag - One of the features of the slender delta is the large increase in induced drag with reduction in airspeed on approach. Approaches on the back side of the drag curve require an awareness of the problem together with care and precision. The situation is normally handled by autothrottle but pilot throttle handling will be practised and shown to be not unduly demanding.

Autothrottle - Autothrottle is of a great assistance but its destabilising effect must be appreciated. Owing to the automatic maintenance of speed, the aircraft has no tendency to return to level flight after a pitch disturbance. This lack of stability can cause altitude deviations when hand flying if care is not exercised.

If autothrottle is inadvertently disengaged on approach it is necessary to re-select IAS ACQ when it is re-engaged.

Incidence Meter - This instrument will be found to greatly facilitate accurate hand flying. The rigging is such that for a particular altitude and speed (in one G flight) the incidence is equal to the pitch attitude required for level flight. It is only necessary to set the incidence on the pitch attitude bug to get a datum for level flight. Similarly, the required pitch attitude on a 3^{o} glideslope is the incidence less 3^{o}.

Sideslip Meter - This instrument measures true aerodynamic sideslip, compared with the traditional ball which measures lateral accelerations.

For optimum asymmetric performance, reduce the sideslip to zero (same sense as ball) and apply sufficient bank to maintain heading, resulting in a small residual bank angle (this bank will cause the ball to be off centre).

C of G - A novel feature of Concorde is the transference of fuel to move the centre of gravity to match the movement of centre of pressure with varying Mach number. It is essential that the pilots and F/E are thoroughly familiar with the flight envelope and CG corridor. A frequent check on Mach number and CG should be made on climb and descent, with particular attention during transonic acceleration and deceleration.

A full description entitled "Flight Envelope & Mach/CG Boundaries" is to be found in this section: 8-28.

CREW TRAINING

Bank - As with other aircraft, 30° is considered the maximum bank for normal smooth safe public transport flying.

Normal bank angles should be reduced when transonic and supersonic to avoid boom focusing and degrading performance. Reduced bank angles are also applicable after engine failures, for performance reasons.

If the bank applied by the Auto Pilot in a particular mode would be excessive use the turn knob. Similarly, do not use the Flight Director in a roll command mode if it would demand excessive bank.

Remember that, due to bank angles and TAS, the variations in turn radii on Concorde are extremely large.

Pitch Effects -

(1) Thrust. Increase in thrust causes the aircraft to pitch up.

(2) Gear. Lowering the gear has little effect on the pitch trim but the drag will cause a speed decay and this will result in a slight pitch down in the normal speed range (if Autothrottle is not engaged).

(3) Reverse. Reverse thrust in the air and on landing gives a nose up pitch change. It is very important that a firm forward pressure is maintained on the control column to resist this in the latter case.

Dutch Roll - This is quite innocuous on Concorde. If Dutch Roll is initiated by mishandling, the aircraft will normally recover on its own if allowed to do so, both with, and without autostabilisation. Without autostabilisation there is a possibility of pilot induced oscillations. These can be cured by releasing the control column momentarily. Use of large control deflections should be avoided.

High Incidence Warning & Protection -

(1) Approach to the Stick Shaker is demonstrated in the landing configuration noting incidence and the speed relative to V_{REF} which is bugged.

Above 11° of incidence, operation of the pitch trim wheel will be the indication of operation of incidence trim.

The Stick Shaker operates at $16\frac{1}{2}^\circ$ incidence. Recover by applying full power and reducing pitch attitude to 0°. Pushing the stick forward is most important and requires considerable force. At 12° of incidence initiate a gentle recovery from the dive.

The Stick Shaker does not have phase advance.

(2) The same exercise is repeated with speed continuing to reduce until the Stick Wobbler operates. Recovery is as above.

The Wobbler operates at a nominal 19° but is a phase advance system.

(3) If autostab is inoperative during these manoeuvres super stab is not available, and there is a tendency to over correct. (When Superstab is operative its effect may be noted on the FCPI)".

(4) If both electric trim systems are inoperative incidence trim is not available, making it easy to reach high incidences, due to the inherent pitch instability of the delta at high incidence.

Touch and Go - During training most of the landings will be touch and go. After landing, engines will not be reversed and brakes will not be applied. Maintain the runway centre line, keep one hand on the throttle levers and, when instructed, apply power smoothly for take-off. Reheat will not normally be used.

"V_1" and "Rotate" will be called by the intructor pilot.

(Deletion)

2. FLIGHT PROFILE

The flight profile is designed to give guidance to Flight Engineers on the phase of flight at which specific items should be monitored. It is presented in pictorial form and further amplified in these notes.

POSITION 1

Before Take-off Check completed.

Ensure that the take-off briefing and departure clearance is understood.

Ensure that the altitude clearance limit is set in the Altitude Selector Window.

Preselect Re-heat on the Re-heat Selectors.

Start stop watch.

POSITION 2

Scan the primary engine instruments and check for correct indications of full power. At 100 kts four Green Clear to Go lights should be illuminated and called. Correct for any exceedence of engine limitations. Once the take-off roll is fully under way with full power set, the Flight Engineer must not bring to the pilot's attention minor faults which could cause confusion or risk an unnecessary aborted take-off. If an engine failure is called do not include the engine location at this stage.

POSITION 3

Define engine failure or fire at the point given in the briefing. When a noise abatement procedure is being carried out, include the Captain's clock in the scan so that the 'NOISE' call is not missed.

POSITION 4

When Noise is called select Re-heat OFF, reduce the engine power to the required setting and call "....%".

POSITION 5

At the end of the noise abatement procedure set the Engine Rating Mode switches to FLIGHT and check that the engine rating indicator shows CLB only. Set the Engine Control Schedule selector to NORMAL and check all engines on HI schedule. Advance the throttle levers gently to the required position.

Monitor Nose and Visor operation
Complete the After Take-off Check
Check Yellow system pressure is reducing.

Monitor engine performance and VHF communications. Particular care should be exercised when reading check list that ATC communications are not blocked out.

FLIGHT ENGINEER'S ROUTINE PROCEDURES

POSITION 6

Check Secondary Nozzles begin to modulate at M = 0.55. At M = 0.70 commence rearward fuel transfer.

At Transition Altitude check Altimeters set to Standard Setting and at each re-clearance the cleared Altitude/Level is reset in the Altitude Select Window.

POSITION 7

If the initial or complete cruise is to be subsonic stop the rearward transfer of fuel when the CG reads 55%.

At each 10,000 ft, an altimeter check, a CG check, a pressurisation check and where practicable, a panel scan, must be carried out.

POSITION 8

Acceleration:-

For a straight out acceleration/climb, at M = 0.93:

- select Reheats On in symmetrical pairs.
- start the stop clock for Reheat timing.
- ensure rearward fuel transfer continues satisfactorily.

To begin an acceleration from subsonic cruise:

- set up maximum climb power (dry).
- select Reheats On in symmetrical pairs.
- start the stop clock for Reheat timing.
- re-start rearward fuel transfer.

The Transonic Check is commenced and progressed throughout the climb.

As the Mach No. increases the CG should be monitored and maintained within the corridor.

Monitor intake ramp movement from M = 1.3 upwards.

POSITION 9

At M = 1.7 or, if 15 minutes has elapsed since selection, select Re-heat Off in symmetrical pairs.

POSITION 10

At M = 1.95 select Cruise Rating and check engine rating indicator shows CRS only. Complete the Transonic Check.

Set Load Limits for emergency forward transfer of fuel. Set Throttle Lever Angle indices to 18°.

During the Cruise/Climb maintain optimum CG for performance and adjust lateral trim by use of the fuel system.

Monitor CG, T.A.T., speed, engines and intake performance: panel scan (excluding legs) at regular intervals.

At the nominated waypoints record fuel on board and complete fuel section of Flight Log. At the nominated fuel check point, cross check the fuel to destination with the Cruise Control Manual, and enter fuel and weight data on the landing card.

(Unchanged)

FLIGHT ENGINEER'S ROUTINE PROCEDURES

Monitor the INS in accordance with Nav. Manual Procedures.

Obtain weather as requested.
Record instrument readings as required.
Monitor ATC clearances and instructions, and on No.1 VHF 121.5 MHz.
Study arrival procedures for destination.

POSITION 11

Shortly before deceleration and descent, reset fuel load limits and recheck setting of Throttle Lever Angle Bugs.

Obtain terminal weather and transmit company message if required.

POSITION 12

On command, retard throttle levers slowly to bug setting. Whenever the throttle levers are moved above M = 1.3 monitor the Intake performance.

Commence Deceleration and Descent Check.

Switch off Tank 11 electric pumps and commence forward transfer of fuel. Monitor Mach/CG corridor.

At M = 1.6 retard throttle levers to 34°.

At each 10,000 ft, during descent an Altimeter Check, a CG check, a pressurisation check and where practicable a panel scan must be carried out.

At each reclearance, check new level/Altitude is set in the Altitude Select Window.

POSITION 13

At M = 1.0 (or before descent if cruise has been subsonic) complete Deceleration and Descent Check.

Set throttle levers as required. (Idle permissible).

Check ATIS.

POSITION 14

Ensure QNH set at Transition Level.

Monitor ATC instructions and clearances: assist in monitoring flight instrument displays and radio aids.

POSITION 15

Carry out Approach and Landing Check. Know decision height and go-around procedure. Call, "Radio Altimeter Active".

POSITION 16

At the Outer Marker check height.

Call 1,000 ft Radio Altimeter height and check four greens, nose and visor down, all flags clear, and go-around altitude set. Scan forward engine instruments.

POSITION 17

On final approach, call Radio Altimeter height of 500, 400, 300, 200, 100, 50, 40, 30, 20 and 15 between each 100' call monitor N_2s.

FLIGHT ENGINEER'S ROUTINE PROCEDURES

POSITION 18

Check throttles are fully closed and that the Reverse lights operate correctly (verbal confirmation not required).

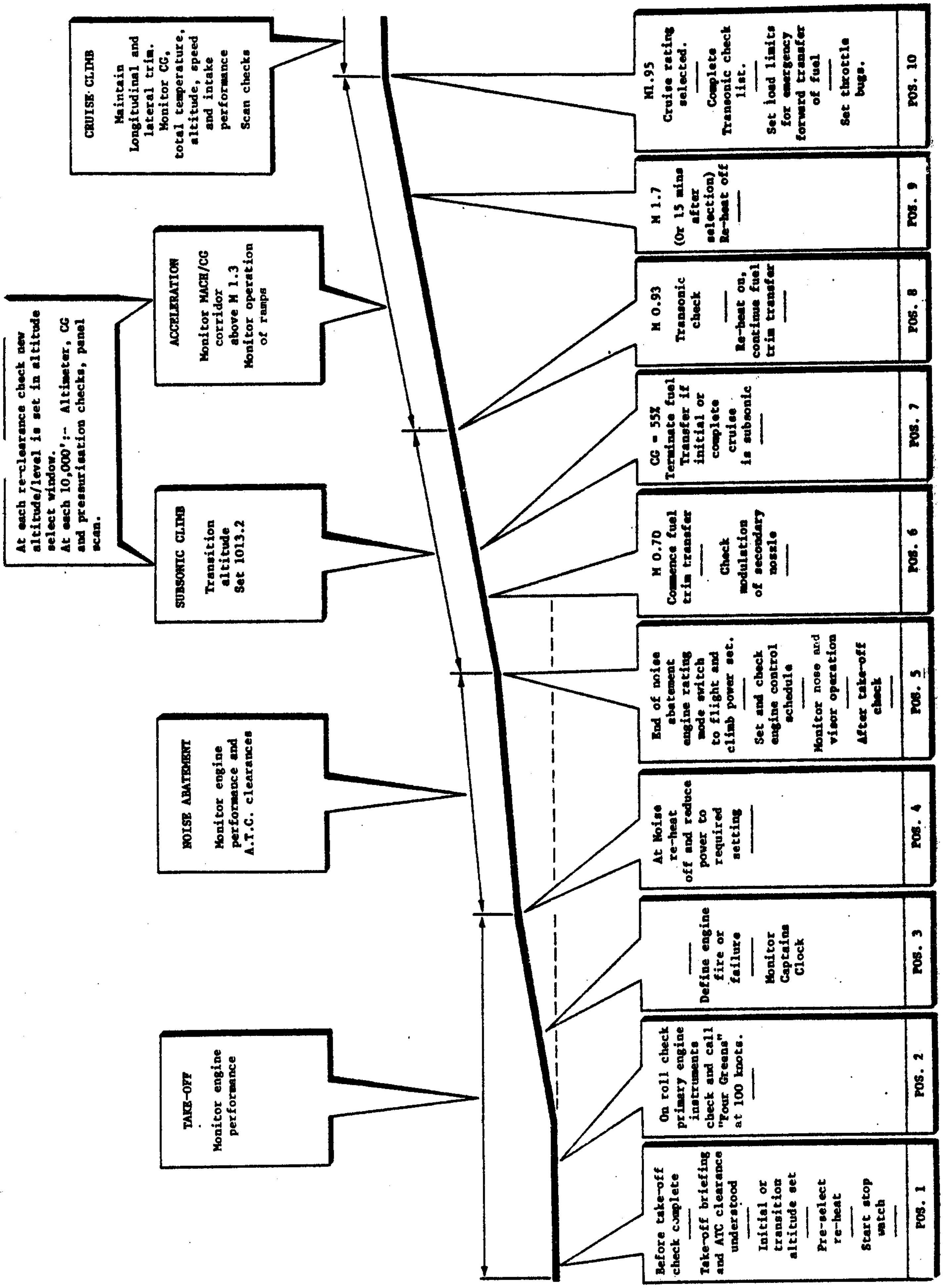
POSITION 19

Monitor engine performance during reverse operation. When clear of runway and when at taxiing speed complete the After Landing Check, shut down inboard engines if systems status permits.

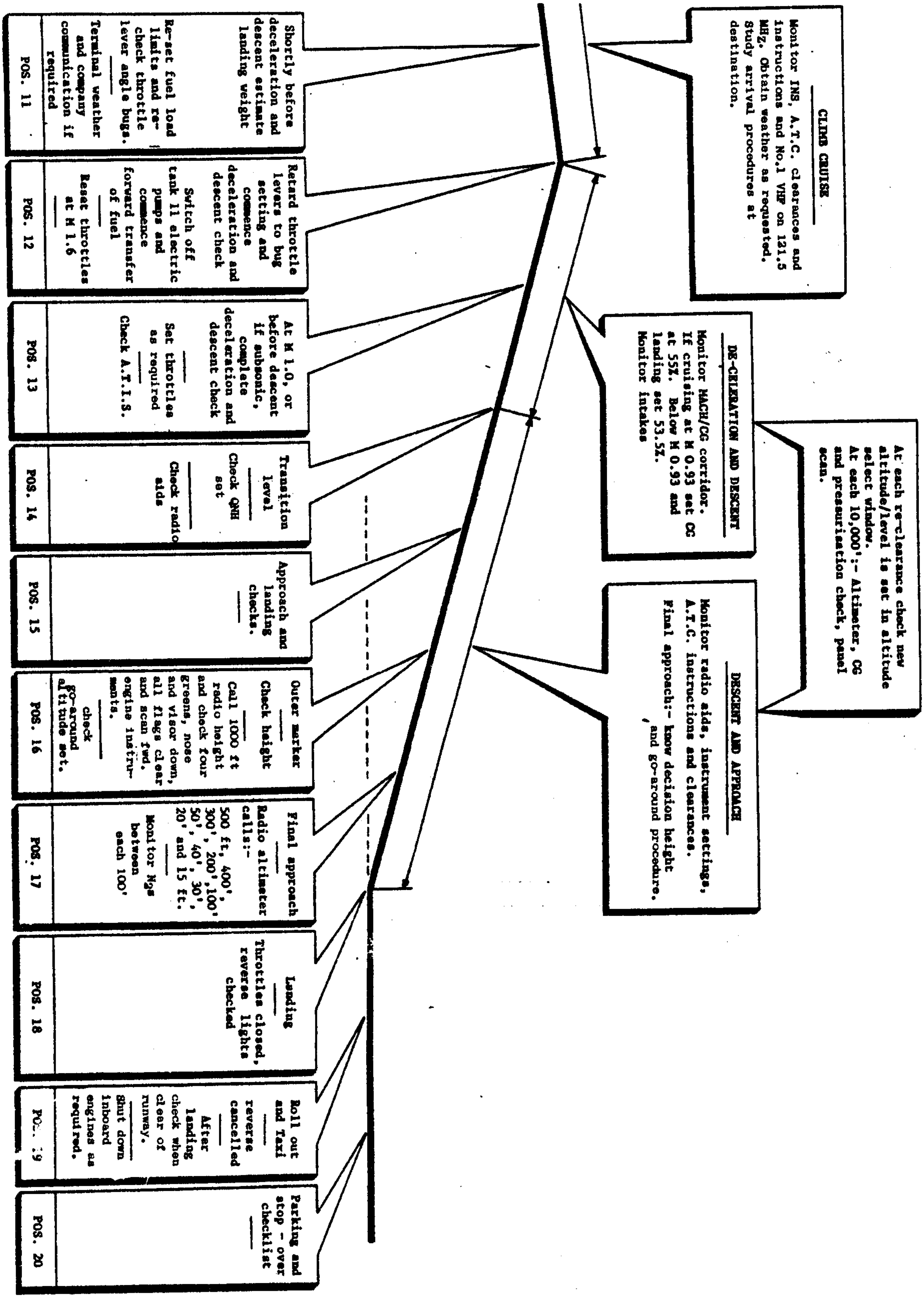
POSITION 20

Complete Parking Check and, if required, Stopover Check.

FLIGHT ENGINEER'S ROUTINE PROCEDURES



FLIGHT ENGINEER'S ROUTINE PROCEDURES



FLIGHT ENGINEER'S ROUTINE PROCEDURES

FLIGHT ENGINEER'S IN-FLIGHT DOCUMENTATION

1. BEFORE STARTING

Extract take-off P7, and Fuel Flow settings from Section 2 of the Cruise Control Manual and insert on the take-off form.

Extract ZFW & ZFCG from loadsheet and use to:-

- set up the ZFW and ZFCG indicators.
- set up the Aircraft Weight Indicator
- extract tank 11 initial supersonic cruise quantity.

Set USABLE fuel on board in Fuel Remaining indicator.

Check Aircraft Weight indication against loadsheet Take-off Weight plus taxi fuel.

On completion of the Radiation Meter check, record the accumulated does in Millirems on the Sector Defect Log page applicable to the projected sector.

e.g. 0 0 0 2 7 . On an SDL page without provision for radiation recording, enter accumulated dose reading in the first Sector Defect block applicable to the projected sector, endorsing the entry as "BEFORE FLIGHT".

2. TAXI AND TAKE-OFF

Note the chocks away and take-off times for insertion on to the Aircraft Movement Signal.

NOTE: Chocks away time is defined as the time when the aircraft first moves with an engine running, whether it is a ground assisted or a taxi manoeuvre.

3. CLIMB CRUISE

A. Aircraft Systems Log

On sectors with a stabilised cruise of approximately 1 hour, complete the headings and log at least the basic engine parameters i.e. N_2, N_1, FF, EGT, A_J, P_7 and TCA, and perform an EGT comparative check as shown in the following table.

On longer sectors, log one set of systems readings where practicable.

EGT Comparative Check

ENGINE NO.	1	2	3	4
DATUM EGT	646	655	650	654
ACTUAL EGT	643	657	662	652
DELTA EGT	-3	+2	+12	-2

From a scan of delta EGTs it can be seen that No.3 engine is hotter. To establish by how much it is hotter, divide the algebraic sum of the other delta EGTs by 3 and compare with the suspect engine i.e. $-3+2+(-2) = -3 \div 3 = -1$.

FLIGHT ENGINEER'S ROUTINE PROCEDURES

No.3 engine can now be seen to have a comparative rise of 13^{o}.

NOTE 1. On multiple sector aircraft trips, establish a datum EGT during first sector supersonic cruise and carry it forward to each calculation.

2. On 2 sector aircraft trips, compare actual EGTs with previous sector EGT's.

3. Before using a previous sector EGT, consult the Notes to Crew and Maintenance Engineers for details of any maintenance that would invalidate the comparison.

4. Do not compare a supersonic EGT with a subsonic EGT.

B. Fuel Checks

The primary source of fuel quantity measurement is the total Fuel Remaining Indicator except in the case of flowmeter failure or following jettison, when the FQI system is to be used.

Flight logs have spaces for "Fuel to Destination" figures on the same line as the "From" position. These figures are calculated at the flight planning stage and entered in the spaces before flight.

On the first line of the first page i.e. the leg from point of origination to first reporting or waypoint, enter the loadsheet fuel on board for take-off.

Subtract the calculated "fuel to destination" from "loadsheet fuel on board" to give a "Fuel Remaining at Destination" figure.

During subsonic or supersonic cruise, at the nominated fuel check points:

- record fuel on board.
- subtract calculated "fuel to destination" from "fuel on board".
- compare resultant "fuel remaining at destination" with figure obtained on the top line of the flight log first page.

4. AT FUEL CHECK POINT IDENTIFIED "FC" ON FLIGHT LOG

A. Fuel Check

One reporting or way point, normally within 1,000 nms of destination will be identified "FC" in the fuel to destination block. At this point, using the Cruise Control manual, complete an accurate fuel check as follows:- (Unchanged)

- extract average wind component from fuel flight plan and distance to go from flight log.
- note the SAT, aircraft weight and fuel on board.
- enter the cruise control manual Fuel Check and Flight Re-Planning table with required parameters and extract Fuel Required to destination.

  NOTE: that separate supersonic and subsonic tables exist.
- enter "fuel required" and "fuel on board" in the appropriate flight log columns.
- subtract "fuel required" from "fuel on board".

FLIGHT ENGINEER'S ROUTINE PROCEDURES

- compare resultant "fuel remaining at destination" with planned fuel at destination i.e. sum of alternate, contingency and excess fuel.

If the remainder of the flight includes a subsonic cruise:-

- extract wind component from fuel flight plan and subsonic cruise distance from flight log.
- enter the cruise control manual Additional Fuel and Time table with the above parameters and extract fuel and time increments to add to the figures derived from the Supersonic table.
- enter the corrected "fuel required" and "fuel on board" in the appropriate flight log columns and complete the calculations as above.

B. Descent and Landing Data Form

Use the "fuel remaining at destination" derived from the accurate fuel check to complete the Descent and Landing Data Form. Enter the following data:-

- estimated landing weight.
- V_{REF}.
- abnormal increment i.e. increment to V_{REF} due abnormal configuration e.g. no autothrottle.
- target speed i.e. sum of V_{REF} and abnormal increment: this should always be entered even when the abnormal increment is zero.
- fuel at destination.
- diversion fuel and name of alternate.
- holding fuel.

NOTE: That space is available for 2 alternates to be considered.

5. BEFORE APPROACH

Check that the landing weight, V_{REF}, and fuel at destination are still valid.

6. AFTER LANDING

Note the landing and chocks in time for insertion on to the Aircraft Movement Signal.

Note the Fuel Total Contents for comparison with refuel book item B

Record the Radiation Meter accumulated dose on the SDL page applicable to the completed sector e.g. 0 0 0 3 6.

On an SDL page without provision for radiation recording enter the reading below the Pre-Flight radiation count, endorsing the second entry as "AFTER FLIGHT".

Complete the AMS and SDL sections of the Maintenance Log.

FLIGHT ENGINEER'S ROUTINE PROCEDURES

7. MAINTENANCE LOG

A. Aircraft Movement Signal

(1) SERVICE FLT. NO.

Begin in the first space: do not leave an empty space between numbers. Only enter the flight prefix if it is other than BA.

(2) SECTOR/TRIP REF.

SECTOR number is sequential commencing 01 as the first sector ex LHR. If a defect is entered prior to moving off chocks at LHR the sector no. is 00.

TRIP no. is sequential for each trip departing LHR.

For trip no. 1 enter as 0001.

NOTE: The previous no. will be on the SDL page carrying the certification for the projected sector.

(3) CHOCKS AWAY DATE

Example 4th May 1976 = 0 4 0 5 7 6.

(4) DEPARTURE AND ARRIVAL STATIONS

Enter with 3-letter code as per index card.

(5) All times GMT.

(6) SUPERSONIC CYCLES THIS SECTOR

Enter the no. of times the aircraft completes a supersonic acceleration.

Enter 0 for a complete subsonic sector or incomplete acceleration.

B. Sector Defect Log

(1) RADIATION ACCUMULATED DOSE RECORDING

Record the accumulated dose as per instructions in Flight Engineer's IN-FLIGHT DOCUMENTATION para.1. BEFORE STARTING and para.6 AFTER LANDING.

(2) EVERY log entry must be allocated a sequential number during the round trip LHR - LHR.

(3) If more than 4 entries are required, place a cross in the "NEXT PAGE USED" box and continue on the next page set. Only the REGISTRATION and SECTOR/TRIP REF need be completed on second and subsequent page sets. Only the last page set per sector need be signed.

(4) If a special Report Form has been raised endorse the appropriate box accordingly.

C. Cabin Defect Report

When a cabin defect report is raised, place a cross in the CABIN DEFECT REPORT box on the SDL. Enter as a Sector Defect log item, any cabin defect that, in the Flight Engineer's opinion, may adversely affect the safety of the aircraft or personnel.

FLIGHT ENGINEER'S ROUTINE PROCEDURES

D. Technical Memorandum

This page is provided to enable a full amplification of a sector defect to be made. Any entry on this page MUST refer to an SDL item.

8. REFUEL BOOK

On arrival at LHR, record the arrival fuel contents as Refuel Log item B. This record is required for Customs.

9. ITEM

The IFM function of ITEM should be operated and recorded as follows:-

(1) For each unplanned disconnect, of technical significance, note the displayed caption and enter it into the Maintenance Log together with a brief description of A.F.C.S. mode and operation immediately prior to disconnect.

The displayed caption should be left in the window to enable it to pass into the ITEM memory.

A further disconnect will replace the previous caption with the appropriate display.

(2) Should a disconnect of no technical significance occur, clear the display by momentarily selecting CANCEL.

10. USE OF DUPLICATED SYSTEMS

(1) On all outbound sectors, LHR to terminal station use:
- main ECUs
- system 1 pressurisation control
- intake lanes A
- LH igniter for starting.

(2) On all inbound sectors, terminal station to LHR use:
- alternate ECUs
- system 2 pressurisation control
- intake lanes B
- RH igniter for starting.

11. FINAL SECTOR INTO LHR

(1) At some convenient point when subsonic carry out a functional check of the Wing and Intake anti-icing systems. Sector Defect Log entry need only be made if a fault if found.

(2) Contact company on v.h.f. Transmit defect report (including significant ADDs) and any other information as required.

DRILLS AND CHECKLISTS

Crew Duties and Integration - The 3 man operation of the Concorde has been made feasible by, among other things, maximum automation of the system control from the Flight Engineer's panel and by carefully studied and planned layout of all equipment and controls on the flight deck.

Drills and duties have been divided for a standard flight deck crew of three. To achieve optimum safety during the critical phases of each flight - i.e., take-off, initial climb, approach landing and deceleration - the Flight Engineer's function is to face forward to monitor instruments, instrument settings, approach displays, warnings etc as well as to monitor communications, maintain a look-out and to make routine or warning call-outs as a back-up for the First Officer (see Standard Monitoring Cross Checks and Call-outs). During other phases of flight the Flight Engineer must also concern himself with all the aforementioned matters when not actually engaged on system management at his own panel or on other duties that may be allocated to him.

All the pre-flight checks on the flight deck have been divided between the First Officer and the Flight Engineer, thus, after the usual formalities and briefing routines at the check-in office, if it is necessary for one man to stay behind for (say) final checking and signature of the flight plan, this may be the Captain or the First Officer at the former's discretion; the other will proceed to the aircraft to perform the pre-fligh checks.

In flight form filling, instrument log keeping and such like paper work must be kept to a minimum and restricted to the en route phases of flight. Other log keeping must not be allowed to interfere with the safety of the operation.

All Concorde Flight Engineers hold R/T licences and can handle routine Company communications, copy clearances and receive weather broadcasts as may be requested by the pilots. In addition they will tune and identify navigation radio aids if instructed.

2 Man Operation (in the event of incapacitation of one crew man is also perfectly feasible.

Standard Procedures - The only satisfactory means of achieving complete co-ordination is through the use of Check Lists, standard cockpit commands and terminology. All check lists are to be read aloud, except that routine items allocated to the Flight Engineer only may be performed silently.

After the Flight Engineer has carried out the SAFETY CHECKLIST he will provide ground power, then complete the PRELIMINARY COCKPIT CHECKLIST which sets the systems, ready for the scan checks.

The First Officer will read the BEFORE START CHECKLIST, PUSHBAC CHECK and the AFTER START CHECKLIST. All other checklists will be read by the Flight Engineer.

C = Captain; P = First Officer; E = Flight Engineer
G = Ground; S = Senior Cabin Crew Member; ALL = C.P.E.

(Unchanged)

DRILLS AND CHECKLISTS

Scan Checks - No Check List is provided for the initial external and internal checks which will be covered by the systematic scan check method. Similarly many routine items not relevant to the safety of the passengers, crew or aircraft have been omitted from the Normal Check Lists. At transit stops or short turn-arounds a full scan preflight check must always be carried out but there is obviously no need to test those pieces of equipment known to be serviceable on arrival.

Call and Response - The Captain will call for the appropriate check list when required and shall not assume that it will be read automatically; the check list reader must ensure that all checks have been carried out. The Captain should also ensure that he receives the report indicating that the check has been completed. Instances may arise where it becomes necessary to deviate slightly from standard drills in order to conduct the flight in a more efficient and safe manner. Captains should use their best judgement in effecting these temporary deviations.

Emergency/Abnormal Checklist Procedures

General

Any crew member detecting an existing or impending emergency/ abnormal condition will immediately inform the Captain.

Where the pilot in charge feels that safety can be enhanced by enlisting the help of other qualified personnel on the flight deck, he should issue clear and concise commands for what he requires of them. Well intentioned but unco-ordinated actions by other crew members may well aggravate the situation. If an emergency should arise during the absence of the Captain he should be summoned to the flight deck by the best means available. In the last resort the public address system may be used.

WHENEVER AN EMERGENCY OR ABNORMAL PROCEDURE IS BEING CARRIED OUT, ONE PILOT MUST CONTINUOUSLY MONITOR THE AIRCRAFT'S FLIGHT PATH.

Emergency Checklists

On the Captain's command the appropriate crew member(s) will REPEAT THE EXECUTIVE COMMAND AND THEN perform without reference to the checklist those items above the dotted line.

Memory items should be completed, each crew member calling aloud the action he is about to take. Where possible actions should be monitored by other crew members.

The Flight Engineer will then read the complete checklist to confirm that memory items have been actioned, and check that th appropriate crew member(s) take the correct action for those items below the dotted line.

The checklist may be read silently except,

- when the correct memory action has not been taken.
- when the correct memory action cannot readily be visually confirmed by the Flight Engineer.

In the above cases the Flight Engineer must challenge the appropriate crew member and confirm correct response and action.

Items below the dotted line which require action by another crew member must be read aloud and the correct response and action confirmed.

Whenever an Emergency is called for that drill must be COMPLETED before any other drill is started even though another condition develops prior to its completion.

Upon completion of the Checklist the Flight Engineer will announce "........ Checklist completed."

Abnormal Checklists

On the Captain's command, the Flight Engineer will read the appropriate checklist.

The "E only" checklist items may be read silently. Items which require action by another crew member must be read aloud and the correct response and action confirmed.

Upon completion of the checklist, the Flight Engineer will announce, "........ checklist completed."

Absence from Flight Deck - The Check List folders shall be kept readily available.

For phases of flight when it is permissible for one of the three technical crew members to leave the flight deck for short periods, the emergency or abnormal procedures will be completed by two men. The First Officer will cover the Captain or Flight Engineer actions and the Captain will cover those allocated to the First Officer.

The Flight Engineer's leaving Panel Check should be carried out whenever the Flight Engineer leaves the flight deck.

NOTES:

1. The winds referred to in the table overleaf are meteorological mean winds, (e.g. in the case of a reported "30 kt gusting 45 kt", the mean wind is 30 kt).
2. Reduced Noise Approach V_{TT} = V_{REF} + 7 kts + wind increment as appropriate. V_T MAX = V_{REF} + 10 kts.
3. The 7 kt increment added to V_{REF} for the autothrottle inoperative case is required for handling considerations. The wind increment is therefore added to the 7 kt increment to provide an adequate margin above V_{REF} + 7 kt.
4. The 5 kt increment added to V_{REF} for the 3 engines operating case is to improve the landing WAT limited weight, rather than for handling considerations. As windspeeds above 15 kt require a V_{REF} increment in excess of 5 kt, the wind and WAT weight increments are not additive.
5. Above 300 ft., the target approach speed on 2 engines is V_{REF} + 30 kts and this is set on an external index.

Target speed (V_{TT}) for the following configurations is V_{REF} + 10 kts An appropriate increment for wind may be added, up to V_T max of V_{REF} + 17 kts with or without autothrottle.

Both electric trim systems lost.

Both pitch auto-stab systems lost.

Flying Controls in mechanical mode.

Both flying control inverters lost.

VLA - From top of descent to FL 400 an external index should be set at 300 knots.

From FL 400 to FL 150 it should be set at 250 knots (Below FL 150 VLA = V_{REF}).

REASON FOR ISSUE:

To incorporate Flight Manual changes.

ACTION:

ASI INDICES

Take-Off - Set the internal index at V_2. Set the external indices at V, V_R, and V_2 + 40 knots.

Landing - Set the internal index at the target speed (V_{TT}).

Set the external indices at V_{REF}, Max Threshold Speed (V_T Max), V_{REF} + 30 (minimum 190 knots) and 250 knots.

Reference Landing Approach Speed (V_{REF}) - The reference landing approach speed is the target speed for final approach and crossing the threshold for the all engines, light wind, low turbulence, autothrottle engaged case.

Target Threshold Speed (V_{TT}) - This is the speed to be used in the latter stages of the approach, and at which the pilot should aim to cross the threshold. For the particular aircraft and atmospheric conditions given in the definition of V_{REF} above it is equal to V_{REF}. For other conditions the speed increments given in the table below must be added to V_{REF}.

Maximum Threshold Speed (V_T MAX) - This is the speed at the threshold above which the risk of exceeding the scheduled landing field length is unacceptably high. If it appears certain that the speed at the threshold will exceed the maximum threshold speed and the runway available is known to be critical, the attempt to land should normally be abandoned.

In cases where V_{TT} is at or close to V_T MAX transient speed excursions above V_T MAX can be accepted.

SPEED INCREMENTS ABOVE V_{REF}

AIRCRAFT CONFIGURATION	INCREMENT TO BE ADDED TO V_{REF} TO GIVE V_{TT}			V_T MAX
	WIND 0 - 15 kt	WIND 15 - 30 kt	WIND Above 30 kt	
4 ENGINES OPERATING	0	1/3 WIND SPEED	10 kt	10 kt
3 ENGINES OPERATING	5 kt	1/3 WIND SPEED	10 kt	10 kt
2 ENGINES OPERATING (Autothrottle) (not allowed)	7 kt	7 kt PLUS 1/3 WIND SPEED	17 kt	17 kt
NO Autothrottle 3 or 4 ENG.	7 kt	7 kt PLUS 1/3 WING SPEED	17 kt	17 kt

(Continued)

ASI INDICES

Take-Off - Set the internal index at V_2. Set the external indices at V_1, V_R, and V_2 + 40 knots.

Landing - Set the internal index at the target speed (V_{TT})

Set the external indices at V_{REF}, maximum threshold speed, V_{REF} + 30 (minimum 190 knots) and 250 knots.

Target Speed (V_{TT}) - For winds not in excess of 15 knots these are:-

Four engines with autothrottle	V_{REF}
Four engines without autothrottle	V_{REF} + 7 knots
Three engines with autothrottle	V_{REF} + 5 knots
Three engines without autothrottle	V_{REF} + 7 knots
Two engine	V_{REF} + 7 knots

NOTE

Above 300 feet, the target approach speed on two engines is V_{REF} + 30 knots and this is set on an external index.

Both electric trim systems lost	V_{REF} + 10 knots
Both pitch autostab systems lost	V_{REF} + 10 knots
Flying controls in mechanical mode	V_{REF} + 10 knots
Both flying control inverters lost	V_{REF} + 10 knots

Maximum Threshold Speed - This speed is independent of the number of engines operating and is:-

With autothrottle	V_{REF} + 10 knots
Without autothrottle	V_{REF} + 17 knots

V_{LA} - From top of descent to FL.410, an external index should be set at 300 knots.

From FL.410, to FL.150, it should be set at 250 knots. (Below FL.150 V_{LA} = V_{REF}).

ALTIMETER SETTING PROCEDURES

	Barometric		Radio
	Subscale	External Index	Internal Index
Take-off	Airfield QNH	Airfield Elevation	20 Feet
Climb) Cruise) Descent)	ATC setting	N/A	N/A
Approach Check (a) CAT 2 or CAT 3 Approach	Airfield QNH	QNH Decision Height ILSH	Tabulated RA Decision Height
(b) ILSC Approach	Airfield QNH	QNH Decision Height (if not listed set ILSH QNH DH)	Tabulated RA Decision Height (If not listed set HAT)
(c) Other IFR approaches	Airfield QNH	QNH Decision Height	300 Feet
(d) VFR Approach	Airfield QNH	QNH Decision Height	300 Feet

NOTES:

(1) All subscale readings and minima settings must be cross-checked at the time of setting.

(2) For autoland with minima below 200 ft i.e. category 2 or 3, the Radio Altimeter DH will always be the overriding Decision Height. The pressure altimeter bug should be set to the appropriate ILSH DH QNH to provide a reference for manual reversion.

(3) In Category 1, the DH RA will be the Decision Height where published, otherwise the DH QNH becomes the Decision Height and the HAT set on the radio altimeter is advisory only.

(4) If an aircraft is passed a height clearance - based on QFE, request must be made for an altitude based on QNH.

(Deletion)

Continued......

ALTITUDE SELECTOR SETTING PROCEDURE

The non handling pilot will set in sequence on command (as appropriate during the climb and descent) in the A/P - F/D altitude selector:-

(a) the altitude clearance limit

(b) the flight level clearance limit

(c) the go-around altitude limit when crossing the outer marker on final approach.

THIS SETTING MUST BE CHECKED AND CONFIRMED AS CORRECT BY THE HANDLING PILOT ON ALL OCCASIONS.

(Unchanged)

MONITORING AND CALLOUTS

Crew Integration - Safety demands that Concorde is operated strictly in accordance with recommended procedures and techniques, varied only as dictated by common sense and airmanship, having regard to all the circumstances prevailing. The occupants of the pilots' and Flight Engineers seats must operate as an integrated crew, monitoring and cross checking each others' actions in so far as is practicable. Duties may be delegated by the Captain to supernumerary or u/t crew members in accordance with their qualifications and they should also assist in monitoring the operation generally.

Commands - In order to avoid any possibility of error or misunderstanding all commands given on the flight deck must be repeated back in the acknowledgement.

e.g. CAPTAIN ... "Gear Up". FIRST OFFICER ... "Gear Up".

Without superfluous wording, direct attention precisely to the item to be changed by first naming the item and second the desired value e.g. "Visor Down", Nose 5°".

Use of Radio Aids - The switching of radio information to HSI, Autopilot and Flight Director can lead to confusion or error if adequate liaison between pilots is not maintained. Navigation facility frequency changes must be announced including confirmation of station identification and correct frequency. The final approach aid must be identified by both pilots.

The transfer switches will only be operated in the event of equipment unserviceability.

Monitoring - The navigation and flight progress indications must be cross-checked and monitored continuously; any crew member must advise the Captain immediately if:-

(1) it appears that the aircraft is departing significantly from its intended flight path OR

(2) any abnormal instrument indications, comparator, caption, flag or light warnings are observed.

Altimeters - Barometric altimeters and subscale settings will be cross-checked at each 10,000 ft level on climb and descent.

The Flight Engineer will participate in altimeter monitoring and to this end must listen to ATC clearance and familiarise himself with safety heights, transition altitudes, levels and met minima as appropriate.

Radio Altimeters - The radio altimeters must be monitored by both pilots at all times that they are active - i.e. below 2500 ft AGL.

Responsibilities - During the take-off, climb and approach to land phases of flight, the non-handling pilot and Flight Engineer will be responsible for monitoring and cross-checking the flight instruments and calling out appropriate information - the ensuing list covers the more important items under these headings. The FE should not call the bracketed call-outs unless omitted by the Co-pilot. On final approach it is vitally important that the non-handling pilot continues to monitor the aircraft's flight path by reference to the instruments, even after becoming visual, until the threshold has been crossed.

(Unchanged)

MONITORING AND CALLOUTS

CG - CG position should be stated by CP & E at the following points:-

(1) Every 10,000 ft altimeter check.

(2) All check listed speed triggers.

(3) At completion of fuel trim transfer operations.

NOTE: When fuel is being transferred in flight for Pitch or Roll trimming the Captain must be informed.

MONITORING AND CALLOUTS

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS: PILOT NOT HANDLING	CALLS: F.E.	ROUTINE	WARNING
Pre Take-Off	Pre-Start	Pressure Altimeters	Both QNH Indicating Elevation				
		Trim	Check set for Take-Off				
		ASIs	Indices Set				
		Pitch Indices	Check set for Take-Off				
Take-Off	Roll	ASIs	Both Registering 'P' Only	"Airspeed Building"		X	
		ASIs -100 kts		"100 kts"		X	
		Power Check	4 lights		"Power Checked" or "Engine Failure"	X	X
		ASI-V_1		"V_1"		X	
		ASI-V_R		"Rotate"		X	
		ASI-V_2		"V_2"		X	
	Initial Climb	Rad. Alt Climbing 20'		"Positive Climb"		X	
		240 knots		"240"		X	
		Noise Abatement		"3-2-1 NOISE"	(NOISE)	X	
		ASI Decaying to or below min		"Airspeed"			X
		VSI negative R.O.C.		"Rate of Climb"			X
		ADI Bank Angle ±2° from specified		"Bank Angle"			X

MONITORING AND CALLOUTS

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
Climb	Every 10,000 feet	Altimeters	Subscale & Readings CG indication	"Altimeter Check" & CG	"Altimeter Check" & CG	X	
	When Altimeter setting changes	Altimeters	Subscale & Readings	"Transition Altitude"	"Transition Altitude"	X	
	Setting cleared Height	Altitude Select	Correct Height Set	"Cleared Altitude set"	"Cleared Altitude set"	X	
	Approaching Cleared Altitude	Altimeter		"1000 ft to Go"	"1000 ft to Go"	X	
Descent	Every 10,000 feet	Altimeters CG	Subscale & Readings C G. Indication	"Altimeter Check" & CG	"Altimeter Check" & CG	X	
	At 10,000 ft (or FL.100)	Altimeter	Subscale & Readings			X	
	Setting Cleared Height	Altitude Select	Correct Height Set	"Cleared Altitude Set"	"Cleared Altitude Set"	X	
	When Altimeter Setting changes	Altimeter	Subscale & Readings	"Transition Level"	"Transition Level"	X	
	Approaching Cleared Altitude	Altimeters		"1,000 ft to Go"	"1000 ft to Go"	X	

MONITORING AND CALLOUTS

(Unchanged)

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS: PILOT NOT HANDLING	CALLS: F.E.	ROUTINE	WARNING
Approach	Approach Check	ASIs	Indices Set				
		Pressure Altimeter	Index set to QNH DH				
		Pressure Altimeters	QNH Set Alts Agree				
		Radio Altimeters	DH Pointer Set				
		Radio Altimeter	Radio Altimeter		"Radio Altimeter Active"	X	
	Final Approach	HSI Beam Bar Off Stop		"Beam Bar Active"	("Beam Bar Active")	X	
		HSI Glide Bar		"Glide Slope Active"	("Glide Slope Active")	X	
		HSIs	Beam and G/S Bars Agree Both Sides				
		GPWS audio "Glideslope"		"Glideslope"		X	
	At O.M.	Altimeters	Instruments	"Height Checks"		X	
	At 1000 ft RA	Radio Altimeter			"1000 ft radio"	X	
		ALTITUDE SELECT	Go-around altitude set	"Go-around altitude set"	("Go-around) (altitude set")	X	
		Nose /Visor & Landing Gear	Fully down Down & Locked	"5 greens" (1 nose & 4 gear)	("5 greens")	X	
		W&LD	Category Status	"Cat 1, 2 or 3" (autoland only)	("Cat 1, 2 or 3")	X	
						X	

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
		CAT 1 DH + 100 DH		"100 to Go" "Decision Height"	("100 to Go") ("Decision Height")		
		CAT 2 & CAT 3 300 Radio DH + 100 Radio DH		"Alert Height,cat.." "100 to Go" "Decision Height"	("Alert Height,cat..") ("100 to Go") ("Decision Height")		
Approach	Final Approach Below 1000ft.	VASIS Indicate too high or low		"VASIS"			X
		VSI Excess 1000 F.P.M.		"Rate of descent"			X
		I.A.S. Near Min, Decaying Rapidly, or Approaching Max. Threshold Speed		"Airspeed"			X
		H.S.I. Beam Bar Exceeds 1 Dot Deflection		"Beam Bar"			X
		H.S.I. Glide Slope Exceeds 1 Dot Deflection		"Glide Slope"			X
		Radio Altimeter Reading			"800', 500', 400', 300', 200', 100', 50, 40, 30, 20, 15."	X	
	Flare	ADI, Pitch Attitude exceeds 12.5°		"Attitude"			X

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
Approach: additional items applicable to Reduced Noise Approach only.		Radio Altimeter AFCS	IAS ACQ selected		**"800 ft"**	X	
		Radio Altimeter ASI, AT & HSI glide bar		"Stabilised"	**"500 ft" ("Stabilised")**	X	
		Radio Altimeter AFCS control panel		"Autopilot" (if AP or FD still engaged)	**"300 ft" ("Autopilot")**	X	

(Unchanged)

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS: PILOT NOT HANDLING	CALLS: F.E.	ROUTINE	WARNING
Missed Approach	Initial Climb	V.S.I - Climb		"Positive Climb"		X	
		A.S.I Decaying or below min.		"Airspeed"			X
		V.S.I. Negative R.O.C.		"Descending"			X
Landing	Deceleration	A.S.I. 100 knots		"100 knots"		X	
		75 knots		"75 knots"		X	
		HSI Ground Speed 40 knots		"40 knots"		X	
		20 knots		"20 knots"		X	
All Phases as appropriate		ADIs Excessive Roll or		"Bank Angle"			X
		Pitch		"Pitch Attitude"			X
		Altitude Alert Tone and/or light		"Altitude Alert"	"Altitude Alert"	X	X
		G.P.W.S. Pull-up lts (pre-mod, Terrain) plus audio "Pull-up".		"PULL-UP" Warning"			X

CREW BRIEFING

Reasons - In the interests of mutual understanding, co-ordination and safety of operation some form of crew briefing by the pilot is considered necessary prior to take-off and also before the approach and landing. The expression 'normal briefing' indicates that normal drills as laid down will be followed but special consideration must be given:-

In the take-off briefing to:-

(a) Cross wind on the runway.

(b) Anti-icing.

(c) Special ATC clearance considerations including setting of radios.

(d) Noise abatement.

(e) Brief review of the abandoned take-off drill.

(f) Transition Altitude.

In the approach briefing to:-

(a) Expected instrument procedure to be followed including use of radios and appropriate company minima. Specific mention should be made of glide-path restrictions when the appropriate ILS is asterisked in the minima.

(b) Missed approach procedure, including pattern to be followed, use of radios and the go-around drill.

(c) Review of pertinent information concerning runway length, turn off points and surface conditions. The serviceability of approach aids, approach and runway lighting and marking should also be reviewed.

(d) Special consideration of any emergency or unusual aircraft or system configuration.

(e) Type of approach procedure and associated drills and monitoring, e.g:- Reduced Noise Approach with or without autopilot, All Weather Approach with or without autoland.

(f) Special briefings for Category 2 or 3 operations.

(g) Transition level.

NOTE: Additional approach briefing will be required in the event of:-

(a) Change from the expected approach procedure or

(b) System failures which affect the landing (e.g. autothrottle).

(c) Change of runway in use.

Rudder Trim - In order to centralise the rudder pedals, the rudder trim should be set to zero before taxiing.

Taxy Power - As fairly high power settings (up to 80% N_2) may be needed to start the aircraft moving when heavy, the area behind the aircraft should be clear before the aircraft is moved under its own power.

Once the aircraft is moving, idle power provides more than enough thrust to keep the aircraft rolling, even at high weight. After landing it is normally recommended to shut down the two inner engines for taxiing.

The use of LO idle is recommended when idle power is providing more than enough thrust to keep the aircraft moving.

Nose and Visor - The recommended procedure is to have the visor down and the nose at 5° for taxiing.

Ensure that ground equipment is clear before lowering the nose.

Braking - When the aircraft is moving, do not move the brakes lever while the brake pedals are depressed.

Continuous braking should be avoided during taxing; it is preferable to use a few smooth firm applications. Continuous braking will result in high brake temperatures.

Pilot's Position - The pilot's position is 38 feet forward of the nose wheel and 97 feet from the main wheels. Care and judgement are needed to make sure that the main wheels stay on the taxiway during turns.

Should there be any doubt about clearances, or wheel position, the DV window should be opened and a visual check carried out (wing tips and all wheels can be seen).

During a minimum radius turn, the wing tip tracks inside the nose but the tail tracks outside the wing tip.

Steering - Steering is normally accomplished with the nosewheel tiller but limited directional control is available using rudder pedal steering.

The rudder/nosewheel interlink makes it essential to hold the tiller during the pre-flight check of the rudder.

If the nosewheel fails whilst taxiing, use differential braking to steer the aircraft. Do not attempt to reset nosewheel steering until below 5 knots.

Ground Speed - INS ground speed must be monitored during taxiing and a maximum of 10 knots observed before entering sharp turns. However, speed should not be allowed to become so low that large thrust applications are required in confined spaces where jet blast should be considered.

180° Turn - A 180° turn can be carried out on a 150 feet wide dry or wet runway provided that the following procedure is adopted. The aircraft ground speed should be between 5 knots minimum and 10 knots maximum. Steer 20 degrees, left or right, from the runway axis. When the pilots seat is plumb over the edge of the runway turn the nosewheel steering handle to full deflection. The nosewheel will not be nearer than 8 feet from the edge of a 150 feet wide runway during a complete 180° turn.

CAUTION: ON A DRY SURFACE DO NOT APPLY BRAKING ON THE INSIDE OF THE TURN WITH FULL NOSEWHEEL DEFLECTION AS THIS COULD RESULT IN LANDING GEAR OVERLOADING.

ON A WET SURFACE GENTLE BRAKING ON THE INSIDE OF THE TURN IS ALLOWED AND IS SOMETIMES NECESSARY TO HELP IN COMPLETING TIGHT TURNS ON WET SURFACES PARTICULARLY AT VERY AFT CG POSITIONS.

Nosewheel Deflector Clearance - The nose wheel deflector ground clearance can be less than two inches depending on tyre compression which is affected by normal considerations such as braking, or turns or surface irregularities. Care is therefore necessary in manoeuvres that bring the nose wheel close to projections above the runway or taxiway surface. 180 degree turns should be limited to runways of 200 feet width or greater to protect the deflector.

The deflector should be inspected after any take-off rejected above 100 knots.

Reverse - Reverse thrust will not be used to back the aircraft.

CG - When starting to taxi with a standard fuel loading, the payload distribution, although quite correct, is likely to be such that fuel transfer is necessary to achieve the recommended CG position for take-off. The relevant figures for pre-take-off transfer, or pre-take-off burn off from tank 11 are given in the loadsheet. The procedure is to achieve the finak tank 11 contents as shown on the loadsheet and accept the indicated CG position provided that it is within ± 0.3% of the required figure.

When taxiing with fuel loads in excess of the 53.5% Co MAXIMUM TAKE-OFF FUEL, it is recommended that nosewheel steering angles are limited to half deflection of the steering handle on dry surfaces and approximately quarter deflection on wet surfaces. If the response to nosewheel steering demands proves to be insufficient, differential braking will be effective in providing the additional directional control.

It is also recommended that the taxiing speed be limited to a maximum of 20 kt true groundspeed.

Take-off must not be attempted with Mach/CG position warning light on.

(Unchanged)

Trim - The take-off trim setting is dependent only on CG position and varies linearly from 2.5° nose down, to 0.5° nose down between CG position of 53.5 and 52.5% Co. At the take-off maximum aft CG position of 54% the trim is 2.5° nose down.

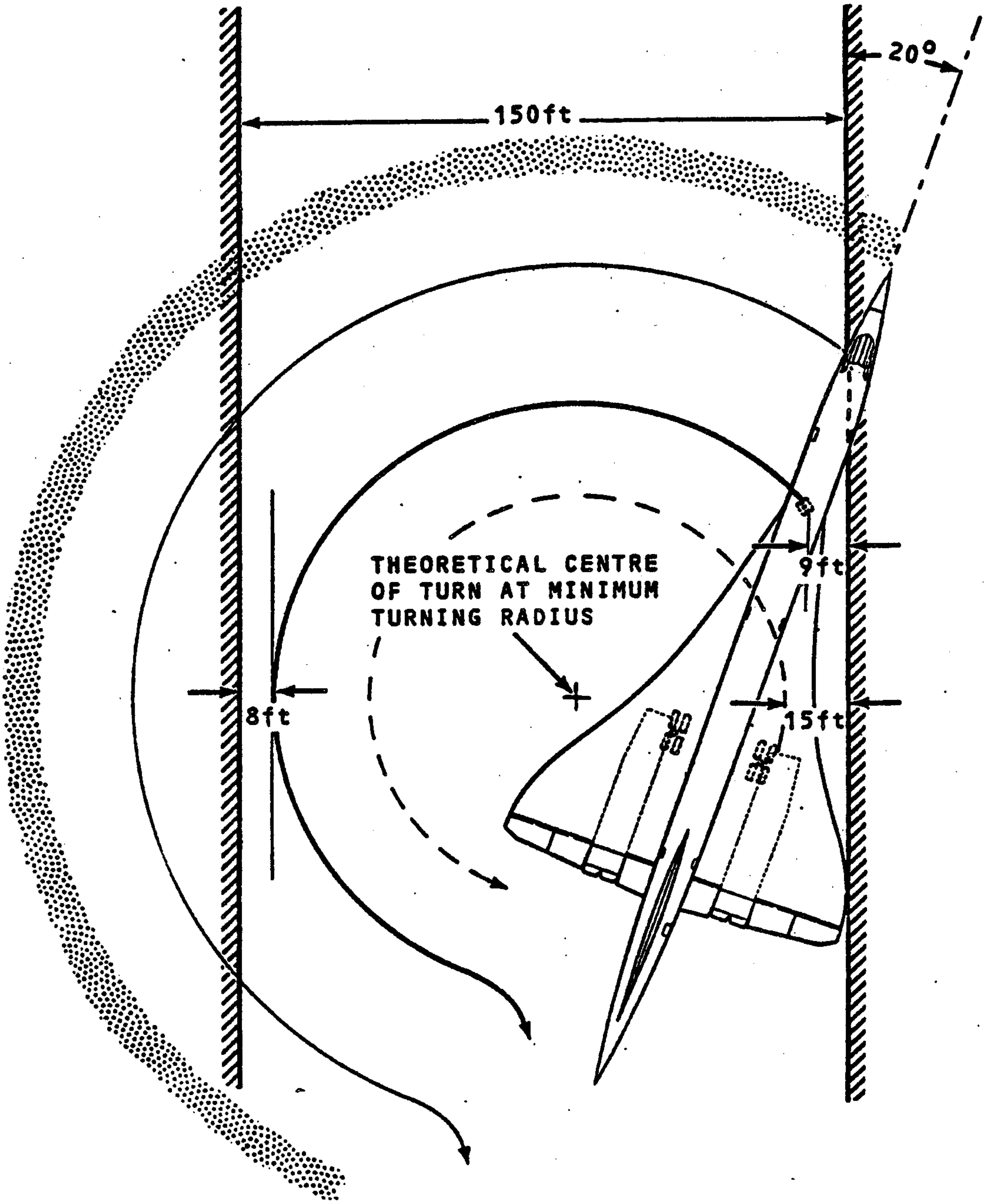
The trim setting should be checked on both the pitch trim indicator and the flight control position indicator.

For optimum performance, the recommended CG position at weights of 140,000 Kg and above, is 53.5% Co. The take-off trim setting for these weights is therefore 2.5 nose down.

To avoid transient CG warnings the recommended CG position at weights below 140,000 Kg is 53% Co. The take-off trim setting for these wieghts is therefore 1.5° nose down.

TAXIING

NOTE:
60° IS MAXIMUM POWERED STEERING ANGLE
3° SLIPPAGE HAS BEEN ASSUMED TO OCCUR
GIVING AN EFFECTIVE ANGLE OF 57°



TAKE-OFF AND INITIAL CLIMB

Differences - Main Differences on take-off compared with other aircraft are:-

(1) Reheat is used.

(2) Initial climb out performance increases rapidly with increasing speed.

(3) Contingency power is selected after engine failure. Speed and sideslip must be carefully monitored to achieve maximum performance.

(4) The tyres are very close to their maximum speed on lift off.

(5) Although the criterion $V_2 \geqslant 1.2$ vs has been generally adequate for conventional aeroplanes for Concorde it is necessary to prescribe separately:-

(a) $V2 \geqslant 1.125\ V_{ZRC}$ (performance margin)

(b) $V2 \geqslant 1.2\ V_{MIN}$ 1G (incidence margin)

(c) Manoeuvre capability at $V_2 \geqslant 1.45$ G

Nose and Visor - The nose must be in the 5° position for take-off.

Take-Off - All take-offs should be regarded as instrument manoeuvres from the point of rotation.

The aircraft should be held on the footbrakes at the end of the runway with the engines at idle power, the rating mode switches at TAKE-OFF and reheat pre-selected.

The brakes are released, and stop watches started at the time the throttles are advanced from idle to achieve take-off power. It is essential that the brakes are fully released before thrust is applied.

Rolling Take-Off - A rolling take-off is permissible if the available distance exceeds the required distance by 60 metres or more. In this case the engines are rapidly accelerated as the aircraft is turned onto the runway, ensuring that the required power is selected within 4 seconds. Stopwatches are started at the time the throttles are advanced from idle to achieve take-off power.

100kt Check - At 100 knots 4 'clear to go' lights should be illuminated. However it is permissible to continue the take-off if one 'clear to go' light fails to illuminate provided that the N_2 of the affected engine has achieved minimum value for take-off and the AREA indication is within the white sector.

If more than one 'clear to go' light fails to illuminate or the N_2 or AREA indication for the engine with the failed 'clear to go' light is not satisfactory the take-off must be abandoned

Once 100 knots is attained attention should be centred on the N_2 instruments, as above 100 knots a decrease in N2 is the most reliable indication of thrust loss.

100kt Check (Continued)

NOTE

It is permissible to plan an operation in anticipation of a single reheat failure before 100kts, provided that the Actual Take-Off Weight is less than the Corrected Performance RTOW by a certain amount see Performance Manual section I. In this case take-off may be continued provided that the N_2 of the affected engine has achieved minimum value for take-off and the go lights of the remaining three engines are on at 100kts.

At airspeeds above 100 knots the loss of one reheat and the related 'clear to go' light can be accepted provided that N_2 indications are correct. Re-selection should not be attempted but the switch must be left at reheat in order to:

(i) Get maximum advantage from automatic contingency on the engine with the failed reheat in the event of failure of another engine.

(ii) Permit immediate manual selection of contingency power in the event of failure of another engine.

NOTE

In the case of continued take-off with one reheat failed before 100kts, failure of another reheat after 100kts (second failure) constitutes an "engine failure" and take-off must be abandoned.

Crew Duties - Crew duties on take-off are as follows:-

(1) Pilot flying
One hand on throttles up to V_1
Other hand on control column
Removes hand from throttles at V_1 and places on Control Column.

(2) Pilot not handling aircraft
At 60 knots calls "Speed Building"
Calls "100 knots", V_1", "Rotate", "V_2", "Positive Climb", "240 knots",

A positive climb should not be considered as established until the radio altimeter indicates more than 20 ft.

Monitors engine instruments with the Flight Engineer.

(Completely Revised)

Crew Duties - Continued

(3) Flight Engineer

- Controls the reheat selectors throughout
- Re-selects any reheat in the event of non-ignition below 60kts.

  Re-selection of reheat above 60kts is not permitted as it imposes a time lag that will reduce the likelihood of achieving full take-off thrust in time for the 100kt check.

- Maintains tactile Monitoring of the no. 4 engine N_1 limiter switch up to 60kts. If it has not disengaged by the time the co-pilot calls "airspeed building" (60kts), it must be manually disengaged.
- Monitors the engine indications as follows:-

(a) Observe N_2 of engines 1, 2 and 3 attain the minimum N_2 for take-off. Engine 4 will be slightly retarded.

(b) Observe N_1 of engines 1, 2 and 3 are sensibly in line with engine 4 slighly retarded.

(c) Observe all FT flags in view and the Fuel Flow of engine 1, 2 and 3 sensibly in line with engine 4 slightly retarded.

(d) Observe all EGTs increasing.

(e) Observe Area of Engines 1, 2 and 3 increase to within the white sector with engine 4 in the yellow sector. The Area of Engine 4 may enter the white sector at this stage; this is an acceptable indication.

(f) At 60 knots no. 4 N_1 limiter disengages, observe engine 4 parameters increase to take-off power and are sensibly in line with the other engines.

(g) Observe all four "clear to go" lights illuminate.

(h) Maintain a continuous scan of engine primary indications and go lights.

If one Go light fails to illuminate but the above sequence of engine monitoring shows the subject engine to have achieved take-off power, in particular THAT N_2 HAS ACHIEVED MINIMUM VALUE FOR TAKE-OFF AND THE AREA IS WITHIN THE WHITE SECTOR, then the take-off will be continued.

If the Area is not within the white sector, but the N_2 check was satisfactory and the pre-flight performance calculations established that a take-off may be scheduled on three reheats, then the take-off will be continued.

(Completely Revised)

Flight Engineer - Continued

- Calls "Power Checked" or "Engine Failure" in response to the 100kts call.

  In the case of continued take-off with one reheat failed before 100kts failure of another reheat after 100kts (second failure) constitutes an "engine failure" and take-off must be abandoned.

Directional Control - Directional control during the take-off roll is maintained by use of the rudder pedal operated nose wheel. The control column should be held neutral even in a cross wind; into wind elevon should not be used.

The rudder pedal operated nose wheel gives adequate steering during take-off and landing on wet or dry runways, in cross winds or with asymmetric power.

Rotation - Rotation is carried out to the pitch attitude set on the white pitch index i.e. the 3-engine V_2 initial attitude (θ_2). Lift off occurs 2 or 3 knots before V_2 and at about 10° pitch attitude.

Rotation is carried out at a normal rate for a jet aircraft. The optimum rotation time from control input to achieving θ_2 on a noise abatement T/O is 5-6 secs. Too rapid rotation or ove rotation adversely affects take-off distance (in the extreme case over rotation causes a tail strike). Under rotation gives increased take-off speeds which can mean exceeding tyre limit speeds. As the aircraft operates frequently at or near tyre limit speeds, a normal rotation to the correct pitch attitude is therefore as important for tyre speed considerations as it is for performance and noise.

Gear-Up - When a positive climb is established the gear is retracted. An extended gear reduces the rate of climb by about 400 feet per min.
A positive climb should not be considered as established until the radio altimeter is indicating more than 20 feet.

Trim - The trim settings used for take-off are approximately correct for stabilisation at the correct climb out speeds.

Initial Climb - After rotation the aircraft is accelerated by keeping it at the pitch attitude θ_2 set before take-off. The acceleration should be continued to reach V_{MO} or to reach the TMA climb speed. The Flight Engineer selects reheat OFF at 500 feet and FLIGHT at 1000 feet on command.

NOISE ABATEMENT

After rotation the aircraft is accelerated by keeping it at the pitch attitude θ_2 until airspeed approaches the noise abatement speed, V_N. Pitch attitude is then increased so that V_N is maintained. At noise abatement time power is reduced and pitc attitude is decreased to continue at V_N. The amount of anticipation required during the acceleration to V_N and the pitch attitude required to maintain V_N, vary with power, aircraft weight, pressure altitude and air temperature. Airspeed values given to provide anticipation guidance are approximations, less anticipation may be required. Pitch attitude values given for guidance are likewise approximations.

TYPICAL HEAVY TAKE-OFF WEIGHTS

Initial Climb - After rotation the aircraft is accelerated by keeping it at the pitch attitude θ_2 set before take-off. At 240 knots or soon after, pitch attitude should be increased to ensure that the noise abatement speed of 250 knots is not exceeded. 18° pitch attitude is a useful approximate target, but this will rarely be the exact attitude required, it may be greater or less. Having increased pitch attitude, adjustments in attitude should be made as necessary to maintain 250 knots.

Power reduction - At noise abatement time the Flight Engineer selects reheat OFF and immediately reduces power to the noise abatement setting. The pilot flying should decrease the pitch attitude to approximately 12° and then adjust the aircraft about that attitude to maintain 250 knots. 12° pitch attitude is a useful approximate target, a higher figure is not normally required but at low take-off weights a lower figure will be. The reheat must not be selected OFF and the power must not be reduced if the speed is lower than 240 knots.

Speed - During the noise abatement procedure the speed of 250 knots should be maintained. If a lower speed is inadvertently achieved, the attitude should be cross checked and adjusted as necessary to achieve 250 knots. If the rate of climb is significantly less than 700 feet per minute sufficient power should then be applied to re-establish the required climb and to slowly regain speed.

A one-per-cent (1%) increase in N_2 will counteract a shortfall of about 200 feet per minute.

If the speed is allowed to fall below 240 knots after reheat off selection and power reduction, the desired noise abatement gradient will not be achieved. In this case the attempt to carry out a noise abatement procedure should be discontinued and a gross power increase made.

If the speed is allowed to increase to above 250 knots, it should be brought back to 250 knots.

LIGHT TAKE-OFF WEIGHTS

Initial Climb - After rotation the aircraft is accelerated by keeping it at the pitch attitude θ_2 set before take-off. At 240 knots approximately, pitch attitude should be increased to ensure that the noise abatement speed of 250 knots is not exceeded. At light weight with take-off power and reheat, a pitch attitude of up to 27° would be required to maintain V_N but in practice it is unlikely that a pitch attitude greater than 22° will be reached before a decrease in pitch attitude is required at noise abatement time.

Power reduction - At noise abatement time the Flight Engineer selects reheat OFF and immediately reduces power to the noise abatement setting. The pilot flying should decrease the pitch attitude to approximately 10° and then adjust the aircraft about that attitude to maintain 250 knots. 10° pitch attitude is a useful approximate target, a higher figure, up to 12°, may be required.

UNREHEATED TAKE-OFF

Initial Climb - After rotation the aircraft is accelerated by keeping it at the pitch attitude θ_2 set before take-off. At 215 knots or soon after, pitch attitude should be increased to ensure that the noise abatement speed of 225 knots is not exceeded. 18° pitch attitude is a useful approximate target but this will rarely be the exact attitude required, it may be greater or less. Having increased pitch attitude, adjustments in attitude should be made as necessary to maintain 225 knots.

Power reduction - At noise abatement time the Flight Engineer immediately reduces power to the noise abatement setting. The pilot flying should decrease the pitch attitude to approximately 12° and then adjust the aircraft about that attitude to maintain 225 knots. 12° pitch attitude is a useful approximate target, a higher figure is not normally required but at low take-off weights a lower figure will be.

POWER RESTORATION

At the end of the noise abatement procedure the Flight Engineer selects FLIGHT and on command advances the throttle levers fully to give climb power. Alternatively, over noise sensitive areas, the power may be increased using the following schedule of N_2 against altitude; 93% at 3000 ft, 95% at 4000 ft, 97% at 5000 ft, 99% at 6000 ft, 101% at 7000 ft, and full CLIMB power at 8000 ft.

The pilot flying should decrease the attitude (to about 10° initially) to accelerate to the TMA climbing speed.

Nose and Visor - Below 250 knots the visor must be down with the nose at 5° (forward visibility consideration). Nose and visor operation must not be made below 500 feet above the terrain. When the nose and/or visor are moved, the aircraft's flight path should be maintained by either the autopilot or by instrument reference, in order to guard against any tendency to disorientation.

Acceleration to V_{MO} - This can be done either whilst climbing or in level flight. In level flight it is necessary to anticipate arrival at V_{MO} by 15 knots. Attitude should be increased to about 10° (if the intention is to climb), or power should be reduced (if the intention is to maintain level flight) because speed increases rapidly. If the climb is continued the aircraft must be stabilised at V_{MO} (either manually or by using the datum adjust) before MAX CLIMB mode of the autopilot is engaged.

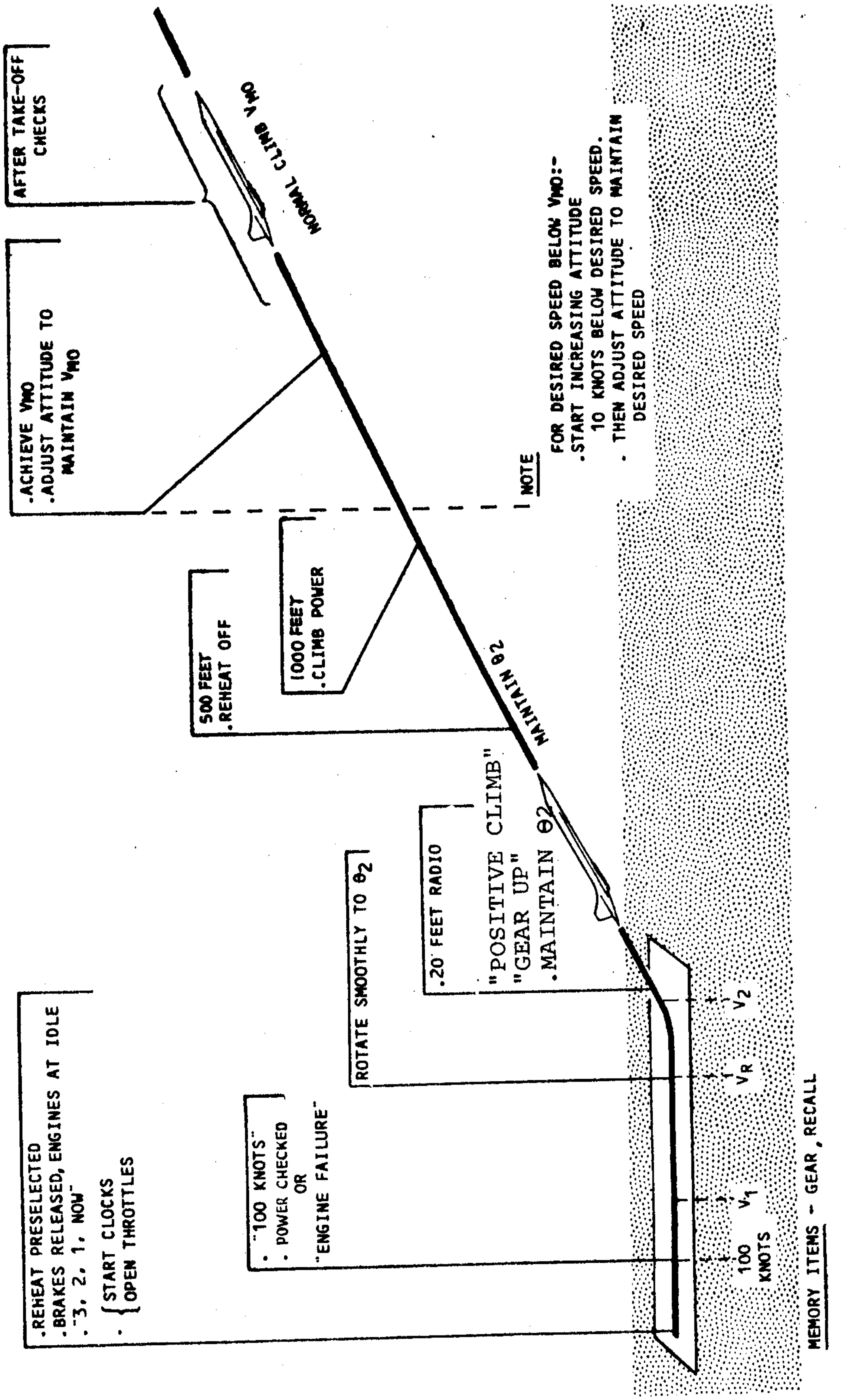
V_{MO} and Fuel Penalties - The best climb speed for fuel economy is V_{MO}. As speed reduces below V_{MO} the fuel penalty becomes increasingly severe. It is important to accelerate to V_{MO} and climb to cruise altitude as soon as possible consistent with ATC restrictions.

Bank Angles - Bank angles in excess of 30° should be avoided as they cause fuel and performance penalties.

When making large sustained turns after take-off the rate of climb should be closely monitored as such turns will cause a reduction of the climb gradient and can easily result in zero or even negative rates of climb. This is particularly true when the turn is associated with the reduction in pitch attitude necessary to accelerate to 300 Kt or V_{MO}.

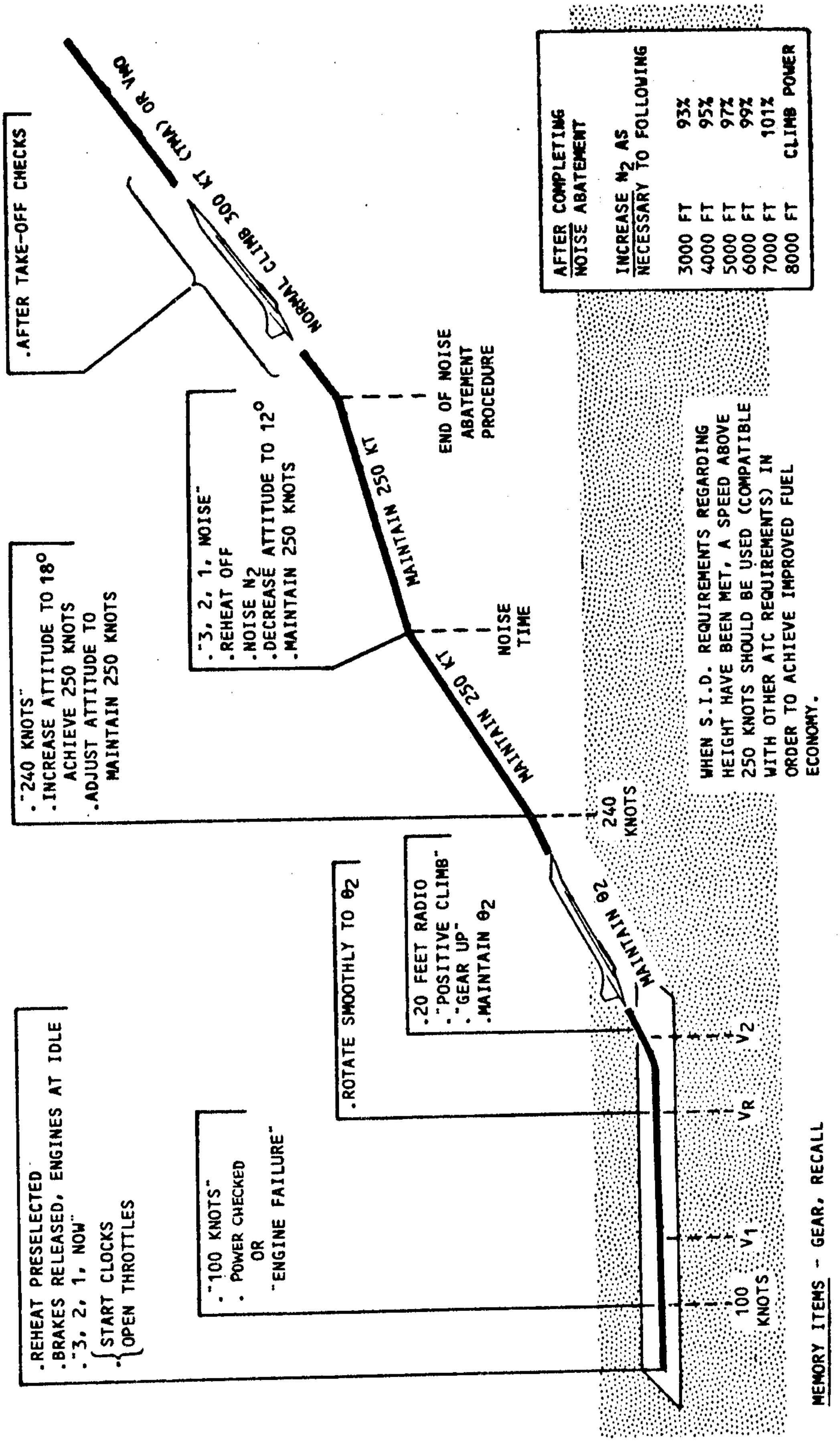
Buffet at Low Speeds - Above an angle of attack of about 7° the wing tip vortices generate a slight buffet similar to that on a subsonic aircraft with high-lift devices extended. This buffet is more noticeable when the nose and visor are up.

TAKE OFF AND INITIAL CLIMB
NORMAL TAKE-OFF



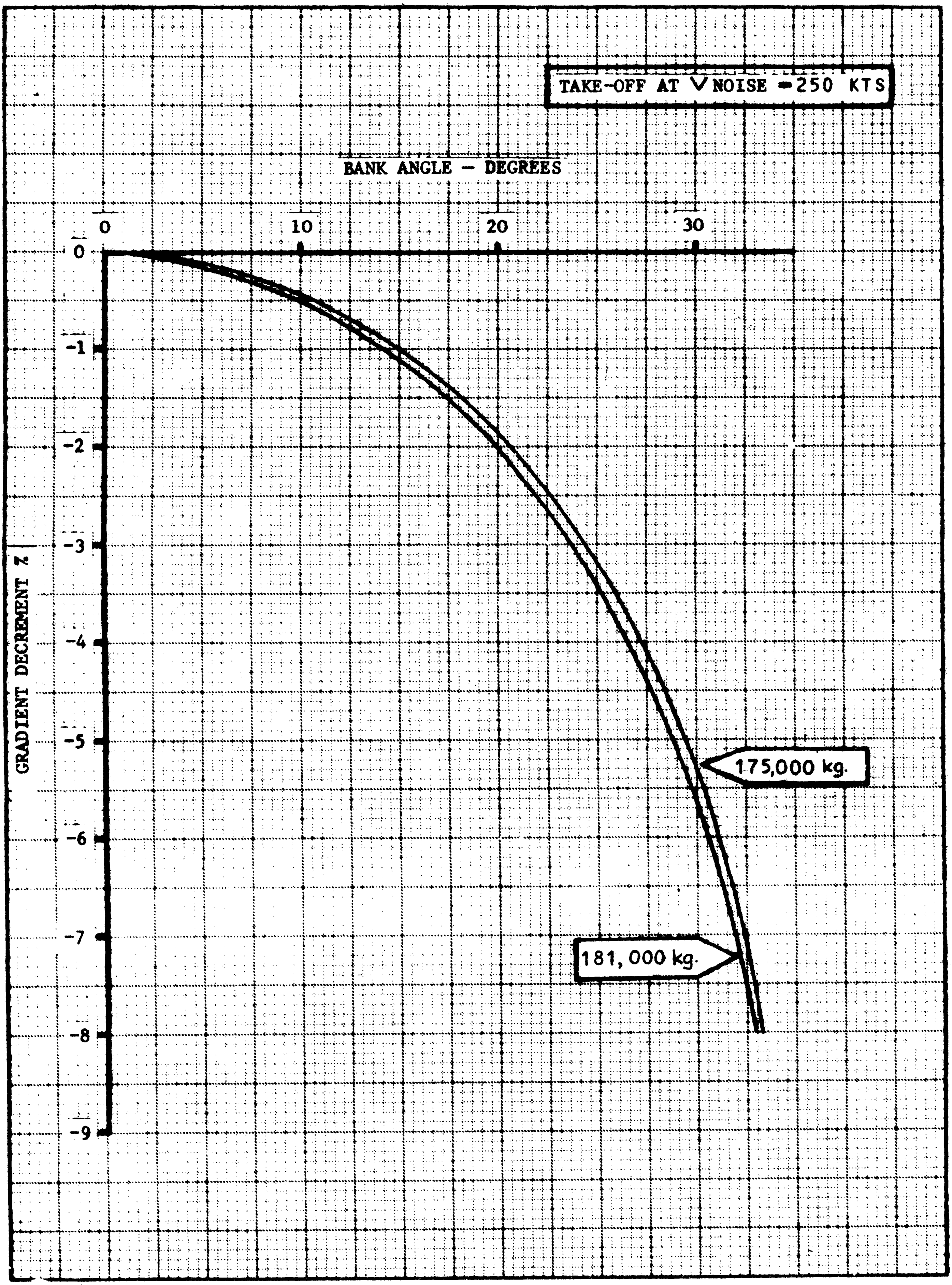
NORMAL TAKE-OFF

TAKE-OFF AND INITIAL CLIMB
NOISE ABATEMENT TAKE-OFF



NOISE ABATEMENT TAKE-OFF

TAKE-OFF AND INITIAL CLIMB
EFFECT OF BANK ON PERFORMANCE



PROCEDURES AND TECHNIQUES

SUBSONIC CLIMB

Procedure - The recommended procedure is to climb at V_{MO} if the climb is to be continued to supersonic speeds or to climb at V_{MO} and then 0.93 if the climb is to a subsonic flight level.
Rearward trim transfer should begin at Mach 0.70.

Climb to Subsonic Cruise - Rearward trim transfer should be stopped at 55% Co for subsonic cruise or if the acceleration is interrupted below Mach 1.00.

SUBSONIC CRUISE

Speed - The subsonic cruise is carried out at Mach 0.95.

Flight Level - The optimum flight level for subsonic cruise varies considerably with the aircraft weight. (At heavy weights, as for example following a maximum weight take-off, the optimum subsonic flight level for specific range is initially FL.250). Any increase in subsonic cruise flight level above the optimum will have an adverse effect on specific range.

As height is increased above the optimum, the I.A.S. at Mach 0.95 can fall progressively below the minimum drag speed for the weight. Drag can thus become more penalising until height cannot be maintained at subsonic speeds.

Maximum Level - At maximum landing weight the optimum level is about FL.370.

Regardless of weight it can be seen from the Flight Envelope that above 41,000 feet the IAS equivalent to Mach 0.95 is prohibited by V_{LA} (Lowest Authorised Speed).

Caution - At heavy weight a large power increase may be required to regain speed following inadvertent deceleration to speeds below about 300 knots. If climb power is insufficient, reheat should be used and if necessary the aircraft should be descended to increase the speed to the lesser of V_{MO} or M = 0.95. The desired level should then be regained by climbing at V_{MO}.

Subsonic Cruise Power - Engine control schedule should be selected to 'flyover' above Mach 0.8 for optimum performance.

CG - The recommended procedure is to fly with a CG position of 55% Co which may give an elevon deflection of 2 to 2.5° down. This deflection is acceptable because the CG position is considered more important than the elevon deflection.

TRANSONIC ACCELERATION AND SUPERSONIC CLIMB

Procedure - The recommended procedure is to climb at V_{MO}/M_{MO} until Mach 2.00 (or T_{MO} 127°C) is reached. This is also the best procedure for optimum specific range. From Mach 0.93 (at approximately FL.250) to Mach 1.70 (at approximately FL.440), reheat is used.

When further climb is determined only by the decrease in weight due to fuel consumption, the supersonic climb becomes a cruise/climb.

Speed - The correct speed for transonic acceleration and climb is V_{MO}. If at any time, the speed is allowed to drop below V_{MO}, it is desirable to regain V_{MO} as soon as possible. The recommended procedure in this case, is to maintain level flight until V_{MO} is regained, and then to resume the climb at V_{MO}.

Precise Pitch Attitude - The transonic acceleration and supersonic phase require precise flying in pitch. The pitch changes at V_{MO} in the transonic region are of the order of 1° but as Mach 2.00 is approached, the changes are much smaller, of the order of a few tenths of a degree (a change of half a degree at Mach 2.00 can cause a vertical speed change of 1000 feet per minute).

Normally the auto pilot is used and it makes these changes smoothly and accurately but for flight without the use of auto pilot, Max climb mode of the flight director is recommended for guidance. If the auto pilot and the flight director are not available, the white pitch index on the A.D.I. should be set to the mean pitch attitude required, and small corrections made about it.

Trim and V_{MO} - The major part of the trim change which occurs during the climb and acceleration is counteracted by Mach trim and by fuel transfer. In manual flight, precise pitch attitude changes to maintain V_{MO} are made easily, but, particularly between Mach 0.93 and Mach 1.30, continued and careful use of trim is required.

Speed and V_{MO} - As altitude increases from about FL.320 to FL.440, V_{MO} also increases from 400 knots to 530 knots. A slight decrease in attitude is therefore necessary to increase speed as the V_{MO} increases.

V_{MO} Pointer - In the higher Mach number range, the V_{MO} pointer indicates the limiting I.A.S. determined by V_{MO}, M_{MO} or T_{MO}.

M_{MO} Pointer - In the higher Mach number range, the M_{MO} pointer indicates the limiting Mach number determined by V_{MO}, M_{MO} or T_{MO}.

Reheat OFF - At Mach 1.70 or after 15 minutes, reheats must be selected off, and the climb continued with climb power.

Roll Balance - Due to the position of the various pairs of wing tanks, equal quantities of fuel in any pair do not necessarily imply roll balance, and any unbalance in roll produces a differential deflection of the elevons which causes an increase in drag. An unbalanced condition can be seen on the Flight Control Position Indicators. To correct an unbalanced condition, transfer fuel from the down-elevon side to the up-elevon side.

(Unchang

Climb Interruption - The aircraft is at its least efficient between Mach 0.97 and Mach 1.40.

If clearance to climb unrestricted to FL.440 or above cannot be obtained, it is advisable to maintain the optimum subsonic level at Mach 0.95 until clearance is received. The optimum level depends on aircraft weight (see SUBSONIC CRUISE).

Acceleration from Subsonic Cruise - Ideally the acceleration and climb is a continuation of the V_{MO} climb without interruption until Mach 2.00 is reached. However if there has been an interval of flight at Mach 0.95 the recommended procedure is:-

(1) Increase pitch attitude in order to anticipate the rapid speed rise.

(2) Apply climb power.

(3) Switch reheats on in symmetrical pairs simultaneously adjusting pitch to attain and hold V_{MO}.

(4) Fuel transfer, having been stopped at 55% Co for subsonic cruise, is resumed at Mach 0.95 when the acceleration is begun.

Sonic Boom - Over areas where supersonic flight is permitted it is undesirable to increase the boom by the increased "focusing" which occurs when bank is applied. At low supersonic speeds, even very small bank angles produce this effect therefore for environmental consideration, supersonic turns below Mach 1.30 are undesirable.

The bank angle at which boom focusing begins can be determined by subtracting 1.00 from the supersonic Mach number and multiplying the result by 15.

(Supersonic Mach number minus 1.00) x 15.

Cruise/Climb - Supersonic climb performance varies the height at which the cruise climb begins.

The cold upper air temperatures found in low latitudes increase climb performance considerably so that cruise may begin above FL 55.0. Conversely the warm upper air temperatures in high latitudes decrease climb performance so that cruise/climb may begin below FL 550. In warm temperatures in flight is limited to T_{MO}.
The detailed procedures for operating at the cruise climb flight levels are given under. AUTO PILOT.
The warm upper air temperatures in high latitudes decrease climb performance so that cruise/climb may begin below FL.550. In warm temperatures, flight is limited by T_{MO}.

(Deletion)

NOTES: 1. Boom and boom focusing must be fully understood and great care taken to ensure that a protected area is not boomed.

2. The pilot should appreciate the limitations placed on acceptable levels on climb and descent due to sonic boom and aircraft performance.

3. It is essential that the pilot monitors the CG/Mach relationship and liases closely with the Flight Engineer to effect the required fuel transfer.

Continued..

<u>Cruise/climb</u> - Continued

NOTES: 4. The crew should frequently cross check the Mach number and centre of gravity. All of the crew need to be thoroughly familiar with the Flight Envelope and CG corridor.

SUPERSONIC CRUISE

General - In order to achieve optimum performance, a cruise climb technique at full throttle, constant Mach No. and at the aircraft ceiling should be applied whenever possible. Cruise mach no. is much affected by wind and temperature and at high altitudes, particularly in the vicinity of the tropopause there are generally rapid and significant changes in wind and temperature. For example, changes of 5°C in 3 nm horizontally or 500 ft vertically are frequently seen in lower latitudes and this will cause a change in Mach No. of + 0.025 for a drop in temperature and -0.025 for an increase. A relatively small wind shear of 15 knots will have the same effect.

This means that supersonic cruise characteristics can be affected by the height of the tropopause and the conditions surrounding it. In polar conditions, where at high altitude the ambient temperature is usually above I.S.A., the tropopause can be as low as 20,000 ft, and in tropical conditions it can be as high as 60,000 ft with very low ambient temperatures. It is also common to find significant inversions between 50,000 ft and 60,000 ft in lower latitudes and turbulence can be associated with wind and temperature changes. In all these conditions the ambient temperature has a considerable effect on the aircraft ceiling at a given weight.

Use of the AFCS in Climb and Cruise - In order to cope with the conditions described above, procedures for the use of the AFCS have been developed in order to minimise crew workload, and they are described in the AFCS section. It is important to appreciate that changing atmospheric conditions will cause fluctuations in Mach No. above and below the nominal optimum cruise Mach No. of M = 2.00, particularly in cold conditions. Fluctuations between M = 1.96 and M = 2.03 should be tolerated and pilot intervention should be avoided. The effect of these Mach number fluctuations on fuel consumption is negligible.

Turns - The increase in angle of attack in a turn gives an increase in induced drag which will cause a speed reduction if altitude and thrust remain constant. Heading changes of 10° carried out with bank angles of 20° to 25° do not cause notable speed reductions. However, as soon as bank exceeds 20° and the change of heading exceeds 10° it becomes necessary to descend in order to maintain the speed. After the turn is completed the cruise climb is resumed at V_{MO}/M_{MO}.

At Mach 2.0 a 30° bank turn has a radius of 36 nautical miles.

At Mach 2.0 a 20° bank turn has a radius of 56 nautical miles.

CG - In supersonic cruise, minimum drag and best specific range are achieved with half a degree of down deflection of the elevons. It is therefore recommended that the CG is controlled within limits by suitable fuel usage and/or trim transfer so as to maintain a deflection on the Flight Control Position Indicators of between zero and 1° down elevon.

Collector Tanks - Providing that tank pressure is satisfactory, the minimum permissible contents in the collector tanks for continuing supersonic cruise is as follows:-

1000 kg for tanks 1 and 4

1000 kg for tanks 2 and 3

When these minima can no longer be maintained by further transfer

Collector Tanks - Continued

from tank 11 because the forward CG limit has been reached, supersonic cruise should be discontinued.

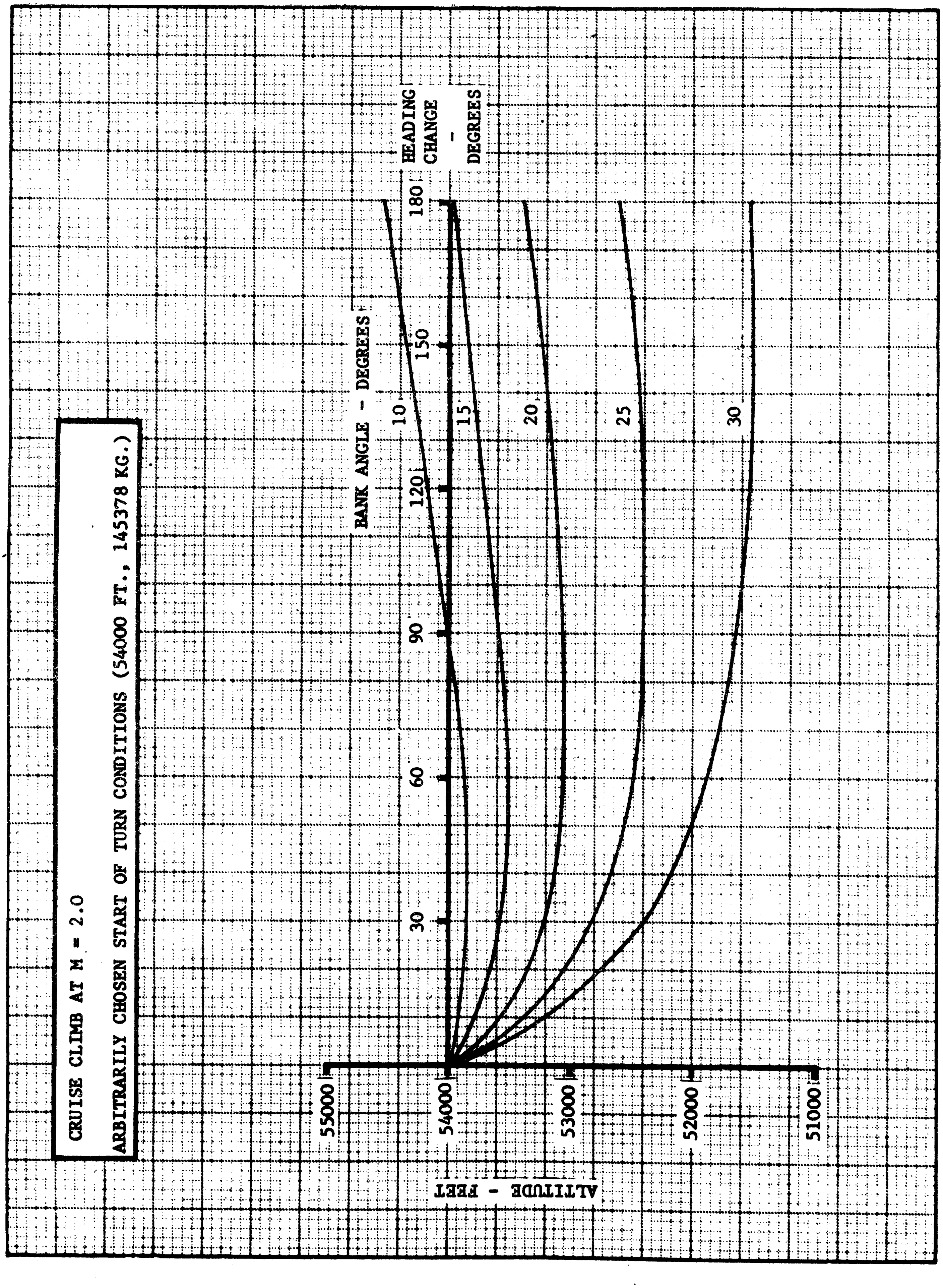
Navigation - It is essential that agreed supersonic corridors are adhered to other than in emergency.

Cruise Procedures - Are described in the AFCS section as follows:-

Cruise Climb
Stepped cruise climb
Level cruise
Cruise at or below 47000 ft.

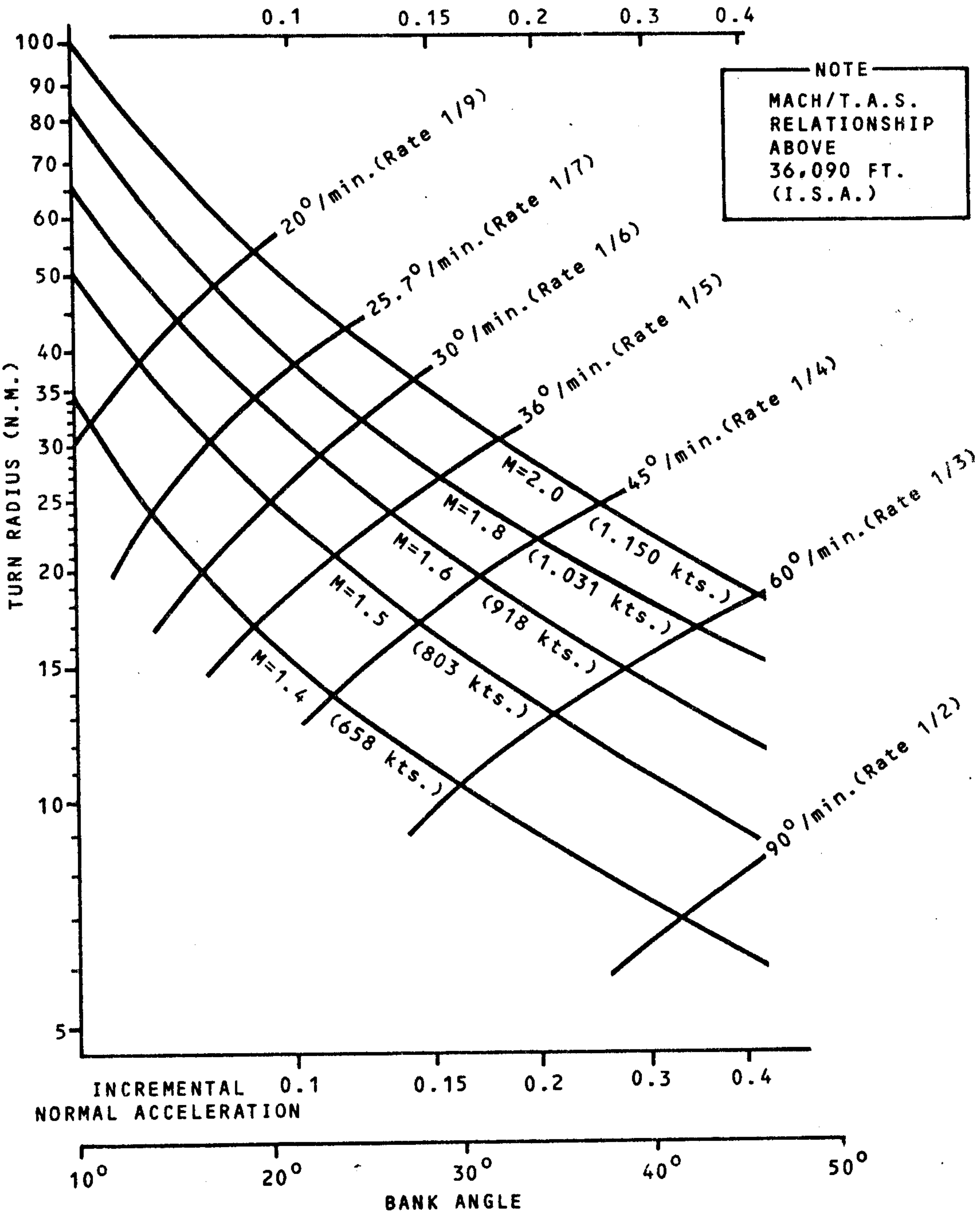
(Unchanged)

SUPERSONIC CRUISE
EFFECT OF BANK ON PERFORMANCE



SUPERSONIC CRUISE

TURNING RADIUS AT SUPERSONIC SPEEDS



DECELERATION AND INITIAL DESCENT

Descent Speeds - The recommended procedure uses a descent speed of 350 knots and flight planning is normally based on this speed. However 325 kts or any speed up to V_{MO} may be used provided that there are no overriding considerations.

At the higher speeds, however, there is a more marked nose down trim change in the transonic region. It is advisable therefore to keep the aircraft trimmed in order to avoid overspeeding.

Power - Deceleration is initiated by bringing all four throttle levers back to 18° Throttle Lever Angle (T.L.A) if the static temperature is warmer than ISA - 10°C, or 24° T.L.A, if the static temperature is colder than ISA -10°C.

When the speed reaches Mach 1.60 the throttle levers are brought back to 34° T.L.A.

When the speed reaches Mach 1.00 the throttle levers may be brought back to idle.

Deceleration/Descent - The recommended procedure is to maintain the cruise altitude until 350 knots is approached. The attitude is then adjusted to maintain the speed. If flying manually the power reduction will cause a pitch down tendency which must be corrected by pitch control. If the auto pilot is in use, ALT HOLD mode should be engaged to maintain the cruise altitude until 350 knots, then engage IAS HOLD.

Interrupted Descent - Above FL.410 any interruption of the descent will adversely affect the aircraft's performance, and the fuel situation, and will also extend the boom area.

If the descent is interrupted at or below FL.410 the level segment is flown at Mach 0.95. Below FL.330 an increase in speed may be required to maintain Mach 0.95.

Fuel Transfer - The forward fuel transfer is initiated according to schedule. If the descent is interrupted, forward fuel transfer is stopped.

Attitude Changes - Significant attitude changes are required in the transonic region in order to maintain the required descent speed. As Mach 1.00 is approached, a reduction in attitude is required and at about Mach 0.95 an increase is required.

The auto pilot in IAS HOLD mode controls these changes smoothly and accurately. When flying manually it is recommended to use the Flight Director.

Turns when Handflying - If handflying in the region between Mach 1.30 and Mach 0.97, smooth accurate flying becomes more demanding because of the trim changes in pitch. Turns should therefore be avoided if possible. If a turn is necessary, bank angle should be limited as far as possible to 15°.

Sonic Boom - see TRANSONIC ACCELERATION AND CLIMB

Delays - Delays in deceleration must be avoided when the descent is being made towards a sonic boom protected area, since the subsequent erosion of the protection distance will be extremely difficult to recover.

INTERMEDIATE DESCENT (SUBSONIC)

In-Flight Reverse - To obtain reverse idle, Flight Reverse must first be armed and then selected on either or both inner engine(s).

When reverse is selected, a slight pitch up moment is induced and the rate of descent for a given speed is approximately doubled.

Autothrottle - Reaching and maintaining a level after descent requires that the correct power for the desired speed should be applied at the appropriate time to prevent an unwanted loss of speed or altitude.

It is strongly recommended that below 10,000 feet, autothrottle is engaged and flight levels are pre-selected on Altitude Acquire. If autothrottle is not available special care must be taken.

Airspeeds - Recommended airspeeds are as follows:-

HOLDING PATTERNS

High level	280 knots
Medium and Low level	250 knots

TERMINAL AREAS

Where speed restrictions apply	250 knots

Approach - It is essential to strike a reasonable balance between fuel conservation, and the need to have the calm unhurried type of approach which is necessary for a safe and properly monitored operation. The following table gives the recommended, and maximum speeds for various distances to touchdown.

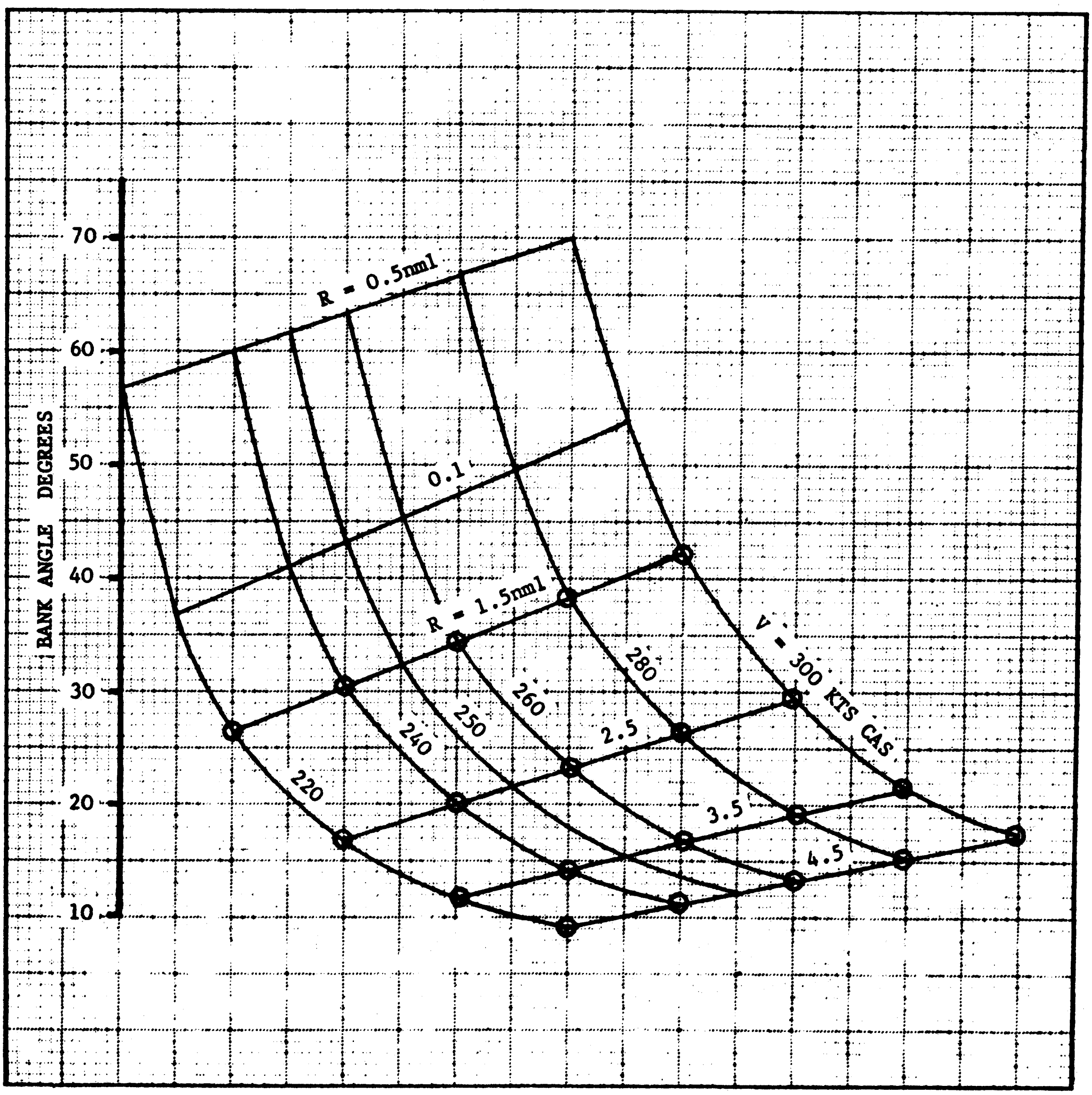
DISTANCE TO TOUCHDOWN	RECOMMENDED SPEED	MAXIMUM SPEED
15 - 20 miles	250 kts	300 kts
12 - 14 miles	210 kts	250 kts
8 - 11 miles	VREF + 30 kts (minimum 190 kt)	210 kts
5 - 7 miles	V REF + 15 kts	VREF + 30
0 - 4 miles	V_{REF}	V_{REF} MAX

Visual traffic pattern V_{REF} + 50

NOTE: Speeds up to 250 knots may be used in a visual traffic pattern in order to reduce noise and fuel consumption.

ILS beam interception V_{REF} + 30 (minimum 190 knots)

BANK ANGLE FOR TURN RADIUS AND SPEED
LOW ALTITUDE



(Unchanged)

APPROACH AND LANDING

<u>Briefing</u> - Crew briefing should, in so far as is practicable, be completed with the Deceleration and Descent Check, at which time all information relating to the holding, approach, landing or go-around and diversion should be reviewed. As with the Abandoned Take-Off drill, it is considered good practice to review each day the Missed Approach drill.

<u>Nose and Visor</u> - Below 250 knots the visor must be down with the nose at 5^{o} or "down" (cockpit visibility consideration).

Nose and visor operation must not be made below 500 feet above the terrain. When the nose and/or visor are moved, the aircraft's flight path should be maintained by either the auto pilot or by instrument reference, in order to guard against any tendency to disorientation.

Nose and visor selections are made within the limitations but when cockpit noise is the only other consideration, it is recommended to lower the visor and nose to 5^{o} when the speed is below 270 knots, and to lower the nose from 5^{o} to DOWN below 220 knots.

<u>Angles of Attack</u> - For a given airspeed, the angle of attack approximates closely to the pitch attitude required for level flight. Angles of attack as shown on the incidence meter can thus be used as a guide to attitude required. At typical landing weights, the angles of attack for given airspeeds are as follows:-

250 knots = 6^{o} to 7^{o}

200 knots = 9^{o} to 10^{o}

V_{REF} = 13^{o} to 14^{o}

For turns with up to 30^{o} bank at constant altitude, such figures can still give useful guidance.

For descent on a 3^{o} glide slope the angle of attack remains the same for the same speed, but the attitude is 3^{o} less.

(angle of attack plus flight path angle = attitude).

Above an angle of attack of about 7^{o} the wingtip vortices generate a slight buffet similar to that on a subsonic aircraft with high lift devices extended.

<u>Pitch Attitude</u> - On final approach when speed is established pitch attitude is normally about 11^{o} on a 3^{o} glide slope (incidence 14^{o}). It will be found useful to set the white pitch index bar to this position.

<u>Speed</u> - The V_{REF} appropriate to the landing weight, the target speed, and the maximum-threshold-speed should be indexed on both pilots A.S.Is.

Speed changes on approach require considerable attitude changes. On approaches other than Reduced Noise Approaches aim at a stabilised approach speed by 700 ft.

<u>Wind</u> - Full use should be made of INS on final approach to assess wind shear.
Assess any displacement from runway centre line on approach. Corrections should take into account present drift and forecast drift at the threshold. Avoid being upwind when crossing the

Wind - Continued

threshold, as this increases the difficulty of lining up with the runway centre line without excessive crabbing at touchdown. Take care not to land on the downwind side of the runway.

Approach and Landing in Wind Shear Conditions - Concorde's autothrottle is much more sensitive to, and capable of dealing with, wind shear conditions than the human pilot. Careful monitoring of autothrottle controlled throttle lever movement and its consequent control of airspeed is an excellent way of detecting wind shear conditions. Combining the autothrottle capability of dealing with wind shear conditions with the autoland capability of the aircraft leads to the following recommendations for approach and landing in wind shear conditions:-

WITH AUTOTHROTTLE

(1) Use full Autoland procedure having checked that all the pre-requisites for an autoland have been fulfilled.

(2) If for any reason an autoland is not possible then a manual approach with autothrottle is recommended, rather than a coupled approach which, with autopilot disconnect at ILSC minima, could coincide with the altitude of worst shear, thereby causing the pilot an undesirable handling problem on transition from coupled to manual flying.

(3) (a) If, during the approach while above 300 ft. R.A. speed falls below target speed minus 10 kts. (V_{TT} - 10 kts) the pilot should be alert to severe wind shear conditions, and consideration given to discontinuing the approach.

(b) If, during the approach, and below 300 ft. R.A. the speed falls below V_{TT} - 10 kts., an immediate Go-Around should be initiated.

WITHOUT AUTHROTTLE

(1) In severe predicted wind shear conditions consideration should be given to diverting to another airfield.

(2) If a decreasing headwind component is expected ADD ½ EXPECTED Shear to V_{TT} up to V_T Max.

(3) If, during the approach, above 300 ft. R.A. the speed falls below V_{TT} - 10 kts. the pilot should be alert to severe wind shear conditions, and consideration given to discontinuing the approach.

(4) If, during the approach, below 300 ft. R.A. the speed falls below V_{TT} - 10 kts. an immediate Go-Around should be initiated.

Approaches, and Take-offs, through line squalls or well developed CBs should be avoided.

Autothrottles - Both autothrottles should be engaged if available for all 4-engine and 3-engine approaches whether visual or instrument, manual or autopilot. The pilot flying the aircraft will keep one hand on the throttles throughout the final approach in order to detect and rectify any autothrottle failure or unscheduled movement. Except during Autoland, autothrottles should be disengaged at 40 feet and the power at disengagement maintained until reaching 15 feet.

(Unchanged)

Autothrottles - Continued

Using Autothrottle, all that is required is to get into the slot using elevons (autothrottle takes care of speed), then establish the datum pitch (usually 11° but is in fact equal to incidence minus glide slope angle). Corrections are made about the datum, returning to it when re-established. Monitor rate of descent during approach.

Autothrottles Inoperative - Should both Autothrottles be unserviceable the V_{REF} is increased by 7 knots to provide a margin. It is important to remember that, unlike previous aircraft, Concorde is flying on the backside of the drag curve and is speed unstable (see diagram). The technique is to have in mind a datum power; about which small corrections can be made if speed deviates, make a positive power correction and return to the datum (or adjusted datum), when the speed is re-established. It is a considerable aid if the Flight Engineer calls the N_2 powers at frequent intervals.

Power Reduction at 15 Feet - Smoothly decrease the power to idle at 15 feet.

The lift due to thrust in the approach attitude is significant therefore the power reduction is important in effecting the flare. Pulling the power right off above 15 feet can induce an undesirably high rate of descent.

As with other aircraft it is important that excessive rates of descent do not occur near the ground. If the rate of descent is higher than normal, this must be reduced prior to throttle closure.

Height Calls - In addition to the pilot calls of "100 feet to go" (to decision heights) and "Decision Height", the procedure is for the Flight Engineer to call "radio altimeter active", then radio altitudes of 1000 ft, "800ft," "500ft" "400ft," "300ft", "200ft", "100ft", "50", "40", "30", "20", and "15".

Pitch Attitude in the Flare - Below about 100 feet no attempt is made to follow the glide-slope but the mean attitude and rate of descent at 100 feet on the glide-slope is maintained until commencing the flare.

Normally at 20 feet carry out a slight check, followed by a gentle flare at 15 feet as the throttles are closed. From that point it is necessary to apply increasing back pressure on the stick to maintain the aircraft attitude prior to touchdown. Both ground effect and throttle closure cause a marked nose down tendency.

Visual cut off is considerable on Concorde making it essential to look at the far end of the runway during the flare. This is particularly important at night when there is a tendency for the pilot to look at the area illuminated by the landing lights.

Ground Effect - Ground effect is very noticeable on Concorde. The pilot feels it as a significant nose-down tendency. If he corrects this to maintain the established pitch attitude, he is in effect commencing a flare on the control column without significantly altering the aircraft's pitch attitude. The flare is then continued to reduce the rate of descent to normal touch-down rates. The attitude change here is very small, of the order of about 1°.

Ground Clearance - In the normal attitude for touchdown the ground clearance is fairly limited. With wings level at touchdown, a pitch attitude of 12.5° or more may cause tail wheel contact depending on rate of descent. If the wings are not level ground clearance becomes increasingly limited (see diagram 08.16.07).

Therefore during the flare, if the pitch attitude exceeds 12.5°, the Co-pilot should call ATTITUDE and the Captain should derotate the aircraft to 12.5° and maintain until touchdown.

If this action is likely to cause a deep landing, then Go Around action should be initiated.

Auto-Land - Autothrottle automatically retards the throttles during the flare. When the mainwheels touch, the auto pilot and auto-throttle should be disengaged and the nosewheel smoothly lowered onto the ground.

If a go-around is made after auto pilot has been disconnected, pitch trim in the nose down sense will be required.

Autothrottle does not however, close the throttles to idle, therefore it is necessary to close the throttles in order to select reverse.

Selecting Reverse - As soon as the mainwheels touch down, reverse IDLE should be selected and the nosewheel smoothly lowered onto the ground. When the nosewheel has touched, reverse power should be selected as desired. The control column should be kept forward to counteract the nose-up tendency which increases as reverse power is increased.

The pilot should move the control column forward initially but the First Officer should then confirm this by holding it forward during the application of reverse.

If,when using reverse power on landing, the nose rises, reverse power must be immediately cancelled until the nosewheel is returned to the runway. Do not try to regain forward thrust as the movement of the buckets may result in the bucket hitting the ground.

Use of Reverse - Normal reverse should be selected on all four engines.

At 100 knots IAS reverse idle is selected on both outer engines.

At 75 knots IAS reverse idle is selected on both inner engines.

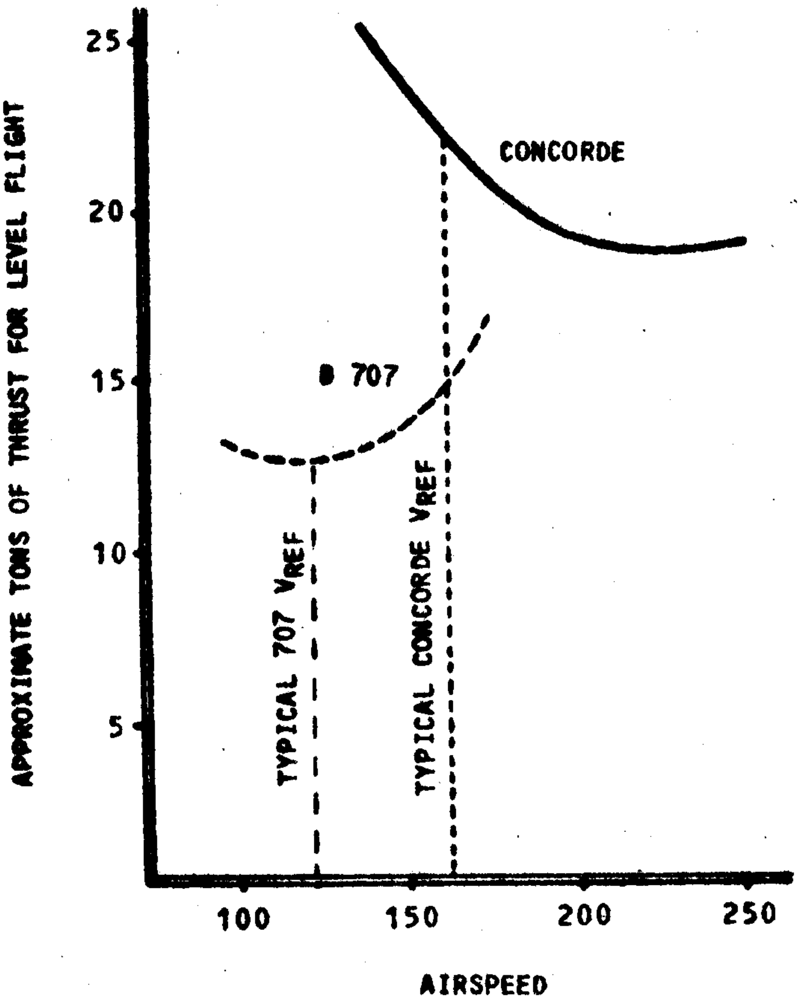
Reverse idle is permitted on all engines down to 40 knots. As this speed is not shown on the ASI, judgement is required. INS ground speed may be used as a guide to determine 40 knots.

Landing On Slippery Runway - Normal "All weather approach" speeds will be used. Maximum reverse thrust must be used on all engines.
At 100 kts, select outboard engines to reverse idle.
At 75 kts, select inboard engines to reverse idle.
Hold reverse idle to stop.

Brakes - For maximum braking, the footbrakes are applied fully as soon as the nose wheel touches down.

APPROACH AND LANDING

COMPARATIVE THRUST IN LANDING CONFIGURATION



NOTE: 1. Slope of Concorde curve is the reverse of the B 707, exhibiting a large increase in thrust with decreasing airspeed causing speed instability.

2. Flattening of Concorde curve around V_{REF} + 50

(Unchanged)

Use of Brakes in EMERG - If normal braking is not available or the anti-skid system is not available, standby braking is obtained by moving the brakes control lever to EMERG. The brake pedals must be fully released before the lever is moved from NORM to EMERG because, with the aircraft in motion on the ground and the brakes depressed, a system change-over may cause an over-torque condition at the brakes.

Anti-skid is not available. Use the brakes with care, applying pressure gently and monitoring the pressure with reference to the BRAKES pressure gauge.

On a wet runway the following technique will avoid tyre bursts, even if the maximum brake pressure is momentarily exceeded, and provide the best stopping performance.

The brakes must be completely released every 5 seconds and the following maximum pressures must not be exceeded:-

450 psi at speeds above 75 knots and
900 psi at speeds below 75 knots.

On a dry runway continuous braking to a maximum of 1100 psi is permitted.

NOTE

If use of the emergency braking system follows the loss of the yellow hydraulic system, only fifteen brake applications are available from the brake accumulator.

Landing After Complete Brake Failure - Normal "All weather Approach" speeds will be used. Maximum reverse thrust must be used on all engines. At 85 kts select outboard engines to reverse idle. At 50 kts select inboard engines to reverse idle. Hold reverse idle to stop.

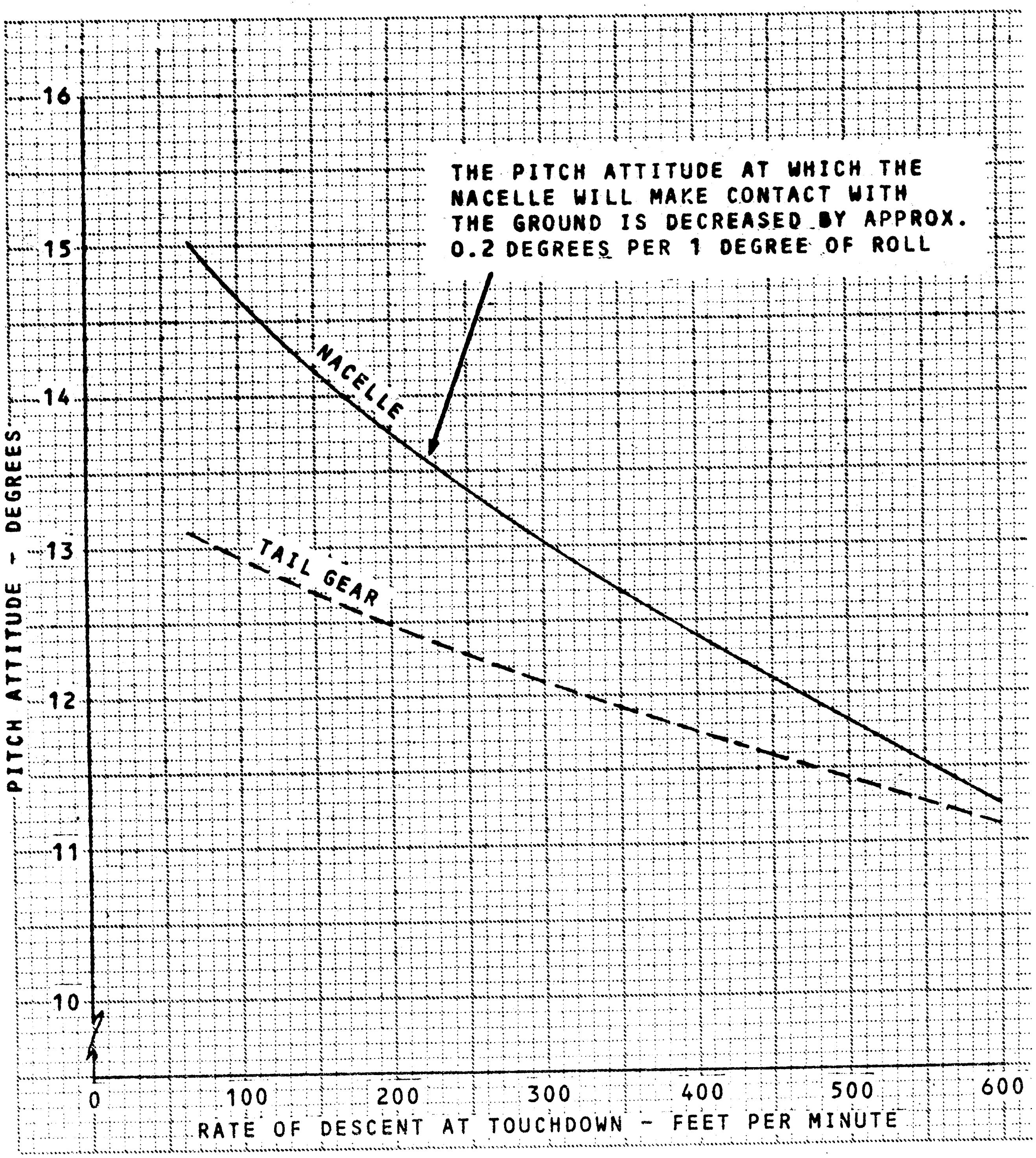
The approximate landing distance required at max landing weight sea level, still air is 10,500 feet.

Taxiing - Until familiar with the aircraft there will be a tendency to approach the runway turn-off or end of the paved surface travelling much too fast. Particular caution is required in wet or slippery conditions; refer to INS Ground Speed on the HSI. First Officers must call INS groundspeeds below 60 knots every 10 knots. Recommended maximum 90° turn off speed is 10 knots (DRY) 6 knots (WET). Exercise EXTREME caution in icing conditions when nosewheel steering may become completely ineffective on untreated taxi-ways at speeds above walking pace during turns.

Crosswind Landings - Cross wind conditions present no problems. The wings are kept level during flare and at 15 ft the crab angle smoothly removed with rudder.

GO-Around - The go-around is initiated by applying take-off power without reheat. The small rotation required is achieved with small elevon movement. When a positive climb is established, the gear is selected up and when the go-around attitude of approximately 15° is achieved speed is increased to V_{REF} + 50, and climb power used as necessary. Bank angle should be limited to 30°. Once a go-around has been initiated it should never be cancelled.

PITCH ATTITUDE FOR CONTACT OF TAIL GEAR AND NACELLE



The average rate of descent at touch-down during a Manual Landing is 150 ft/min. Autoland R.O.D. average is 120 ft/min.

Hand Flying using Autothrottle - Autothrottle is of considerably benefit when hand flying particularly at lower speeds, provided that attitude changes are kept small. It should be remembered however, that there is a "de-stabilising effect" which becomes more apparent with large attitude changes.

Without autothrottle, the aircraft has a normal tendency to return to its original speed following a disturbance or change in attitude.
With autothrottle, speed is maintained following a disturbance or change in attitude, but the power change which achieves this, produces a change in trim which tends to sustain the divergence. This effect increases the need to monitor attitude carefully in order to prevent divergence from the desired flight path. This need is particularly noticeable in the approach phase and is also noticeable in turns.

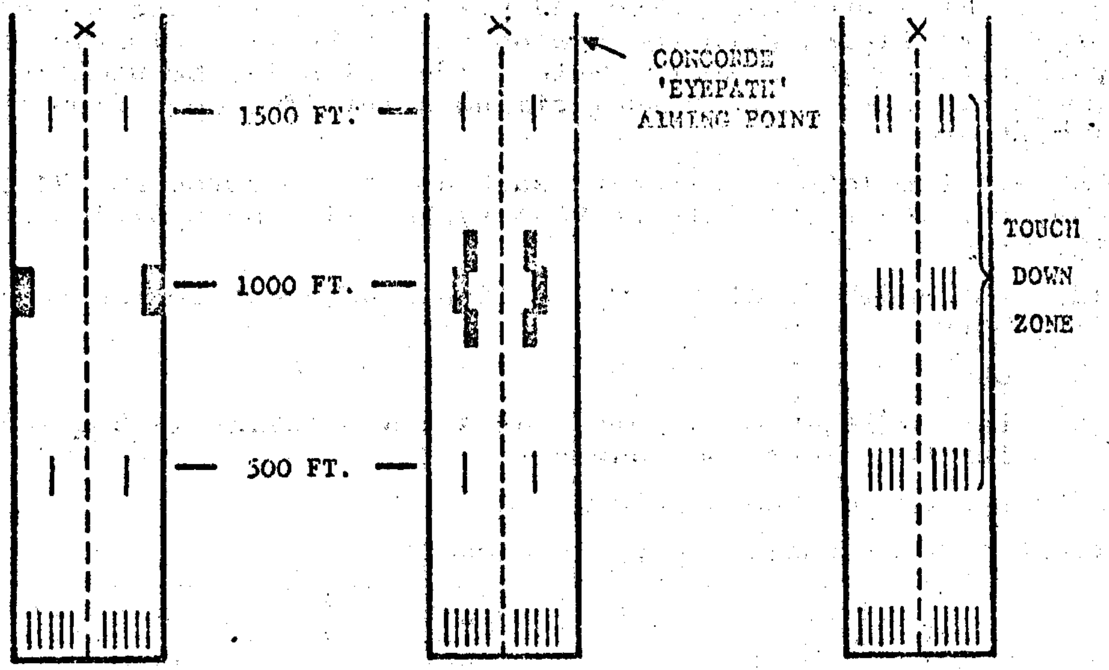
Visual Approach without Glide Slope Guidance - The vertical distance between the path followed by the pilot's eyes and that of the main landing gear is approximately 40 feet with the aircraft in the approach attitude on a 3° approach path.

Where an approach has to be made without any glide slope guidance, these eye/wheel characteristics should be borne in mind, and whatever means are available, DME, geographical features, INS etc, should be used to determine the distance from touch down in order to establish at least initially, a 3° slope to the touch down area. For a given height, the distance in nautical miles to commence a 3° glide path is found by dividing the height in hundreds of feet by 3 e.g. at 1500 feet, the descent should be commenced 5 nautical miles from touchdown.

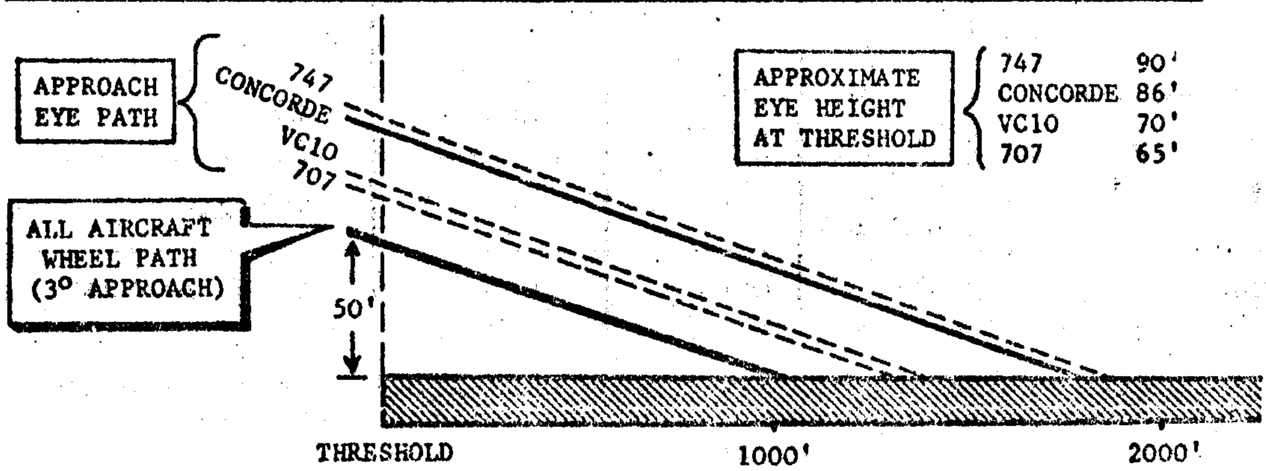
On an approach, the ground speed in knots multiplied by 5 gives the rate of descent in feet per minute approximately equivalent to a 3° glide path.

The sketch of typical touchdown zone markings is included as a reminder. Until pilots are familiar with the vastly increased pilot eye height at touchdown there will naturally be a tendency for the wheels to touch short of the desired area. On the correct Concorde glide slope, the pilot eye path will intercept the runway at a point about 1800 feet from the threshold. The approach eye path illustration shows approximate measurements only but is intended to highlight the problem and danger inherent in visual approach judgement on Concorde. As can be seen the situation is almost exactly analogous to the 747.

TYPICAL TOUCHDOWN ZONE MARKINGS



NOT TO SCALE



Visual Approach Slope Aids - Long Bodied VASIs and T type VASIs may be used in exactly the same way as that described in the Aerodrome Folders for 747, the pilot's eyepath on Concorde is virtually the same as that on the 747.

On Standard VASIs a RED/RED indication will put the aircraft short of the runway; a RED/WHITE $2\frac{1}{2}^{\circ}-3^{\circ}$ slope may also be too low at the threshold. The 747 practice (when using standard VASIs) of flying with the upwind VASI a WHITISH PINK (a little pink behind) is an approximate guide which may be used in conjunction with the visual aiming point 1800 feet from the threshold.

To assist pilots of aircraft such as the Concorde and 747, at many airfields the Calvert VASI system will be modified either by:

(a) the addition of two white lights adjacent to the upwind bars.

OR

(b) the addition of a third bar set approximately 500 feet further along the runway.

With system (a) the displays are:-

(left side of runway only - depicted)

	Additional Lights		Upwind	Angle from
	Outer	Inner	VASI	Lights
High	BRIGHT WHITE	BRIGHT WHITE	PINK	$3\frac{1}{8}^{\circ}$ +
On Glide Slope	BRIGHT WHITE	DIM WHITE	RED	$2\frac{7}{8}^{\circ}-3\frac{1}{8}^{\circ}$
LOW	DIM WHITE	OFF	RED	$2\frac{5}{8}^{\circ}-2\frac{7}{8}^{\circ}$
UNSAFE	OFF	OFF	RED	Less than $2\frac{5}{8}^{\circ}$

With system (b) the two upwind bars should display red and white lights when on Concorde glide slope; the near downwind bar should always appear white.

If the nose of the aircraft is not almost over the threshold at the "50" foot call point, the descent must be checked immediately (and power applied as necessary if Autothrottle not engaged) Dragged in approaches are unsafe; do not deliberately aim to touch down on the first 500 feet of the runway.

Noise Abatement - Noise and fuel consumption are both greatly increased at low speed. It is therefore important to carefully plan and monitor descent and speed reduction, avoiding prolonged low altitude or low speed flight.

Reduced Noise Approach - The object of this type of approach is to reduce noise whilst saving both time and fuel. It will, therefore, constitute a high precentage of all Concorde approaches.

Limitations - 1. ILS glide slope guidance must be available

2. The approach must be:-
   (a) A manual approach using ILS glide slope guidance
   (b) A manual approach using FD in GLIDE mode
   (c) An AP approach in GLIDE mode

   NOTE: glide mode is used rather than Land Mode because of the difference in pitch authority laws between the two modes.

3. Surface wind limitations - in (a) above, normal landing limits apply: in (b) and (c) above, the headwind limit and the crosswind limit are both 25 kts.

4. $V_{TT} = V_{REF}$ + 7 Kts + wind correction as appropriate, up to V_T MAX of V_{REF} + 10 Kts.

5. Aircraft configuration must be such that a V_{REF} Abnormal Increment does not apply (e.g. 3 engines).

6. The weather must be such that there is high probability of visual contact with the runway by at least 500 ft R.A.

7. Both ATs must be engaged at the beginning of an approach.

8. Minimum height for use of AP or FD is 200 FT R.A.

   NOTE: When using beams with a shallow glide slope angle (less than 2.7°) in winds above 15 kts, the minimum height for use of AP or FD is 300 ft.

Procedure - Upon reducing to 190 Kts engage AT in IAS HOLD and Maintain 190 Kts to 800 ft R.A. V_{TT} should then be preset in the IAS ACQ window and cross-checked. ($V_{TT} = V_{REF}$ + 7Kts + wind correction as appropriate up to V_T MAX of V_{REF} + 10 kts).

At 800 ft R.A. engage AT IAS ACQ mode. Should inertial ground speed be greater than 220 kts at 1000 ft R.A. then IAS ACQ should be engaged at that point.

At 500 ft R.A. the co-pilot will check glide slope speed and AT activity are satisfactory and call "Stabilised", or that parameter if unsatisfactory (e.g. "Glide Slope"). Power will normally start to increase at approximately V_{TT} + 10 Kts.

At 300 ft R.A. the co-pilot will call, "Autopilot" if either AP or FD is still engaged. This is a reminder to the handling pilot that the AP and FD must be disengaged by 200 ft R.A. on this type of approach.

Finally - As with other aircraft, the emphasis is on establishing the 'slot' at the correct time and reliance on the radio altimeter to determine flare height; avoid cramped or rushed patterns or procedures. Use all available aids and when possible use the runway that offers the greatest safety having regard to the length, surface conditions, wind, weather and facilities available.

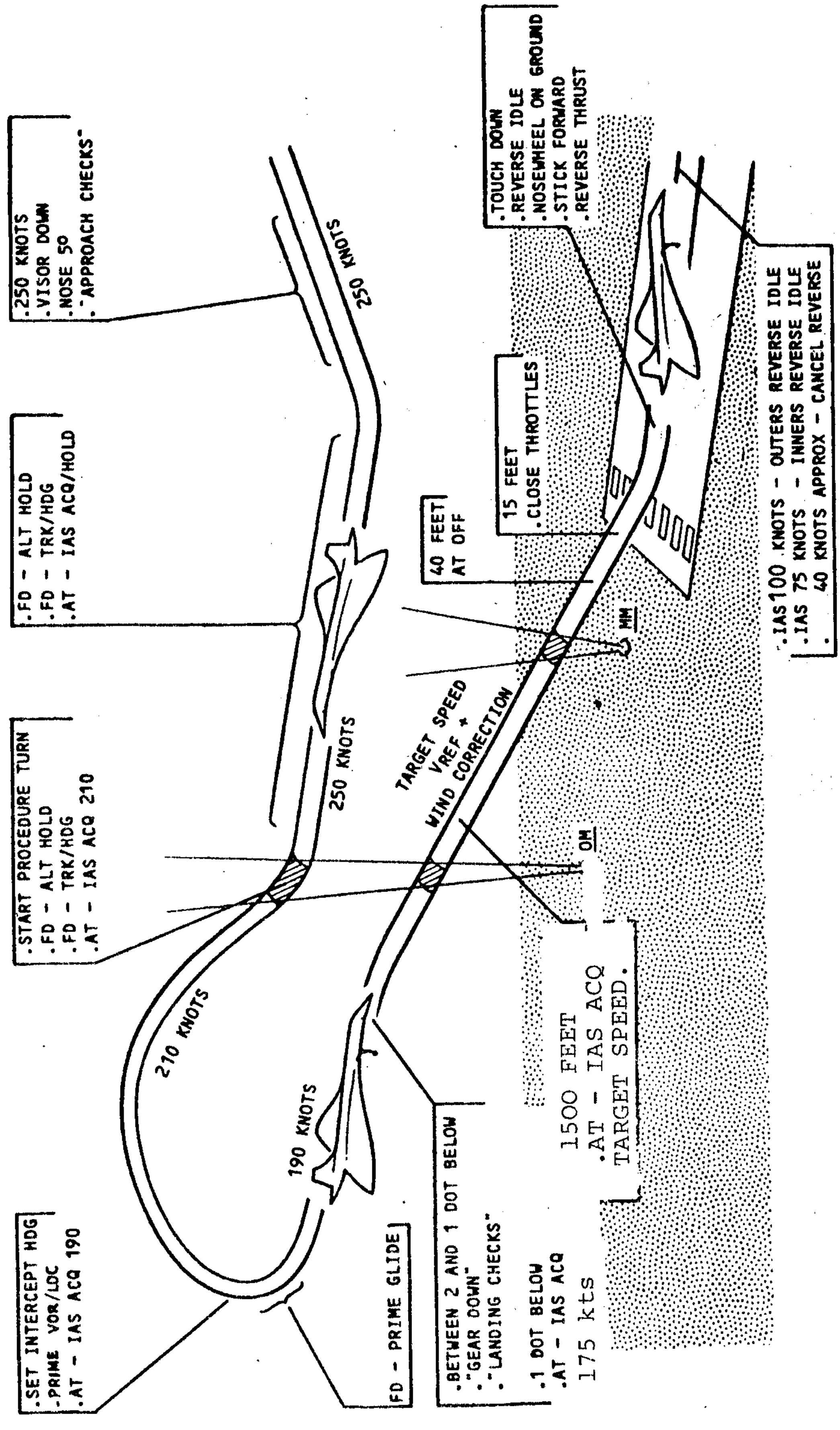
The Golden Rules bear reiteration:

(a) ADHERE TO RECOMMENDED TECHNIQUES.

(b) DON'T TRY TO SALVAGE A POORLY PLANNED OR EXECUTED APPROACH OR ONE THAT DOESN'T LOOK RIGHT AS THE THRESHOLD IS APPROACHED: IT IS SAFER TO GO AROUND AND START THE APPROACH AGAIN.

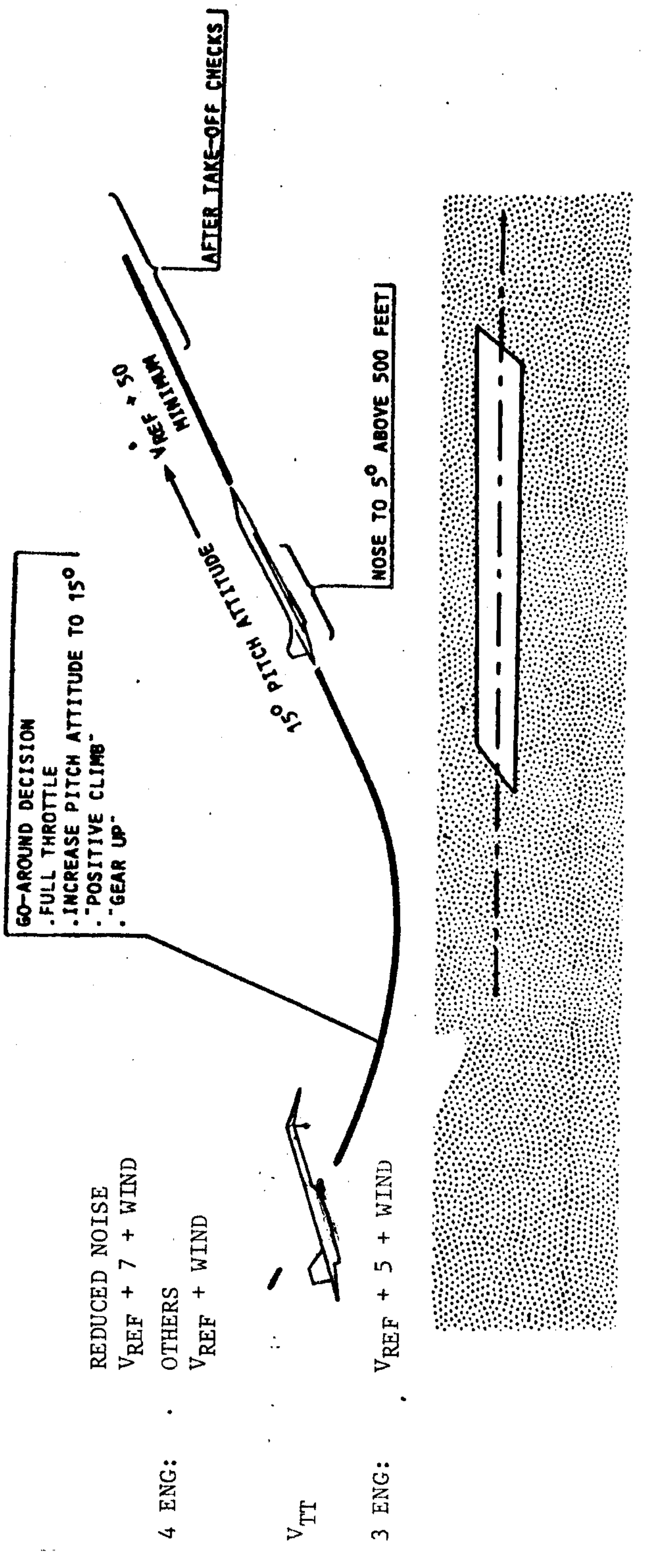
APPROACH AND LANDING

4 ENG. ALL WEATHER ILS



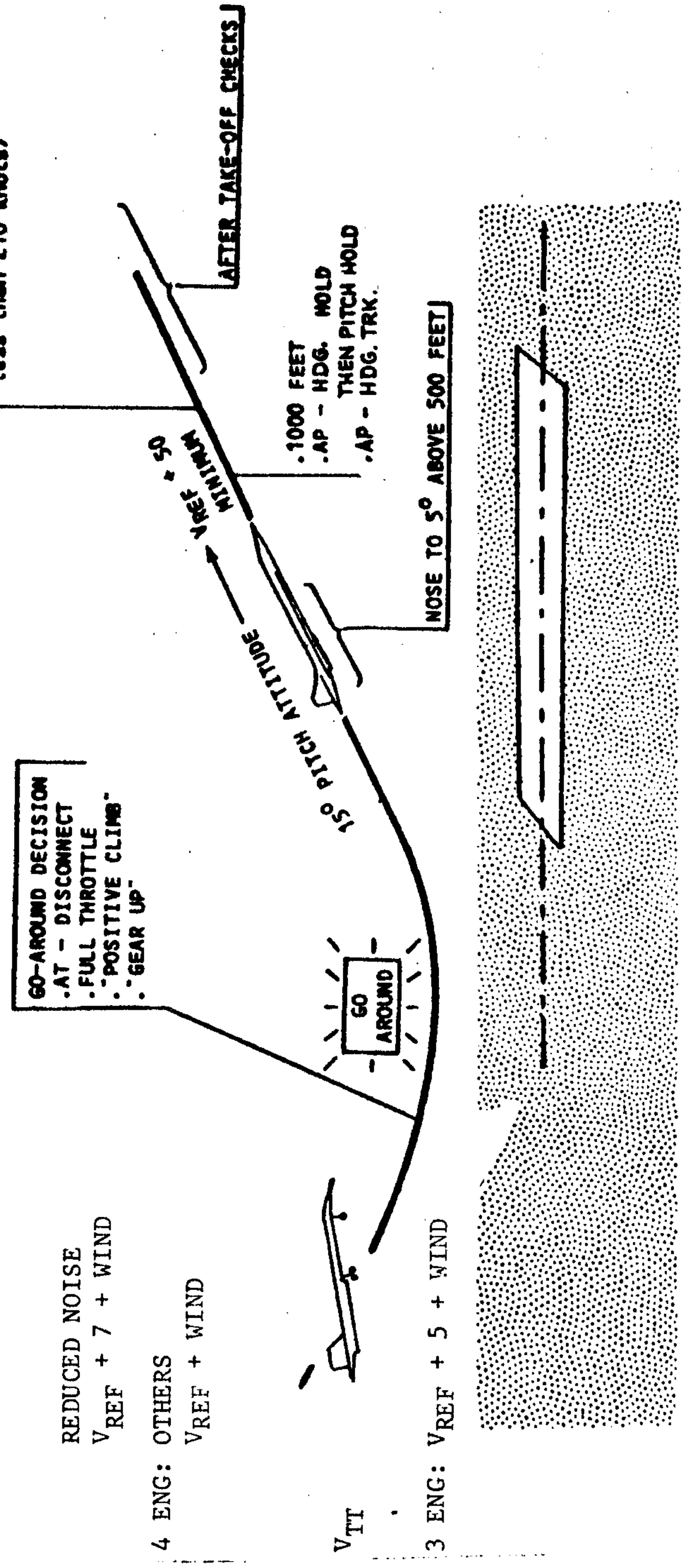
4 ENG ALL WEATHER ILS APPROACH AND LANDING

APPROACH AND LANDING
4 ENGINE AND 3 ENGINE GO-AROUND



4 ENGINE AND 3 ENGINE GO-AROUND

APPROACH AND LANDING
AUTOPILOT GO-AROUND



AUTOPILOT GO-AROUND

INSTRUMENT FLIGHT

Instruments - A noticeable difference on Concorde is the high pitch attitudes used in low speed flight. The pilot quickly adjusts to this when particular attention is paid to the new pitch datums.

The ADI pitch scale is expanded in the normal range and marked in 1^{o} increments. Close adherence to recommended pitch attitudes and constant attention to 'pitch attitude flying' will ensure accuracy and safety of the highest standard. The pitch index is set for take off at the screen pitch attitude for three engines. This index is useful when hand flying, it should be habitually set to the currently required pitch attitude.

The incidence meter may be used to assess the pitch attitude for level flight. At a particular height and airspeed (1G flight) the required pitch attitude is equal to the incidence. On a 3^{o} glideslope the pitch attitude is 3^{o} less than the incidence.

Due to the large speed range of Concorde the ASI pointer indications are on a small scale. For accurate airspeed control it is necessary to use the digital readout.

Pressure altimeters are set to airfield QNH for landing. Interpretation requires special care by pilots previously flying aircraft utilising QFE.

Transfer Switches - The Transfer Switches should always be in the normal position, unless changeover is required by a failure.

Flight Directors - Whenever possible, to achieve optimum monitoring, the Flight Directors should be selected to their own separate computers.

Use of the Flight Director during take off and initial climb is not authorised; use ADI and HSI as the primary reference instruments.

When bank angles of less than 30^{o} are required (high speed, or two engines) the Flight Director should not be used in a roll command mode. In particular the Director should not be used during a two engine approach because of: excessive bank demand, incorrect GO AROUND attitude, and possibility of inadvertent GO AROUND on approach if the throttles are opened fully.

Autothrottle - It is a good practice to select Autothrottle to standby whenever ALT ACQ is selected (providing Auto Pilot/Flight Director is in a speed mode) in subsonic flight.

Autothrottle controls speed accurately but has a destabilising effect on the aircraft. Pilots should be aware of this but with a good scan and attention to pitch attitude it is no problem.

Radios - Always use radios to optimum advantage. The primary approach aid must be set and identified on two receivers (ADF, VOR or ILS). When tracking on VOR or ADF use two receivers unless one is required for an inter-section check.

Linear Holding - For an equivalent delay, linear holding requires 50% less fuel than stack holding. This procedure should therefore be used when the commander is confident that a delay is required and he can obtain ATC clearance.

INSTRUMENT FLIGHT

Stack Holding - Due to Concorde's higher holding speeds it is essential to monitor all parameters closely to ensure that the aircraft stays within the holding area.

For economy, speeds should be as high as airmanship and ATC considerations permit.

ILS - The Flight Director will normally be used for all ILS approaches but as with other aircraft it is essential that the pilots also monitor the raw data.

Localiser capture is "all angle" with a recommended intercept angle of between 20^{o} and 60^{o}. Establish an intercept heading using ALT HOLD and TRK/HDG modes, reduce speed to V_{REF} + 30 (minimum 190 kts) with Autothrottle in IAS ACQ, then prime VOR LOC.

The command to turn onto the localiser should be carefully watched, as the Flight Director may require immediate response to accomplish this without overshooting the centre line. The interception should be monitored by additional facilities e.g. ADF.

When on the localiser prime GLIDE.

Approaching the glideslope will be indicated by the glideslope pointers of both ADI and HSI. Interception of the glideslope will be indicated by the lowering of the pitch command bars plus the GLIDE caption becoming illuminated.

Upon interception of the glideslope, start descent and at 1500 feet reduce speed to V_{REF} plus wind allowance.

(Deletion)

EMERGENCY DESCENT

Power Reduction - Emergency descent is initiated by rapid power reduction to flight idle thrust. The autopilot should be disconnected.

Fuel Transfer - At the same time as the power reduction, the fuel "FORWARD TRANSFER" switch on the pilot's overhead panel is put to the forward position until such time as the Flight Engineer can take over control of the fuel transfer.

Pitch Attitude - Above FL.500 attitude should be 5.5° below the horizon.

As soon as FL.500 is achieved pitch should be adjusted to 0°, to avoid excessive speed. This is maintained until V_{MO} is reached, after which the pilot holds V_{MO}.

Speed - During the descent from FL.500 to FL.400 at the recommended attitude of 0°, IAS will normally be less than V_{MO}. At FL.440 this difference may be as much as 50 knots but because V_{MO} then decreases rapidly with decreasing height, the difference between IAS and V_{MO} soon becomes smaller. When IAS is equal to the constant V_{MO} (380 to 400 knots depending on weight) the attitude can then be changed by the pilot to maintain the speed. The descent is then continued at V_{MO}.

Trim - At high supersonic speed, the change in trim which occurs with rapid power reduction induces a decrease in attitude. If no corrective action is taken, the attitude change could become excessive.

It is necessary therefore to re-trim in order to avoid exceeding 5.5° below the horizon, and to re-trim again when the attitude is changed to 0°.

Pitch Down Tendency - At V_{MO}, there is a strong tendency to pitch down as the Mach number decreases between Mach 0.97 and Mach 0.93. The use of electric trim is recommended to counteract this tendency.

Audio Warning - The audio warning given when speed exceeds $V_{MO}/M_{MO}/T_{MO}$ Limits is also given when pitch attitude is more than 6° $V_{MO}/M_{MO}/T_{MO}$ below the horizon at speeds greater than Mach 1.00.

NOTE

This manoeuvre is also a deceleration, hence the emergency FORWARD TRANSFER. Reference to the flight envelope will explain the changing pitch datums. Initial throttle closure produces a marked nose down pitch change such that it is a question of exceeding 5° nose down pitch rather than achieving it. (5.5° is maximum super sonic nose down pitch).

As with other aircraft it is important to cross check heights on descent, with Concorde it is additionally necessary to check Mach number and CG.

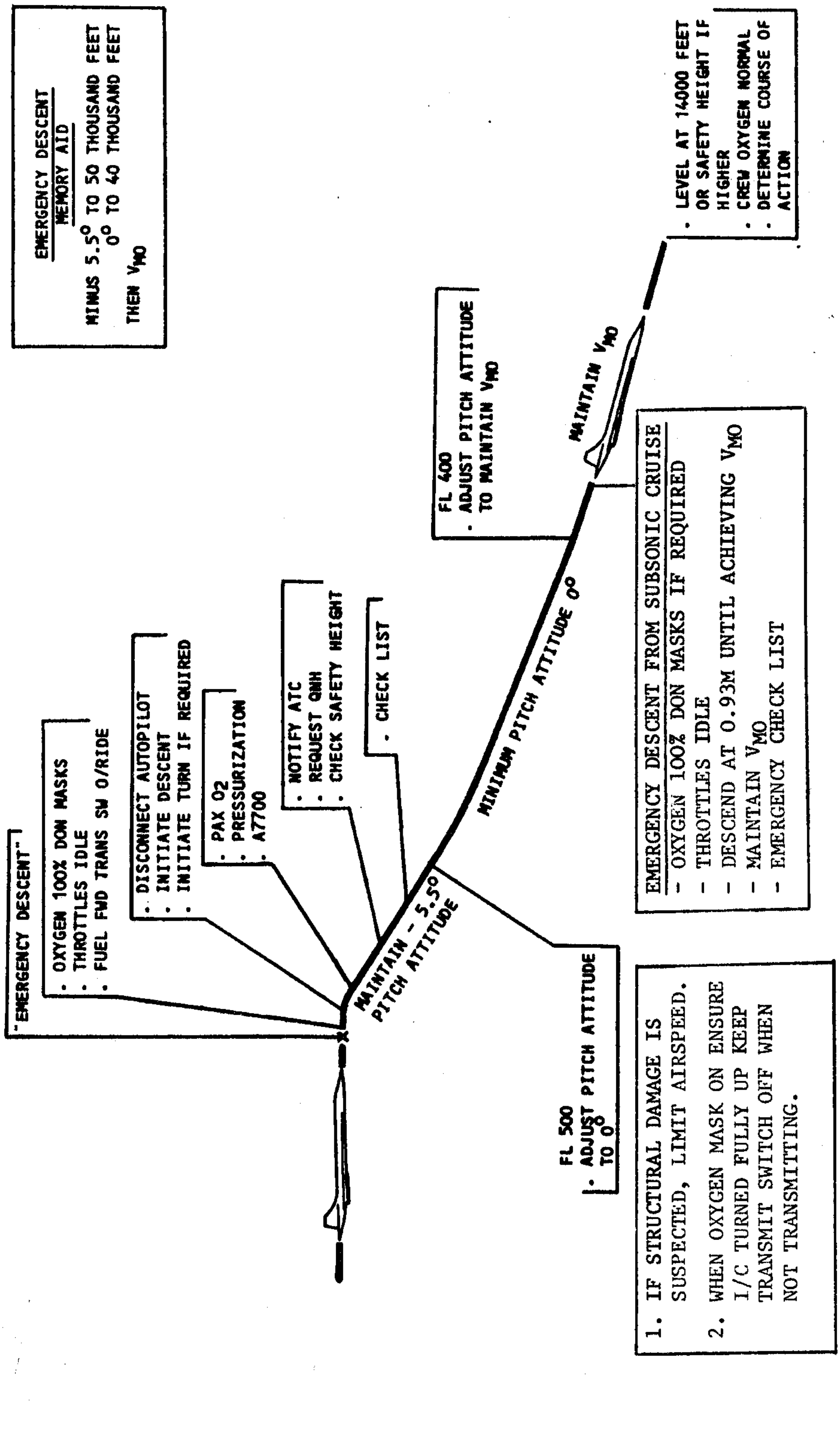
A7700 should be selected on transponder.

When time is available the Emergency Descent and deceleration checks should be carried out.

Average rate of descent is 7000 f.p.m.

(Unchanged)

EMERGENCY DESCENT



EMERGENCY DESCENT

(Deletion)

LOSS OF AUTOSTABILISATION

Partial Loss - There is no change in handling characteristics with the loss of one autostabilisation system in any axis.

Total Loss in Pitch - The Mach/CG corridor limits are such that the level of handling quality is excellent with autostabilisation and reasonably good without, but handling becomes more sensitive as the CG is moved aft. For this reason the drill for loss of autostab in pitch includes specific maximum aft CGs for supersonic and subsonic flight. Because of the loss of superstab, the drill also includes an increased target speed.

During rotation on take-off, attitude stabilisation becomes relatively difficult particularly during noise abatement procedures. The possibility exists of pilot induced oscillations (P.I.Os) reaching amplitudes of 1° or 2°.

Without the resistance provided by autostabilisation only light control forces are required. In the normal flight range but particularly at high speeds, even light control forces can produce attitude changes which result in significant variations of height or airspeed. Particular care in accurately trimming the aircraft is required to reduce the tendency to set up pilot induced oscillations.

Power reduction for deceleration/descent causes a strong pitch down movement which must be controlled on the elevons. The power reduction should therefore be made smoothly and gradually.

On the approach the possibility of pilot induced oscillations exists in turbulent conditions. These are not dangerous but can be uncomfortable for passengers, and best damped by releasing the control column momentarily.

The flare should be made with a single smooth backward movement of the control column. There is a possibility of over rotation, therefore a slight under rotation which produces a slightly firm landing is preferable to over rotation followed by a series of increasingly difficult pitch down-and-up phases.

Total Loss in Roll - The absence of damping in roll, particularly in turbulent conditions, may lead to a tendency to over control, but this is easily corrected by releasing the control column momentarily. In supersonic cruise, maximum Mach number is reduced because of the tendency to overbank in the event of an engine failure.

Total Loss in Yaw - Roll/yaw interconnect is lost but throughout the normal flight envelope, rudder can be used to augment roll rate or co-ordinate turns.

Roll demands should be made slowly and smoothly because excessive roll inputs may induce side-slip.

During transonic flight pilot induced oscillations can occur about the roll/yaw axes. This should be dealt with by releasing the controls momentarily and allowing the oscillations to cease.

In supersonic cruise, maximum Mach number is reduced because the auto rudder control which compensates for engine failure at high Mach number is lost. Rudder input should be made carefully to reduce side-slip.

LOSS OF AUTOSTABILISATION

Fixed Gain - The loss of both ADCs results in "fixed gain" operation of all three autostabilisation axes with the autostab switches latched on.

If this occurs after GLIDE Capture and below 1,500 feet (Flight Director or Auto Pilot engaged) the Flight Director and/or Auto Pilot will remain engaged and "fixed gain" gives autostabilisation the same as that found normally at approach speeds.

Other than in the approach case "fixed gain" gives autostabilisation in roll and pitch similar to that found at Mach 0.65 and autostabilisation in yaw similar to that found at Mach 1.4.

Handling in general will be similar to that with normal autostabilisation and very little if any difference noted. However, in heavy turbulence or when unusually large control inputs are made, some slight deterioration in damping may be noted.

Loss of Autostabilisation due to Mechanical Signalling - The loss of electrical signalling results in the loss of autostabilisation to the appropriate elevons even though the autostab switches remain latched on. See MECHANICAL SIGNALLING TO FLIGHT CONTROLS. The flight director is still available.

MECHANICAL SIGNALLING TO FLIGHT CONTROLS

Effect on Autostabilisation - Mechanical signalling causes loss of autostabilisation, therefore the considerations given under LOSS OF AUTOSTABILISATION also apply to flight with mechanical signalling. Depending on the elevons affected, the same restrictions on CG apply to supersonic and subsonic flight and the same restrictions on speed apply to high speed and approach speed. See LOSS OF AUTOSTABILISATION.

(i) Outer and middle elevons in mechanical signalling causes:-

Loss of roll autostabilisation
Loss of half of the pitch autostabilisation (the other half being provided by the inner elevons).

(ii) Inner elevons in mechanical signalling causes:-

Loss of half the pitch autostabilisation (the other half being provided by the outer and middle elevons).

(iii) Rudders in mechanical signalling causes:-

Loss of yaw autostabilisation.

Partial Elevon in Mechanical - With either the outer and middle elevons or the inner elevons in mechanical signalling, there are no further significant handling effects, but damping will be less effective in heavy turbulence.

All Elevons in Mechanical - With mechanical signalling to all elevons, there is a slightly different response to control inputs. More care is therefore needed than that required by the loss of autostab alone. This is particularly noticeable in pitch both in supersonic and in subsonic flight.

Without electrical signalling, there is a barely perceptible lag in elevon response to control input which is sufficient to require anticipation by the pilot. Control movements should be small therefore, and they should be discontinued before achieving the desired result. This anticipation will prevent over controlling. Electric trim can be used to advantage for very small adjustments.

Rudders in Mechanical - With mechanical signalling to the rudders, there is a risk at transonic speeds of pilot induced oscillations in roll and yaw. These are best dealt with by releasing the controls momentarily and allowing the oscillations to cease.

Autopilot - If control signalling changes to mechanical whilst the autopilot is engaged, the autopilot should be disengaged. The controls should be released momentarily to allow any oscillations to cease.

Under certain conditions listed below the autopilot may be re-engaged.

(a) With the rudder and/or inner elevons in mechanical mode.

(b) In stabilised flight with the outer and middle elevons in mechanical mode.

The performance of the autopilot should be carefully monitored, if the performance is not satisfactory it must be disengaged.

MECHANICAL SIGNALLING TO FLIGHT CONTROLS

Pilot Induced Oscillations - Because of the slight lag in elevon response in mechanical signalling, it is comparatively easy to set up oscillations but they are easily dealt with by releasing the controls momentarily and allowing the oscillations to cease.

Accurate trimming in pitch and roll reduces the possibility of pilot induced oscillations and assists the recovery.

LOSS OF BOTH ELECTRIC TRIMS

Effects - Except in LAND mode below 100 feet and in GO AROUND, total loss of electric trim results in loss of both auto pilots.

The loss of artificial longitudinal stabilisation provided by Incidence trim, Mach trim, Speed trim, and Speed minus V_{MO} trim affects:-

(i) The high angle of attack situation

(ii) The transonic region

(iii) Any speed increase or decrease

(iv) Flight above V_{MO}.

Feel and Trim - The aircraft should be manually trimmed using the hand wheel. Static longitudinal stability is degraded and artificial feel is dependent on the pitch trim setting. Any airspeed change or change of Mach number especially transonic, should be monitored closely because of the lack of automatic trim.

CG and Trim - In the cruise, normal procedure is followed. The CG should be controlled within the limits by fuel usage and/or trim transfer so as to maintain a deflection of the Flight Control Position Indicators of between zero and 1° down elevon. The aircraft should be trimmed manually in the normal way by means of the handwheel.

At low speeds there is no change to the CG limits but a forward CG within the limits is recommended to improve longitudinal stability.

NOTE: If the cause of the failure is a jammed system longitudinal trimming will no longer be possible. To reduce out of trim loads on the control column the artificial pitch feel can be disengaged. It should be remembered that by so doing the stick wobbler function will be lost and appropriate recommendations regarding flight without pitch artificial feel must be applied.

LOSS OF ARTIFICIAL FEEL

Loss of One Hydraulic Feel System - Artificial feel is provided by the remaining system so there are no handling considerations. As a precaution in case of further failure, coarse use of the controls should be avoided and the aircraft should be kept in trim.

Above 250 knots the aircraft must be trimmed before any attempt is made to re-engage a failed system.

Spring Rod and Hydraulic Feel - Artificial feel in each axis is provided by a spring rod supplemented (above 200 knots) by one of two hydraulic feel systems. Loss of a spring rod affects handling below this speed. Loss of both hydraulic artificial feel systems in one axis affects handling above this speed.

Loss of Artificial Feel Spring Rod - There is no feel force below about 200 knots. With only the slight friction in the control run to overcome, the controls should be moved with extreme care to avoid over controlling. The autopilot can be used to advantage for approach and landing, and if the auto-pilot is disengaged before landing, extreme care is again necessary.

Total Loss of Hydraulic Feel in one Axis below 200 knots - There are no handling considerations below approximately 200 knots because feel is provided by spring rod without hydraulic assistance whether an artificial system is functioning or not.

With total loss in pitch the protection of the stick wobbler is lost but the target-approach-and-threshold-speed remains unchanged as the remaining anti high incidence protection is still operative.

Total Loss of Hydraulic Feel in one Axis above 200 knots - Control forces are reduced, the aircraft should be flown with caution.

(i) Roll - There are no additional considerations. Coarse roll manoeuvres should be avoided.

(ii) Yaw - Rudder should be used with caution. Only sufficient rudder to prevent side-slip should be used.

There is no hydraulic feel protection against excessive rudder pedal deflection.

At high subsonic speeds this lack of protection is important because rudder pedal movement can produce rudder deflections that could overstress the aircraft, therefore use of the rudder pedals in subsonic flight above 250 knots should be avoided. Any corrections to side-slip should be made by careful use of rudder trim.

At high supersonic speeds side-slip corrections can be made normally with the rudder pedals as saturation of the rudder affords protection.

LOSS OF ARTIFICIAL FEEL

(iii) Pitch - Supersonic flight requires careful handling to avoid coarse control inputs. In order to reduce the pitch demands in turns, bank angle should not exceed 30°. In transonic flight, the need for careful handling is increased because of the changes in pitch, therefore the aircraft should be kept trimmed continually and bank angle limited.

Because handling becomes more sensitive as the CG is moved aft, the drill for loss of artificial feel in pitch includes a max aft CG for subsonic flight.

LOSS OF ONE FLIGHT CONTROL HYDRAULIC SYSTEM

Half Power - Low hydraulic pressure or a servo control spool valve jam can result in the loss of one flight control hydraulic system i.e. the loss of half the power to the flying controls.

Saturation of Flight Controls - It is possible to achieve "saturation" i.e. for the aerodynamic load on a control surface to exceed the power of the servo control.

When large control deflections are required such as in the transonic region or in turns, saturation is more likely to occur with the flying controls powered by a single hydraulic system.

When an inner elevon is saturated, the inner elevon light illuminates. This light also illuminates in the case of linkage failure. (See "Loss of an Inner Elevon," page 08.28.08).

Mach/CG - Although half power to the flight controls is taken into account in the construction of the Mach/CG corridor and is the prime consideration in the transonic portion of the corridor, it is considered prudent to avoid the CG boundaries in order to maintain maximum flying control effectiveness.

Speed - Below Mach 0.93 there are no additional considerations to the normal flight envelope.

Above Mach 0.93 it is necessary to use a speed that avoids the boundaries to maintain maximum flying control effectiveness therefore speed should be reduced to 350 knots and this speed used for the descent to Mach 0.93.

Re-pressurising - A flight control system may be re-pressurised but it is essential to have the controls in a non-saturated condition. Re-pressurising should be carried out in level flight with the aircraft in trim.

Rudder - It should be noted that even with two hydraulic systems operating normally, it is possible for the rudder surfaces to become saturated at high supersonic speeds. This saturation in addition to hydraulic artificial feel, protects against excessive rudder deflection.

TOTAL LOSS OF AUTOTHROTTLE

Levelling After Descent - Reaching and maintaining a level after descent requires that the correct power for the desired speed should be applied at the appropriate time to prevent an unwanted loss of speed or altitude.

Throttle Handling - Throttle handling at speeds above the minimum drag speed requires no particular mention.

Below the minimum drag speed, the characteristics of power required in relation to speed become reversed and a reduction in speed requires an increase in power to maintain the flight path. The power required for a speed below the minimum drag speed is also capable of giving stable speed conditions at a higher speed above the minimum drag speed.

Speed Correction - As the approach and landing are made at speeds where these characteristics of power and speed are more pronounced it is therefore wise to correct any undersired speed variation greater than 5 knots as soon as possible. This should be done by increasing the power boldly in the case of an undesired speed reduction or by decreasing the power boldly in the case of an undesired speed increase. In either case follow-up action is required in the form of resetting the power to an intermediate position and making small adjustments.

Approach Speed - With no autothrottle, the speed on final approach should be V_{REF} + 7 knots + wind correction with a maximum threshold speed of V_{REF} + 17 knots. Below 500 ft maintain VTT.

Dispatch with no Auththrottle - In this case the Landing Distance required for Abnormal Landing Configuration must be determined. This landing distance is based on the assumption that speed on final approach is V_{REF} + 7 knots + wind correction and on the assumption that the maximum-threshold-speed is VREF + 22 knots.

ENGINE FAILURES

ENGINE FAILURE DURING TAKE-OFF BEFORE V1

Action - When the failure is identified the captain calls "abandon", closes the throttles, applies maximum footbrakes, holds the control column forward and applies full reverse thrust as quickly as possible on all engines.

The pilot should hold the control column forward initially, but the co-pilot should then confirm this by holding it forward during the application of reverse.

At 100 knots reverse idle is selected on two engines so as to leave full reverse thrust on two "live" symmetrical engines until 75 knots. Reverse idle is then selected on these remaining engines. At 40 knots all engines are selected to forward idle.

Braking is the primary means of stopping but the aircraft is certified using reverse thrust in addition.

NOTE: Prior to take-off the pilot must be absolutely clear about what engine conditions will require him to abandon.

Once the take-off roll is under way with full thrust Flight Engineers must not announce minor or unimportant faults or instrument failures such as could cause confusion or risk unnecessary aborting of the take-off.

It is essential that a firm forward pressure is maintained on the stick to prevent the nosewheel leaving the ground.

ENGINE FAILURE DURING TAKE-OFF AFTER V1

Action - When the failure is identified, contingency power on all engines is selected by the Flight Engineer. The T/O light on the engine rating mode annunciator is extinguished by this selection and the CTY light comes on steady.

Auto Contingency - A flashing CTY light indicates that N_2 has fallen below 58% on an engine and that contingency power has been automatically selected on all engines. Contingency power should be selected on all engines as a confirmatory action. The CTY light then stops flashing and becomes steady.

Having confirmed contingency power following an automatic contingency selection, it is necessary to pull out the take-off monitor control button so that take-off rating can be re-selected when required.

Rotation - If the failure occurs whilst the aircraft is on the runway, rotation is initiated at V_R at a slower rate than usual. The rate of pitch attitude increase should be controlled so as to achieve simultaneously the V_2 speed and the initial climb out attitude, θ_2.

A slower rotation is required on three engines because the rate of increase of airspeed is noticeably less than on four engines and becomes even less after lift off which occurs 2 or 3 knots before V_2 and at about 10° pitch attitude.

ENGINE FAILURES

Gear - The command "gear up" should be given when a positive climb is established. A positive climb should not be considered established until the radio altimeter is indicating more than 20 feet

Failure to retract the gear causes a performance penalty of 400 f.p.m. rate of climb.

Speed - On achieving the initial attitude θ_2, the speed should be V_2. This speed is maintained until commencing the horizontal acceleration to V_2 + 40 knots. When the gear is up, a small attitude increase of about 1^o is required to maintain V_2.

If however, after rotation to θ_2, a speed higher than V_2 is achieved because the engine failure occurred at a speed close to V_2 or because the power loss was gradual, or because weight is not limiting, the higher speed should be maintained until the horizontal acceleration to V_2 + 40 knots is commenced. The higher speed gives a better climb-out gradient with less induced drag.

A rotation carried out too rapidly results in too low a speed and reduced performance margins, therefore any tendency to rotate too quickly must be corrected. However, if it happens and a speed below V_2 is obtained, this achieved speed must be maintained until the horizontal acceleration to V_2 + 40 knots is commenced.

Directional Control - Directional control should be maintained with rudder. As the speed increases following engine failure at V1 or above, a reduction in the initial rudder application will be required for the climb-out. After rotation when the initial climb-out is established, it is necessary to achieve zero side-slip for the best engine-out climb performance. A small amount of bank (approximately 2^o or 3^o) is then necessary to maintain a constant heading.

Power Limitations - Accurate timing of engine rating selections would ideally commence at the time of selection, but this is impractical for timing contingency rating following engine failure on take-off. The maximum time limitations will not be exceeded by using the time measured from the start of take-off as follows:-

After 3 minutes reselect take-off rating by selecting reheat.

After 7½ minutes select reheated climb power by selecting Flight Rating.

After 22½ minutes select reheats off.

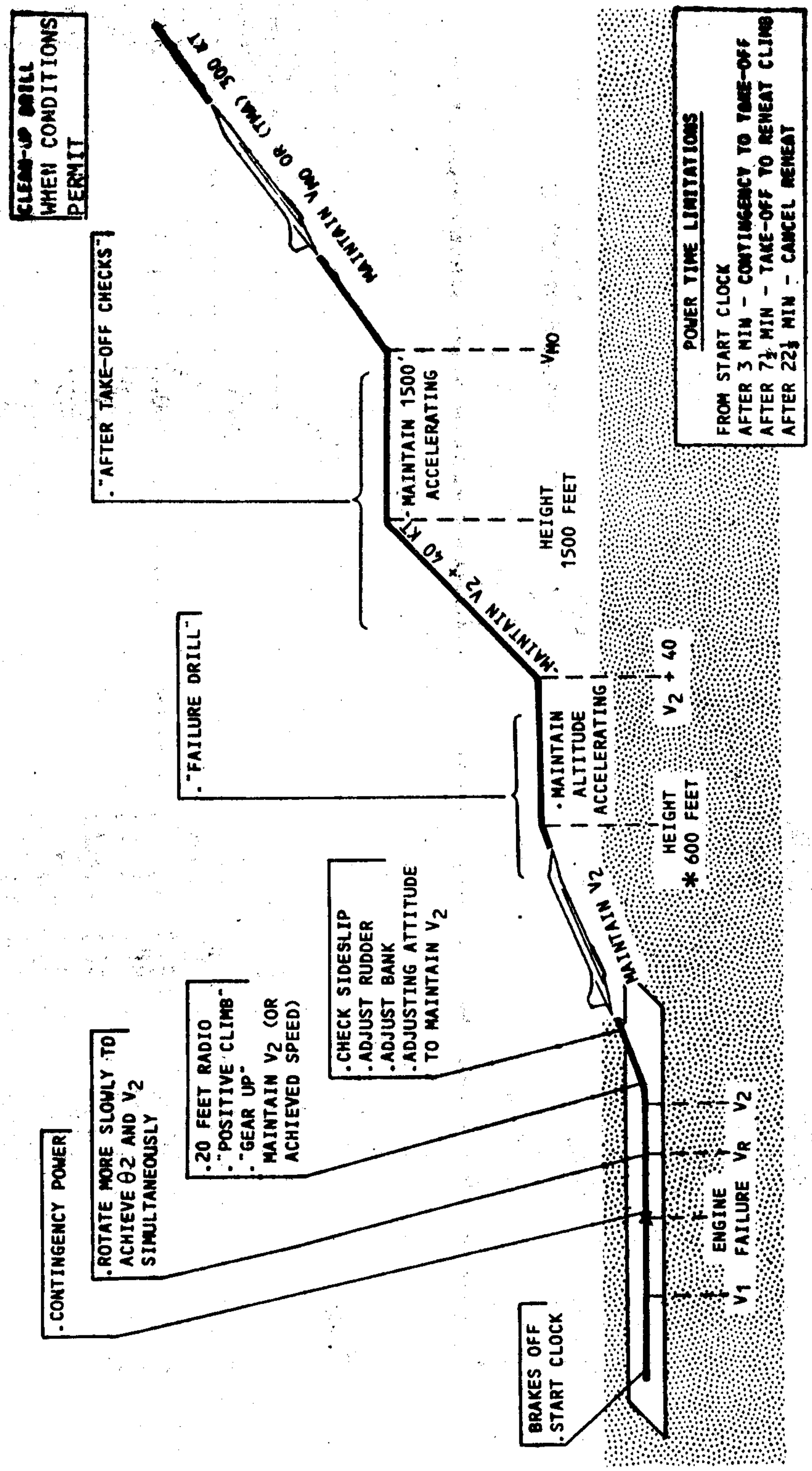
Turns - Where possible turns should be avoided because of the increased angle of attack required and the consequent increase in induced drag. However, a turn at V_2 with 15^o bank gives approximately the same climb performance as a conventional four engine aircraft with one engine out and wings level.

En Route Climb Speed - The scheduled en route climb speed is V_{MO}. The acceleration from V_2 + 40 knots is made in level flight at 1500 feet.

When manoeuvring in terminal areas prior to fuel jettison a speed of 300 Kts, not less, is recommended.

(Unchanged)

ENGINE FAILURE AFTER V_1 ALTERNATIVE 1



ENGINE FAILURE AFTER V_1 ALTERNATIVE 1

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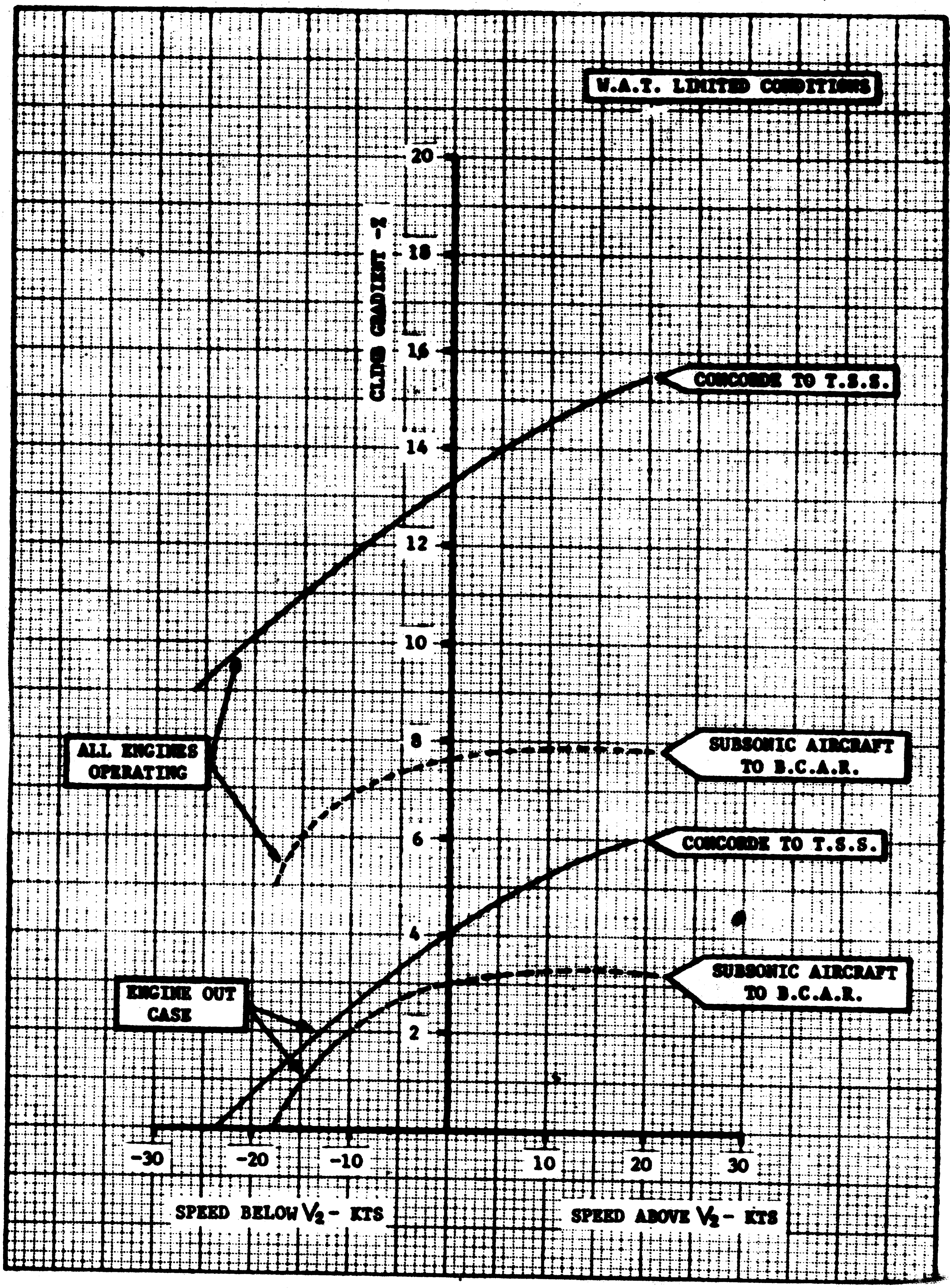
ENGINE FAILURES
TAKE-OFF CLIMB GRADIENT COMPARISON



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ENGINE FAILURES

Performance - Concorde's performance is much more affected by speed and by turns than other aircraft. (V_{ZRC} is greatly increased in turning flight).

Considering the graph "Take off Climb Gradient Comparison". Several relevant facts are apparent:

(1) In both cases Concorde has a much greater increase in climb gradient with increasing speed (ie it is more speed sensitive) therefore if speed inadvertently exceeds V_2, after an engine failure, hold that speed. Do not attempt to get back to V_2.

(2) In the engine out case Concorde gradient is 1% better than the subsonic aircraft at V_2 but at V_2-10 knots this advantage is virtually lost.

(3) The loss in performance due to engine failure is much greater on Concorde than the subsonic jet.

Drills - Engine failure prior to initial climb will be announced as 'Engine Failure'. When the aircraft is safely established in the climb attitude the Flight Engineer should repeat the failure and identify the engine. The appropriate drill should then be called for. Memory drills should be performed slowly, the pilot and Flight Engineer announcing clearly the action to be taken so that each may monitor that the other's action is correct.

ENGINE FAILURE SUBSONIC

Aircraft Behaviour - The reaction of the aircraft is similar to that of a subsonic aircraft and is corrected easily in the conventional manner.

The aircraft is flown with zero side-slip and a small bank angle is required to maintain constant heading.

Speed with one Engine Failed - The optimum speed for best range and for sustaining altitude is Mach 0.95, or V_{MO} if V_{MO} gives a Mach number less than Mach 0.95.

When speed is reduced below V_{REF} + 50, it is recommended that bank angles are limited to 20°.

Double engine Failure - The reaction of the aircraft is similar to that of a subsonic aircraft and is corrected easily in the conventional manner.

The aircraft is flown with zero side-slip and a small bank angle is required to maintain constant heading.

The change of yaw trim with power changes is more marked than in the three engine case.

Speed with two engines failed - The optimum speed for best range and for sustaining altitude is Mach 0.80, or V_{MO} if V_{MO} gives a Mach number less than Mach 0.80.

When a reduction in speed is necessary, 250 knots is recommended where possible. In no case should speeds below V_{REF} + 50 knots be used until manoeuvring is completed and the aircraft is on final approach.

etion)

ENGINE FAILURES

ENGINE FAILURE SUPERSONIC

Descent - Descent must be commenced following a single or double engine failure. The descent is carried out using the normal deceleration and descent procedure and is continued to subsonic flight level.

Aircraft Behaviour - An engine failure at Mach 1.60 and above causes the aircraft to bank. The reaction of the aircraft differs from that of a subsonic aircraft because the opening of the spill door on the failed engine projects air downwards thus generating a lift force which raises the wing on which the failure has occurred.

Basic yaw and side-slip reaction are conventional and a slight pitch down is induced. A further pitch down is induced when power is reduced on the live engines to commence descent.

Correcting side-slip and bank - Auto-stabilisation reduces the resulting flight path disturbance. The wings should be levelled smoothly and the pitch down tendency corrected. This correctly controls the aircraft initially and any residual side-slip is corrected by movement of the rudder pedal in the direction of the side-slip index. A small bank angle is required to maintain constant heading.

Rudder loads will be heavy, making it advantageous to use rudder trim at an early stage.

Coarse use of roll elevon should be avoided because the side-slip thus induced could bring the good engines to a condition approaching surge.

As a descent is commenced following engine failure at supersonic flight levels, the power reduction on the live engines decreases the amount of yaw and roll trim required.

Double engine failure - The effect produced by double engine failure is similar, but more pronounced.

Where possible, the aircraft is flown with zero side-slip but on two engines at high supersonic speed there will be a small residual side-slip which is acceptable and is due to insufficient rudder control with cruise power on the live engines. However, as a descent is commenced following engine failure or failures, the power reduction on the live engines decreases the amount of yaw and roll trim required.

Power - Power should be reduced on the live engines in accordance with the normal throttle procedure for deceleration/descent.

Deceleration/Descent - The cruise altitude should be maintained in the deceleration until the speed approaches 350 knots in accordance with the normal procedure for deceleration/descent.

(Unchanged)

Speed with one engine failed - 350 knots should be maintained until Mach 0.95 is reached. The descent to the optimum altitude is then continued at Mach 0.95 unless limited by V_{MO}.

Speed with two engines failed - 350 knots should be maintained until Mach 0.80 is reached. The descent to the optimum altitude is then continued at Mach 0.80 unless limited by V_{MO}.

ENGINE FAILURES

Performance - Unlike most subsonic jets, there is a considerable loss of range on Concorde if an engine failure occurs. From four engine supersonic cruise to optimum three engine cruise incurs a range penalty of 30-35%

The loss of range between four engine cruise supersonic, and four engine cruise subsonic is also significant, in the order of 25%. In addition, in reverting to subsonic flight, be it on three or four engines, the aircraft may well have exchanged an environment with light winds to one with strong headwinds. An associated problem is the drift down into the track of other aircraft, making it essential to be aware of procedures applicable in the area being flown.

It is important that pilots are constantly aware of the course of action that they would take, and alternates available, should an engine failure occur at any time.

A double engine failure produces difficulties of a similar nature but to a much inflated degree.

A technical failure which causes the pilot to reduce from supersonic to subsonic cruise will have similar effects on range to a single engine failure.

NOTE: In the event of a double engine failure a landing should be made at the nearest suitable airfield.

ENGINE FAILURE IN THE APPROACH PHASE

Aircraft Behaviour - The reaction of the aircraft is similar to that of conventional aircraft and is corrected easily in the conventional manner. Induced drag increases rapidly with angle of attack so turns and decreasing speeds or combinations of turns and decreasing speeds require careful monitoring.

3-engine Approach - Both autothrottles should be engaged if available. Traffic speeds are as for four engines but 5 knots is added to V_{REF} for final approach. If autothrottle is not used, 7 knots is added to V_{REF} for final approach. Rudder trim should be set to zero by 500 feet on final approach.

During asymmetric flight, autothrottle movement produces considerable yaw inputs, it may be found helpful to keep a hand on the throttles so that these inputs can be anticipated.

Reverse thrust is used normally on the three live engines except that maximum reverse is used on the available engines down to 100 knots. Reverse idle is then selected on the asymmetric engine and the normal procedure resumed.

The go-around on three engines is similar to that for four engines, but bank angle should be limited to 20°.

(Deletion)

2-engine Approach - Autothrottle should not be used. Speeds up to 250 knots may be used in visual traffic pattern in order to reduce noise and fuel consumption, but in no case should speeds below V_{REF} + 50 knots be used until manoeuvring is completed and the aircraft is on final approach. The speed on final should then be reduced to V_{REF} + 30 knots and this speed is maintained until 300 feet or lower.

The minimum height recommended for go-around is 500 feet.

ENGINE FAILURES

Full dry power will be adequate to maintain the glide slope but if at any time on the approach, speed or altitude is less than that desired, reheat should be used without hesitation plus contingency if required.

2-engine landing - Rudder trim should be set to zero by 500 feet.

Below 300 feet the target speed becomes V_{REF} + 7 knots. The recommended procedure is to continue initially at V_{REF} + 30 knots and at about 300 feet begin to reduce speed, maintaining the glide slope. The pitch attitude required increases by about 3° during this phase. The attitude change must be made so as to ensure that no deviation below the glide slope follows the small reduction in power.

Use of reverse - Normal Reverse should be selected on the two operating engines.

With both operating engines on the same side of the aircraft reverse idle is selected at 100 knots on the outer engine and 75kts on the inner engine.

With an operating engine on each side of the aircraft reverse idle is selected at 75 knots.

Reverse idle is permitted on both engines down to 40 knots.

Second engine failure during 3-engine approach - It is possible that failure of a second engine at V_{REF} + 5 knots during a 3-engine approach may be identified and controlled without deviation from the glide slope, and the speed increased by the required 2 knots with normal power application. However, if the failure results in loss of speed and/or deviation below the glide slope, contingency power should be selected and maintained until the flight path is re-established at V_{REF} + 7 knots on the glide slope. Normal throttling should then be resumed.

2-engine go around - The minimum height for go around is 500 feet.

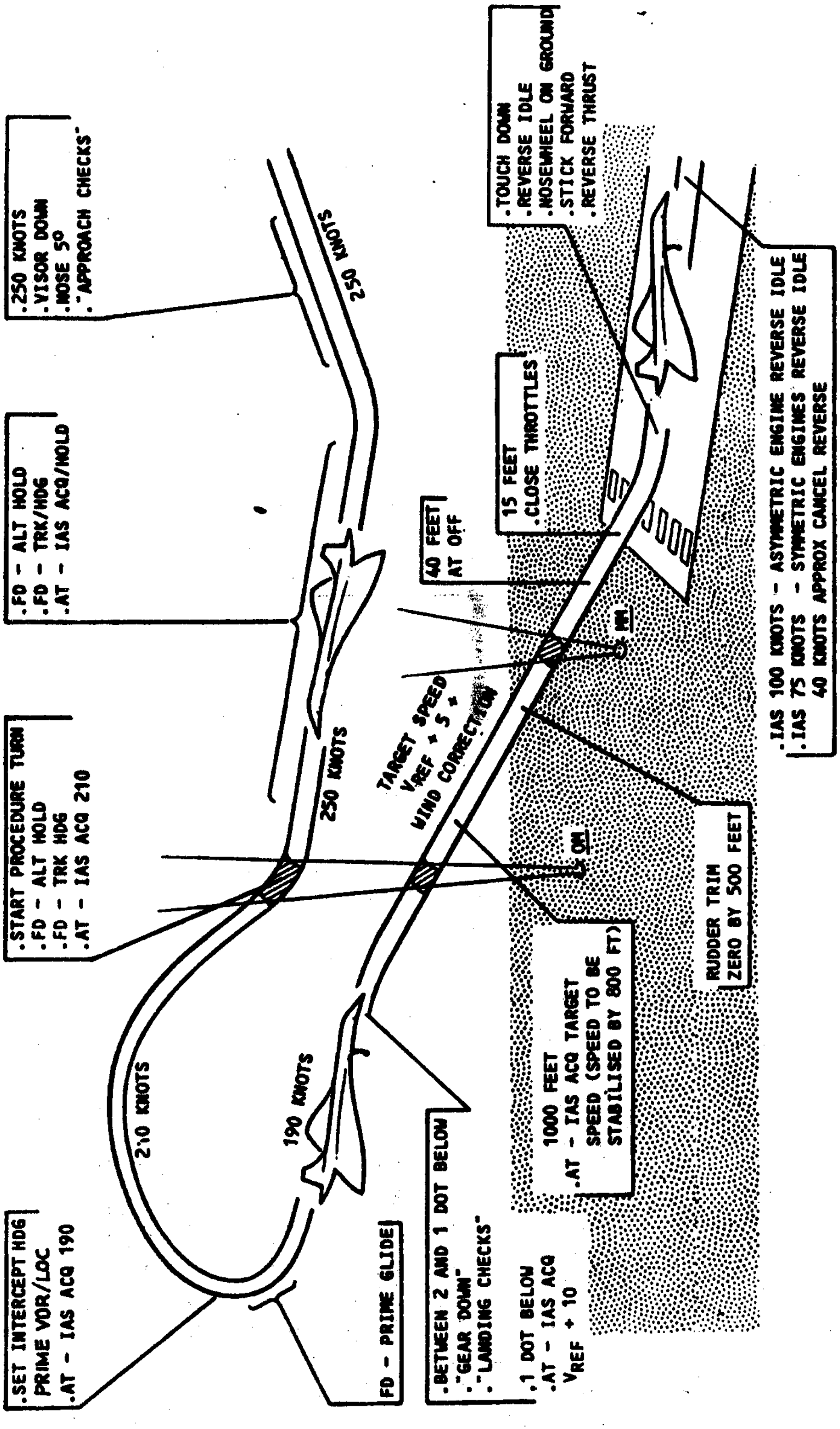
If due to loss of engines or hydraulic pumps the landing gear has been lowered, using the standby system, then the gear cannot be raised. The recommended speed of V_{REF} + 30 knots at 500 feet gives adequate performance even at the landing WAT limit with the gear down.

Maximum contingency power should be applied and the pitch attitude adjusted to arrest the sink whilst maintaining the speed at V_{REF} + 30 knots. This may result in a slight descent initially. When a positive climb is established the gear should, if possible, be raised and the aircraft rotated smoothly to 12° and the climb continued, accelerating to V_{REF} + 50 knots. Bank angle should be limited to 20°.

After 2½ minutes, select Take-off Rating by setting the Reheat selectors from Contingency to Reheat.

ENGINE FAILURES

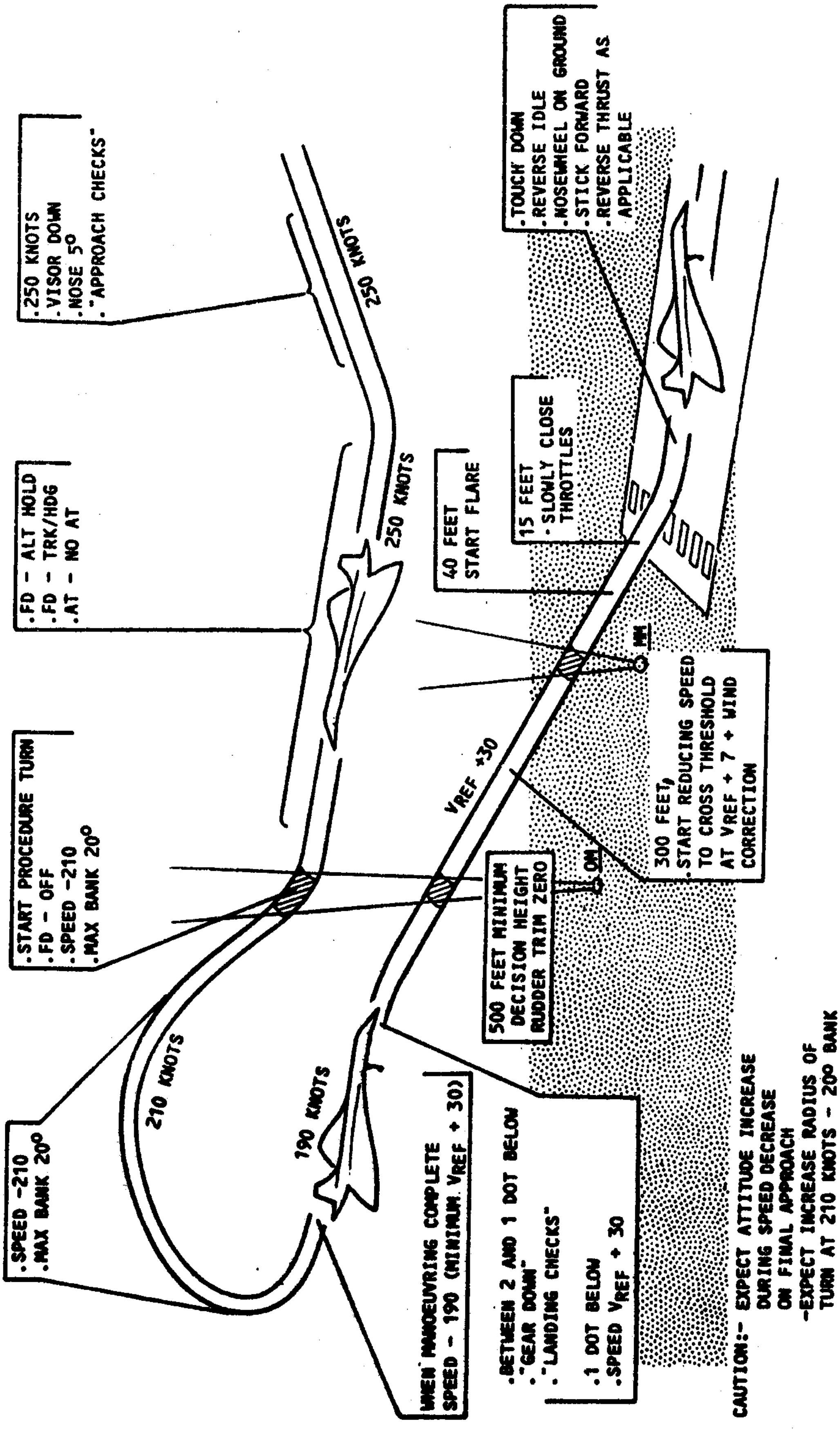
3 ENGINE ILS APPROACH AND LANDING



3 ENGINE ILS APPROACH AND LANDING
MANUAL WITH FLIGHT DIRECTOR

ENGINE FAILURES

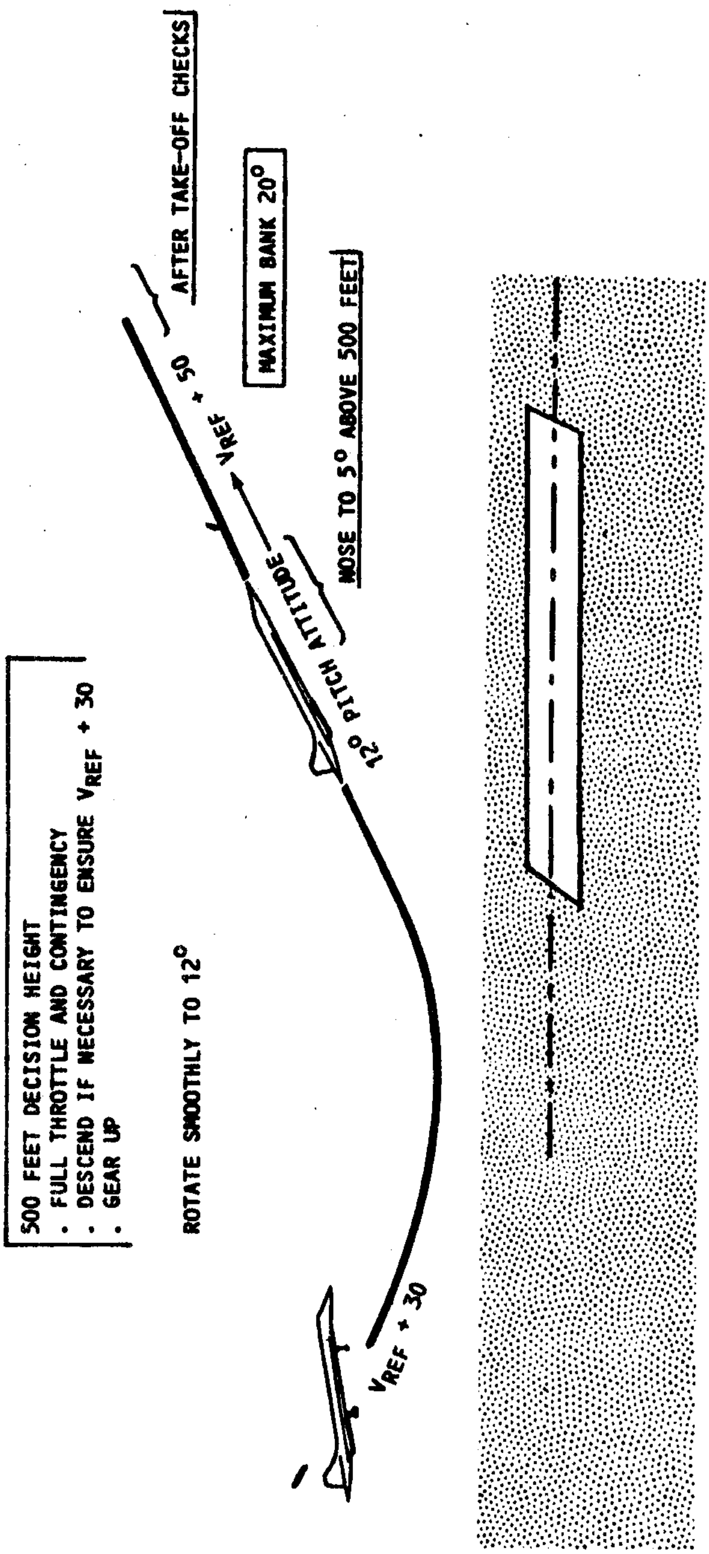
2 ENGINE ILS APPROACH AND LANDING



2 ENGINE ILS APPROACH AND LANDING

ENGINE FAILURES

2 ENGINE GO-AROUND



CAUTION - WITH BOTH LEFT ENGINES FAILED
GEAR CANNOT BE RAISED

2 ENGINE GO-AROUND

ENGINE FAILURES

Engine Surge - Surge on a jet engine is caused by a significant break down in flow in the engine compressor(s). On a supersonic aircraft a more complex air inlet and exhaust system is required to give good efficiency, and hence failure of some part of the total powerplant must have a slightly higher probability.

If all systems are working correctly and procedures and limitations are observed surge should not be encountered. The possibility of a failure serious enough to induce surge is remote, but should it occur it is desirable, as on all aircraft, to take prompt action to eliminate the condition.

Recognition - Some thrust loss will inevitably occur when surge is present but this is often not a sufficient indication on its own of the condition. Surge can evidence itself in a sudden change in engine instrument readings alone, but more often is accompanied by a general "roughness" or where higher degree of flow break down occurs, by cyclic 'banging' sound from the engine.

When subsonic little difficulty should be encountered in identifying the faulty powerplant by observation of the engine instruments. When supersonic, however, surge frequently gives little or no indication on the engine instruments but the faulty powerplant can usually be identified by observation of the intake pressure ratio gauges, where it is seen as a fluctuation of the gauge needle as the surge occurs. At Mach numbers greater than about 1.5M identification is further complicated by the fact that surge in one engine can cause a 'sympathetic' surge in its adjacent partner.

Corrective Action - If the surge is other than simply transient in nature the relevant failure drill should be carried out.

Should the surge be only transient and not persist, then the event should be logged and that powerplant carefully monitored, thereafter, where possible making adjustments to power slowly.

If for any reason an engine is throttled beyond the recommended position above M1.6 a mild 'pop' surge may occur during throttling, or any subsequent re-advance of the throttle. Such surges may be disregarded so long as they are not accompanied by unusual instrument readings or failure indications.

EMERGENCY FLIGHT CONTROL

General - The system is fitted to ensure control can be maintained in the extremely unlikely event of a jammed control run between the control column and the relay jack, in either the pitch or roll axis. Since the system operates through the pitch and roll autostabilisation system it cannot provide roll signals to the inner elevons. To prevent disconnection of the flying controls through surface comparator action the comparators are inhibited when the emergency flight control is engaged.

Engagement - The system must only be engaged if there is a total jam or where the required range of movement of the control column cannot be obtained. The system must not be used simply to overcome stiff or heavy control column movement.

At the moment of engagement, the controls must be released in order to avoid sudden and perhaps excessive control input.

Handling - If the roll axis is unjammed, or jammed in a way which allows some movement, roll control will be noticeably more sensitive. This is because the normal control inputs and those of the emergency system will be combined. This increased sensitivity is not apparent in the pitch axis because the emergency system takes account of any normal control input which is available. When operating the control column in the jammed position, the control forces experienced in the direction of the jam are similar to those with the artificial feel system switched off, i.e. only the spring rod operating.

If reasonable care is taken in applying control inputs, good and precise control can be maintained within the authorized envelope.

Should a jam occur in the pitch axis, control forces can be trimmed out in the normal manner. There is no facility for trimming if a jam occurs in the roll axis.

FLIGHT IN SEVERE TURBULENCE

Severe turbulence should be avoided whenever possible. If it cannot be avoided, or is met unexpectedly, the aircraft should be flown at the recommended rough air speed, V_{RA}, speed being adjusted according to weight and altitude.

Above 32,000 ft speeds up to V_{MO}/M_{MO} are permitted. Optimum climb performance is associated with the highest permitted speeds. In such cases, if frequent speed fluctuations occur, it will be necessary to reduce speed below V_{MO}/M_{MO} to avoid "Overspeed" warnings. If performance is not to be significantly degraded during the climb such reductions in speed should be kept to the minimum to maintain the aircraft within the limitations.

Below 32,000 ft the maximum permitted speed in rough air depends on aircraft weight. At weights above 140,000 kgs it is 375 kt; below 140,000 kgs it is 300 kt.

The minimum permitted speed in rough air is V_{LA} or 250 kt which ever is greater. To avoid the risk of excursions below V_{LA}/250 kt it may be necessary to select a speed sufficiently above V_{LA}/250 kt to provide an appropriate margin for the prevailing conditions.

Alough flight is permitted within the maximum and minimum limits given above, the recommended rough air speed is 300 kt whenever such a speed does not impose unacceptable performance or operational limits.

If severe turbulence is anticipated, that cannot be avoided, adjust air speed to the appropriate value before entering the turbulence. Gross adjustments to speed, power or altitude should be avoided once the turbulence is encountered, and attitude used as the prime flying reference.

If severe turbulence is met unexpectedly, speed should be changed, if necessary, to the desired value carefully, relying more on a correlation of engine power and aircraft attitude than on airspeed, (or Mach number), and altitude readings.

In the cruise if severe turbulence is widespread and continuous, a change in altitude may be desirable. In which case any such deliberate change should be accomplished by a small change in power accompanied by a corresponding small change in pitch attitude.

In all cases the autopilot should normally be engaged. Because of the aerodynamic characteristics of the aircraft, the behaviour in turbulence is better than that of conventional subsonic aircraft, thus usually permitting the use of the normal cruise modes of the autopilot and of the autothrottle, (i.e. Max Climb/Max Cruise or ALT HOLD and autothrottle), whenever overflying or making a lateral avoidance of a known severe storm area. If, however, severe turbulence is encountered or flight near severe storm tops is unavoidable, the autopilot should be engaged in PITCH HOLD without autothrottle engagement. Only if this results in autopilot disconnects need resort be made to use of the TURB mode.

Severe turbulence is particularly to be avoided if autostablisation has been lost in one or more axis.

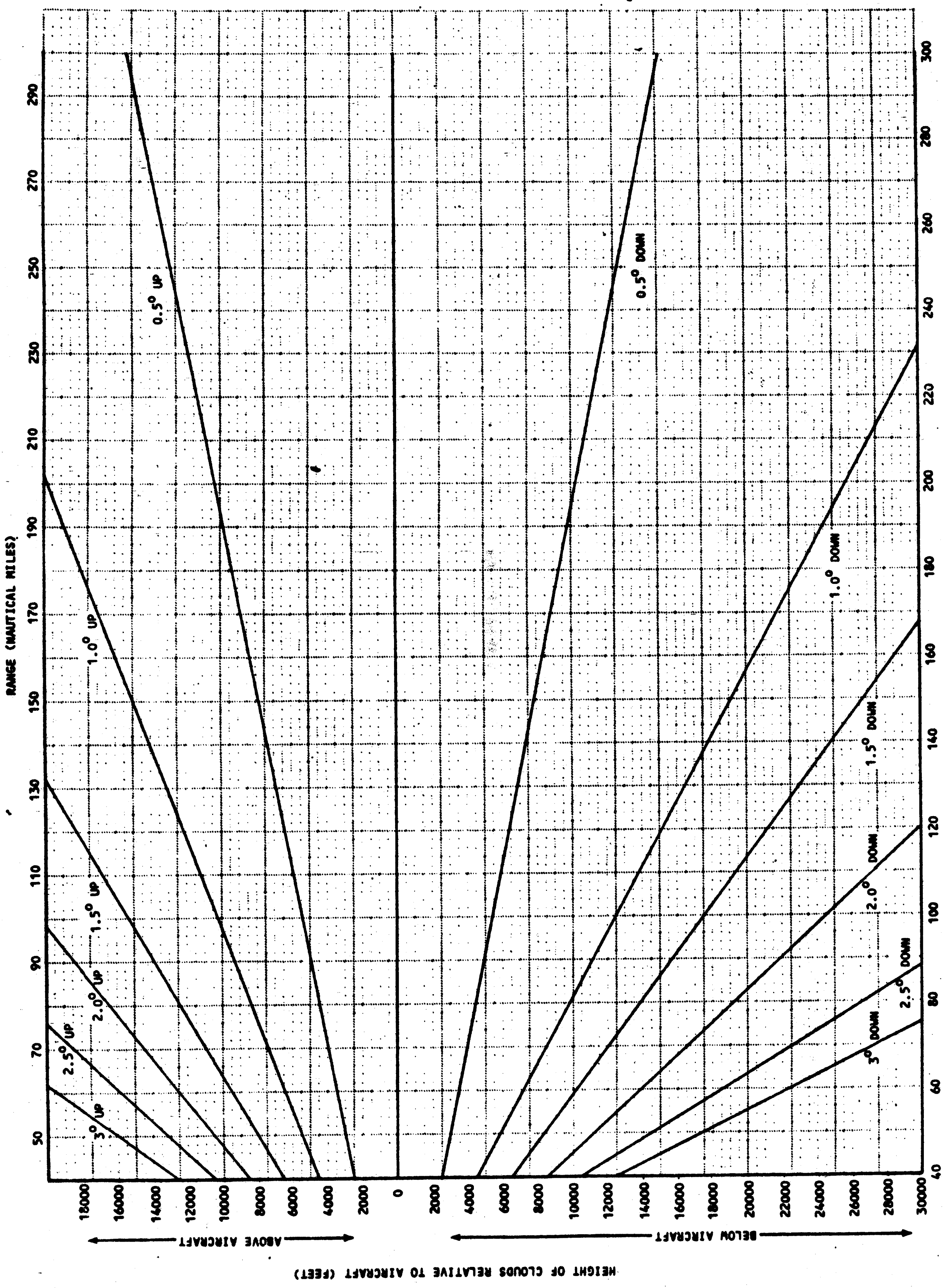
Continued......

FLIGHT IN SEVERE TURBULENCE

General Recommendations - All normal generalised recommendations regarding flight in, and avoidance of, potential areas of severe turbulence apply. In particular if overflight of a storm area is attempted it is important that it is properly established that adequate clearance will be present taking into account the possible growth rate of the storm. With the high speeds involved in supersonic flight once a decision to overfly has been made little opprotunity will be provided to modify this decision, in the form of attempting lateral avoidance, if the initial decision to overfly proves impossible at a later stage. Typically in the cruise at Mach 2.0 the latest time at which a 30° banked turn must be initiated in order to avoid a storm area of 15 nms radius directly ahead, is about 22 nms from the centre of the storm. Since this represents only about one minutes flying time from the storm centre, a more realistic range at which action requires to be taken to avoid a storm centre is perhaps twice this time or at a range of about; 40 nms. It should be noted that at this range (i.e. 40 nms) the radar beam represents a vertical depth of 10,000 ft.

Detection of severe storms should be possible at ranges in excess of 250 nms and a rough estimate of their height can be made by use of a range-height diagram whilst noting the angle of tilt at which the return is no longer received. This method can also be used to give some idea of the rate of growth of cloud. However, it is doubtful whether the relative heights of aircraft and cloud top can be known better than ± 2,000 ft at the time when an overflight/avoidance decision must be made, and this value must be added to any margin it is decided is required for overflight (e.g. typical vertical separation required over a severe storm, based on an estimate of its height by the method suggested, should be in the region of 5,000 ft).

FLIGHT IN SEVERE TURBULENCE
HEIGHT OF CLOUDS RELATIVE TO AIRCRAFT (FEET)



FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

Introduction - 'Flight Envelope' is the name given to the low and high limits of speed in relation to height, within which the aircraft is normally operated. These limits are also related to aircraft weight where this is applicable. The Envelope is represented graphically on page Vol.II.01.01.08.

'Mach/CG Boundaries' is the term used to refer to the forward and aft CG limits, in relation to Mach number, within which the aircraft is operated. The forward limits are also related to aircraft weight. The Mach/CG Boundaries are represented graphically on page Vol.II.01.01.06.

The ASIs, Machmeters and CG position indicators show continuously the limits arising from both sets of requirements, except the Lowest Authorized Speed limit (V_{LA}), as aircraft weight, height, speed and CG position vary. A normal procedure is recommended for setting the ASI index to the V_{LA} appropriate for the condition of flight. Additionally there is a system of audio, visual and/or tactile warnings should any of the limits be exceeded. A graphical illustration of the limits arising from both sets of requirements is shown, for one given CG position, on the figure on page 08.28.10.

Flight outside the limits of the flight envelope and/or Mach CG boundaries is not normally permitted, but both are constructed so that inadvertent excursions due to upsets or extreme atmospheric effects leave adequate margins to permit safe recovery back within the authorized envelope or boundary.

Under certain laid down conditions, intentional flight outside the limits is permitted for airworthiness testing and for crew training. See Section 6 Flight Manual.

Flight at and beyond the high speed limits - The high speed IAS limit (V_{MO}) varies within a wide range from 300 kt at sea level to 530 kt at about FL 430 and reduces in the conventional way with height at constant Mach number, (M_{MO}) above about FL 510. From sea level to about FL 430, V_{MO} varies also with weight. In the supersonic cruise at temperatures greater than ISA + 5°C, speed must be reduced to remain within the temperature limit, (T_{MO}).

The max. speed pointers on the ASI and Machmeter indicate the lowest of the limits determined by V_{MO}, M_{MO}, or T_{MO}. The over-speed audio warning operates if V_{MO} is exceeded by 6 kt or T_{MO} is exceeded by 4°C. To provide advance warning of a possible overspeed the audio warning will also operate if the indicated pitch attitude is more nose down than -6°, whenever the aircraft is flying at speeds greater than M = 1.0. This warning is inhibited, however, if the stick shaker is operating

Within the flight envelope, the speed and Mach trim functions automatically apply up or down elevon, through the electric trim system, to provide, as far as is reasonably possible a conventional change of trim with change in speed. This counteracts the natural trim changes that occur due to the change in lift distribution over the wing, as the aircraft accelerates up to, or decelerates from, cruise speed. When at supersonic speeds greater than M = 1.15, if speed is allowed to exceed V_{MO} + 5 kt, a further automatic trim function isintroduced to prevent any further inadvertent increase of speed. The authority of this function increases with increasing Mach number.

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

In the case of a gross overspeed outside the flight envelope, the outer elevons are automatically driven progressively to, and held at, the zero degree position, when the speed exceeds V_{MO} + 25 kt. This signal is transmitted through the electrical control channels and will therefore not be present in the mechanical signalling mode. As speed is reduced, the elevons take up their normal demanded position at V_{MO} + 20 kt. This 'neutralising' of the outer elevons prevents the lateral control reversal effect which could take place if a gross excess of speed is allowed to occur in the transonic region, and hence ensures adequate roll power is maintained.

In the supersonic cruise, when ambient temperatures are above ISA + 5°C, temperature becomes the overriding limit. Even large excursions above T_{MO} have no noticeable effect on handling characteristics or engine operating performance, however, they can have a long term effect on both airframe and engine life. Excursions above T_{MO}, must therefore be avoided and where inadvertent excursions occur, immediate action taken to reduce speed to ensure they are of only a transient nature. See page Vol.II.01.01.07.

Altitude Limit - The upper boundary of the flight envelope is 60,000 ft at all speeds. This is a more significant limit than the equivalent for conventional subsonic aircraft in that the very high kinetic energy and lift capability available at high supersonic speeds permits it to be very readily exceeded, by simple conversion of speed into height. Because of this a warning is provided when the height limit is exceeded by a significant margin, (See 'Flight at and below the low speed limits'). This height limit is not dictated primarily by handling considerations but by systems performance. Nevertheless, whenever exceeded, prompt recovery action should be taken to return to within the authorized envelope.

Flight at and below the low speed limits - The authorized low speed limits are conventionally derived at low speeds from the minimum permitted speeds during take-off and landing, (V_2 and V_{REF}). Once established en-route the minimum value (V_{LA}) is initially 250 kt increasing to 300 kt at 41,000 ft and above.

Exceedance of these limits at low levels is indicated by operation of the stick shaker whenever the incidence, (angle of attack) is permitted to go to, or beyond, 16.5°. It also operates when speed is allowed to fall below V_{LA}-20 kt, (i.e. 280 kt between 60,000 ft and 43,000 ft and 230 kt between 43,000 ft and 25,000 ft). In addition, at speeds below 380 kt the stick shaker will operate whenever 63,000 ft is exceeded. This provides warning of departure from the height limit of the authorized envelope. Recovery from stick shaker operation is achieved by increasing power and applying down elevon to increase speed and reduce incidence, (angle of attack), where appropriate, or in the case of the altitude limit being exceeded, to ensure height is lost.

The stick shaker is also operated when the aft CG boundary is exceeded by a significant margin indicating that speed is too slow for the prevailing condition (See Mach/CG boundaries).

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

The primary anti-high incidence protection systems are operative only at speeds below 270 kt since they are fitted to provide protection in the low to medium altitude range where flight at slow forward speed is required. At high altitude the primary protection against inadvertent speed loss is the stick shaker and here very significant departure from the authorized flight envelope must occur before any limiting low speed condition is reached.

At very low speeds a deterioration in longitudinal stability occurs with increasing incidence, (angle of attack). On the same principle as the speed and Mach trim, the incidence, (angle of attack), trim is used to apply automatically up or down elevon, as appropriate, through the electric trim system, to counteract this deterioration. When flying at authorized speeds the system is required only to make very small inputs, but if speed is permitted to fall well below the normal minimum value the authority of the system is increased and it serves as a measure of protection against further inadvertent loss in speed.

Protection against a rapid increase in incidence, (angle of attack), or speed decay rate, is provided by use of the pitch autostabilization system. At an incidence, (angle of attack), greater than 13.5°, both the gain and authority of the system are increased in a down elevon direction, such as to oppose any elevon control commands or external disturbances, that would otherwise produce an undesirably rapid rate of approach to the absolute safe limit (19°) or incidence, (angle of attack). Should the limiting incidence, (angle of attack), be achieved, or approached rapidly, at a speed of 140 kt or less, the pitch autostabilization system applies an additional 4° down elevon demand (i.e. on operation of the stick wobbler - see below).

Identification of the limit incidence, (angle of attack), having been reached, (or a rapid rate of approach to it), is provided by the stick wobbler. This can be likened to a pulsating stick pusher, but it operates only towards the trimmed position and the effect on the stick ceases to be felt when backward pressure on the stick is released. The system can sense rate of increase of incidence, (angle of attack) but the stick shaker system cannot. Therefore, to prevent operation of the wobbler before the stick shaker, the shaker is always signalled to operate simultaneously with the wobbler should it not already be operating.

In the normal event, recovery action should be taken well before the limiting incidence, (angle of attack), is achieved. Should it be achieved, however, either deliberately (for training purposes), or inadvertently, prompt recovery action should be taken by simultaneously applying full throttle and down elevon. When the angle of attack reduces to about 12°, and the speed begins to increase, the aircraft should be eased out of the ensuing dive by increasing attitude gently to regain the required flight path.

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

As incidence, (angle of attack), is increased to high values directional stability, as well as longitudinal stability, deteriorates. To compensate for this, the yaw auto-stabilization gain and authority are augmented at an incidence, (angle of attack), greater than 13.5°.

It should be noted that all high incidence, (angle of attack), protection devices operating through the autostabilization systems will not be operative on any surfaces in mechanical signalling.

Movement of the CG in flight - As previously mentioned, during the acceleration to cruise speeds there is a change in lift distribution on the wing. This change is similar to that found on conventional high speed subsonic aircraft and arises due to the formation and movement of shock waves on the wing at the higher Mach numbers.

Once full supersonic flow is established on any wing (i.e. supersonic as opposed to transionic flight) the shock waves take up a fixed formation which results in a lift distribution such that the centre of pressure is moved considerably further aft. During the acceleration from subsonic to supersonic speeds, therefore, although the changes in centre of pressure that occur are not necessarily continuously uniform in direction throughout the early part of the acceleration, they do eventually require a progressive need to apply more nose up control, so long as the CG remains in a constant position. This results in high drag due to a significantly deflected control surface in an already intrinsically high drag region, and it also limits manoeuvre capability in a nose up direction. In addition, the formation of shock waves reduces control effectiveness so that for a given condition more control surface deflection is required to trim than would be the case if shock waves were not present.

To compensate for the need for large control deflection angles with the attendant problems of high drag and limited manoeuvre capability, fuel is transferred aft (and hence the CG moves aft) as the aircraft accelerates. This maintains the CG in a position such as to match that of the centre of pressure so that in steady flight only small elevon angles are usually required to trim. The combination of the Mach and speed trim functions ensures that, in spite of the changes in trim due to movement of the shock waves on the wing and the CG shift, conventional stick forces with change in speed are sensibly maintained.

Since the CG position that is desirable for one condition of flight may well be unsuited to another condition, the permissible CG range is a variable, dependent on flight conditions. This has the effect of producing a unique authorized envelope for any given CG position, which lies within the overall flight envelope. A typical envelope for a CG position of 55.6% is given by the figure on page 08.28.10.

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

In flight CG limits - As it is an increase in speed accompanied by the centre of pressure change that permits safe flight at a more aft CG, the aft boundary may be considered as a modification of the conventional low speed limit, and conversely, the forward boundary can be considered as a modification of the high speed limit. However, it should be noted that at the extremes of the authorized envelope it is possible to be flying at the maximum authorized speed on the aft limit. It is also possible to be flying at the minimum authorized speed on the forward limit.

The basic criteria that govern the limits for any condition are the maintenance of adequate longitudinal stability, the control travel limits and the power available at the elevon jacks. The latter two determine the degree of manoeuvrability available. It is a requisite, therefore, that within the authorized CG range none of these factors become limiting, and that an adequate margin is provided for inadvertent transgressions of the authorized boundaries. The ultimate limits themselves vary, dependent on a number of factors and these are:-

The speed and Mach number.

The weight of the aircraft.

The engine thrust.

The total temperature variations the aircraft has been subjected to on a particular flight.

Whether or not the pitch autostabilization is operative.

The worst possible combination of these factors has been taken into account and the boundaries established accordingly. In addition the rate of fuel transfer possible has been considered where this could affect recovery from a limiting situation.

The normal procedures are matched to the normal rate of acceleration and deceleration of the aircraft, together with the rate of fuel transfer rearwards and forwards, in such a way that speed and CG position are normally maintained within the boundaries throughout the flight profile. In conditions producing extremes of performance, however, it may be necessary to 'pause' temporarily with the fuel transfer or the rate of acceleration. Mismanagement of the fuel transfer, or a gross divergence from the normal flight profile for any reason, can naturally lead to transgression of the boundaries. Indications and warnings of such transgressions are provided, and are described overleaf.

The flight deck indication of limits for take-off, landing and supersonic cruise are set at a small margin beyond the operating limits. This is to allow for tolerances in the indication system where flight is planned at the limit. For these flight conditions pre-computation of fuel quantities to meet the operating limits are made and are then cross-checked with the CG indicator once the relevant fuel quantities have been adjusted.

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

Flight at and beyond the aft limit - The aft limit is determined mainly by considerations of stability, except at low supersonic speeds, where half power to the elevons is the predominant consideration.

Good handling qualities are preserved out to the aft limit and although degraded when pitch autostabilization is lost, never reach an unacceptable level. In the very worst combination of conditions, including only half power to the elevons, it is possible at the aft limit, and at low supersonic speeds, to be unable to maintain the maximum authorized speed. Should this very unlikely combination of circumstances occur it is only necessary to reduce speed, as the procedures dictate, to 350 kt and descend until the aircraft is subsonic. Once speed has been reduced complete control will immediately be re-established. The situation arises because the elevon jacks become saturated and it is not possible to apply sufficient down elevon to maintain the higher speeds.

Saturation of an inner elevon or elevons will be indicated by the INNER ELEV warning light and the relevant procedure is the same as that for flight on half elevon power. The inner elevons are the most powerful surfaces, in the aerodynamic sense, where control effectiveness is at its worst, so it is important that their failure to follow control demands fully is known. For this reason the inner elevon warning system also brings up the warning light should a spool valve linkage fail and hence control be lost to that elevon. The likelihood of such a failure is extremely remote, but the significance of such loss at supersonic speeds is sufficient to warrant the need for a warning. Whenever the warning appears at speeds between M = 0.93 and M = 1.70 the autopilot should be disconnected, speed reduced to at least 350 kt and a bank angle of 20° not exceeded. Maintenance of the speed and bank angle limits will ensure adequate control is available for return to subsonic speed.

If the aft boundary is exceeded the Mach/CG warning will operate and the degree of exceedance will be indicated on the Machmeter and CG indicator. Should remedial action be delayed, or insufficient, the second boundary will be reached, indicated by flashing of the Mach/CG warning lights and operation of the stick shaker.

When, however, forward movement of the CG is the overriding requirement, (i.e. in the case of a Mach/CG warning in low speed flight near the ground, or in high speed flight in the cruise), the aft limit second boundary warning is inhibited at Mach numbers less then M = 0.45 or more than M = 1.6. This avoids the consequences of an instinctive reaction to the stick shaker which is an inappropriate action to effect a recovery in these conditions. If the secondary boundary warning commences above M = 0.45, it is not inhibited if the speed is subsequently reduced to below M = 0.45 and the aircraft is still outside the second boundary. This is to ensure that loss of the second boundary warning is not mistaken for successful remedial action when the aircraft is in fact still well outside the authorized boundaries.

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

It is possible to have an aft CG warning at high speed. Therefore, to avoid simultaneous operation of the stick shaker and overspeed warning, the second level of warning is inhibited if the speed is equal to or greater than V_{MO} -7kt.

Flight at and beyond the forward limit - The forward limit is determined mainly by manoeuvrability considerations. Therefore, as the aircraft accelerates from subsonic to supersonic speeds it is the rearward movement of the centre of pressure that principally determines the forward limit, coupled with need to assume the possibility of having only half elevon power available.

Manoeuvrability is considerably reduced when flying at transonic or supersonic speeds if the conditions of being on the forward CG limit and having only half elevon power are combined. In this condition if large pitch elevon demands are made, or are required roll control may be limited to that provided by the rudder. The roll control/rudder interconnect will automatically apply rudder when roll demands are made, and this can naturally be augmented if desired by pilot applied rudder inputs. Adequate, although limited, manoeuvre capability is available for safe flight within the authorized envelope, but to guard against the possibility of an inadvertent departure from that envelope the procedures require that the aircraft speed is reduced to 350 kt and then a descent carried out until the aircraft is subsonic. Once at subsonic cruise speeds full manoeuvre capability is restored.

If the forward boundary is exceeded the Mach/CG warning will operate and the degree of exceedance indicated on the Machmeter and CG indicator. Should remedial action be delayed, or insufficient, the second boundary will be reached, indicated by flashing of the Mach/CG warning lights.

Actions following warnings - The actions required following warnings are generally instinctive because the required action is seen easily be reference to the indices on the Machmeters or the CG position indicators.

If a first stage warning occurs, correct fuel transfer should be confirmed. This situation may also be corrected by increasing, decreasing or maintaining the Mach number as appropriate.

If a second stage warning occurs because of misdirection or gross mismanagement of fuel transfer, corrective action to both Mach number and CG position is required. It may be necessary to reverse the acceleration or deceleration and to reverse the direction of transfer. The appropriate actions are detailed on the figure on page 08.28.10.

In the presentation of the combined flight envelope and Mach/CG boundaries, there are 'corners' where conflicting requirements of increase/decrease speed warnings can arise following non standard management of either fuel transfer or flight profile. The appropriate actions are detailed on the figure on page 08.28.10.

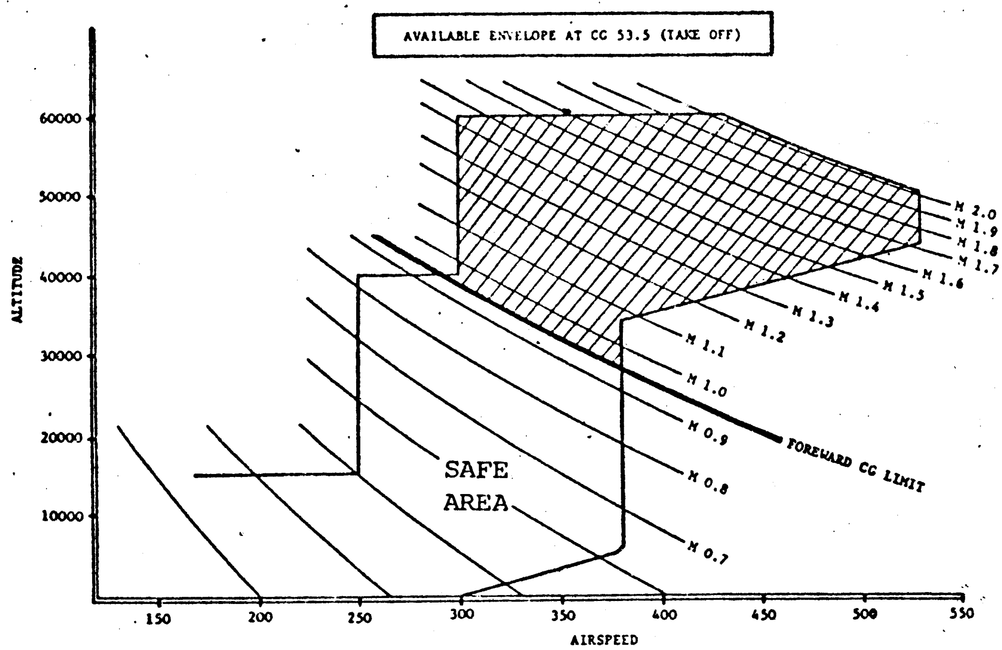
FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

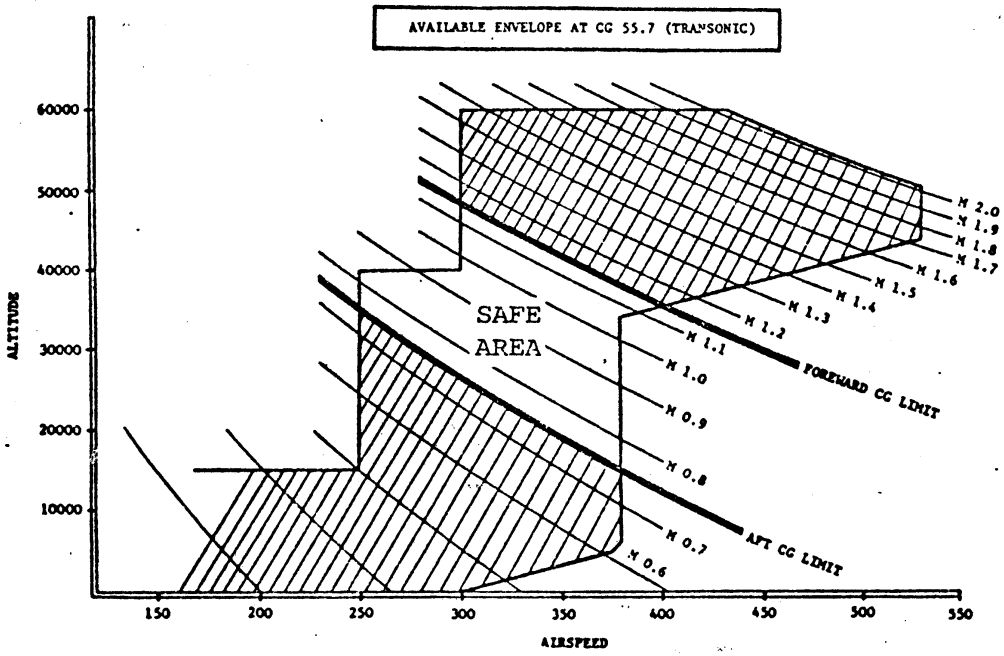
Loss of an Inner Elevon - The inner elevons are the most powerful control surfaces, in the aerodynamic sense, under those conditions where control effectiveness is at its worst. The likelihood of such a failure is extremely remote but the significance of such loss in the transonic region requires that prompt action should be taken to reduce speed and bank angle, should it occur.

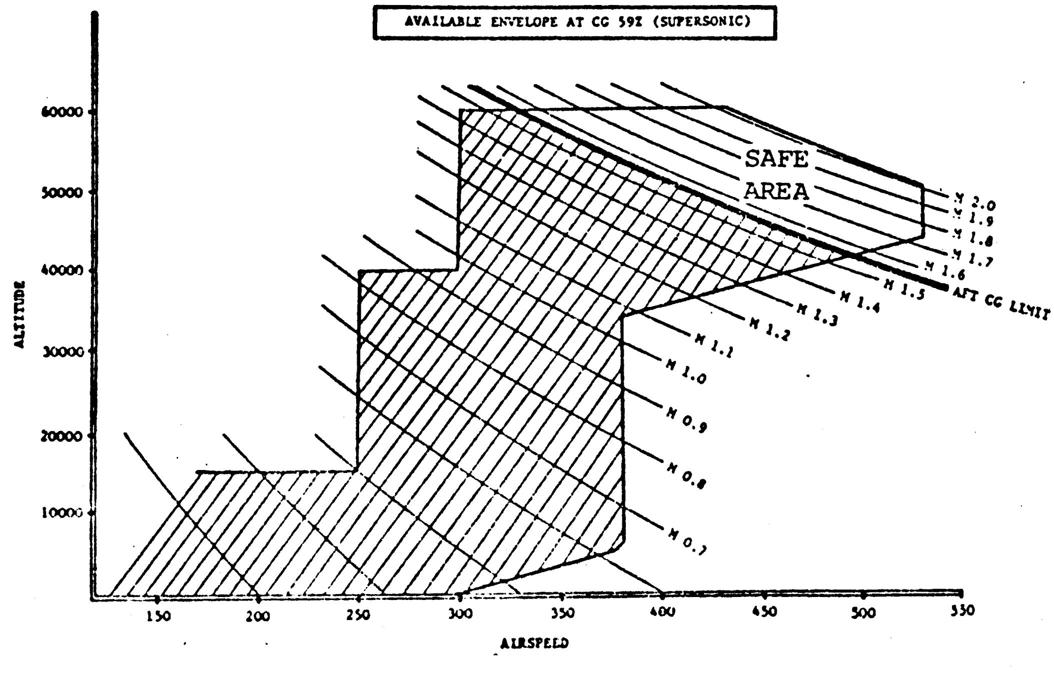
The failure can be brought about by failure of the spool valve linkage in the main servo control and will be indicated by the INNER ELEV. warning light. The failed control surface will tend to drift to the zero aerodynamic load condition and will not respond to pilot control inputs. Since the other inner elevon will respond, then unique demands in either pitch or roll will result in a combined pitch and roll response from the aircraft. This requires that slow small control movements are made where possible so that the effect is kept to a minimum. At speeds between 0.93M and 1.7M speed must be reduced to at least 350Kts. and bank angle limited to 20° to ensure that an adequate margin of control is maintained. At other speeds ample control is available but the autopilot must not be engaged at any time with this failure present.

The INNER ELEV. warning light will also indicate saturation of the elevon jacks, that is, when there is insufficient hydraulic power to move the control surface to the demanded position. This should only occur when flying on half elevon power and will be distinguishable from spool valve linkage failure by the fact the condition should only be transitory and both inner elevons will fail to respond throughout the period the warning light is on. The probability of such saturation of the inner elevon control jacks is remote, but should it occur no action is necessary other than to ensure appropriate limitations are being observed.

FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

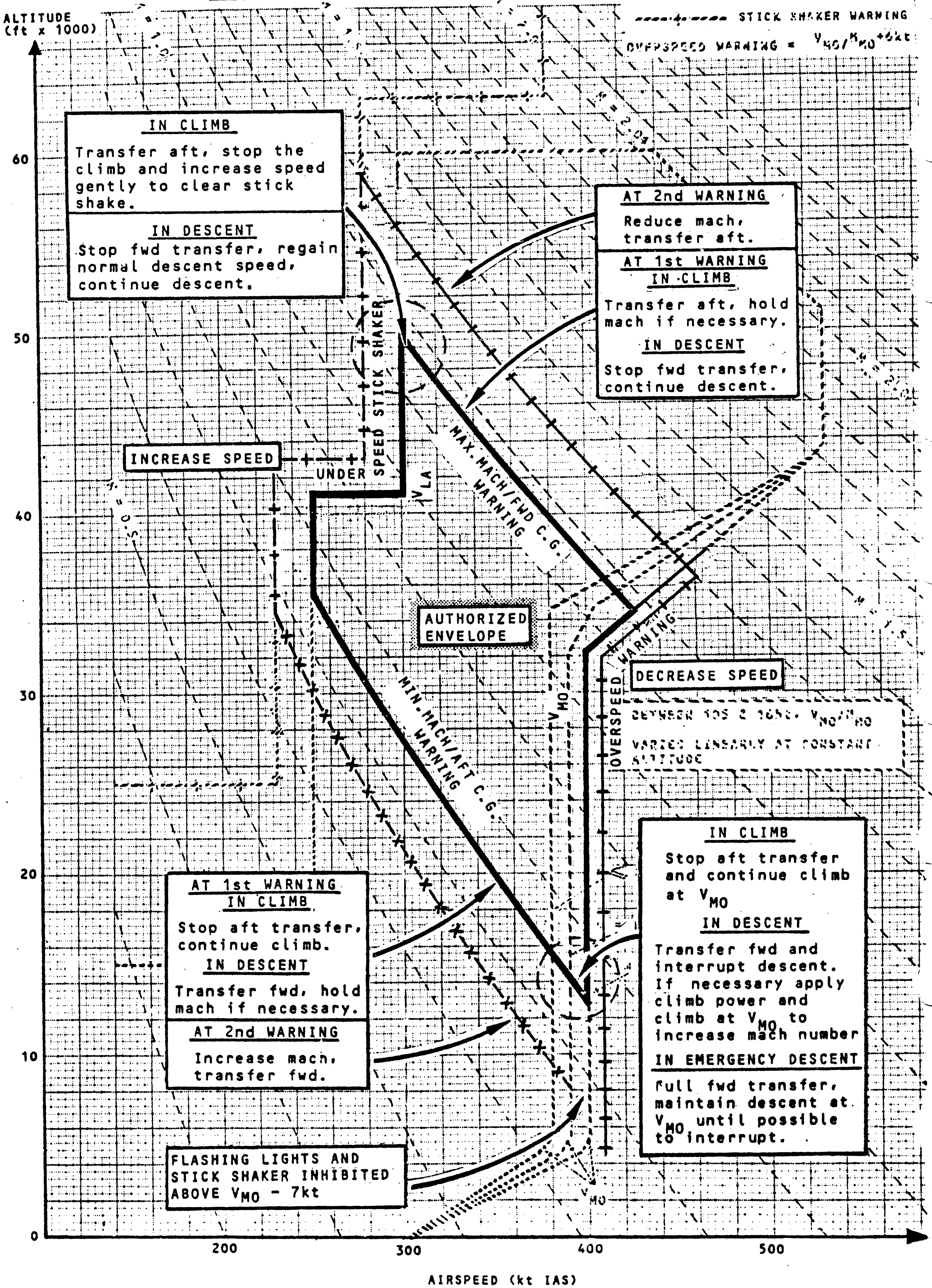






FLIGHT ENVELOPE AND MACH/CG BOUNDARIES

CORRECTIVE ACTIONS FOLLOWING WARNING OF DEPARTURE FROM AUTHORISED ENVELOPE



AUTOTHROTTLE

The autothrottle provides thrust control of speed. Normally both systems are engaged with number 1 system in control and number 2 system in synchronised standby. Autothrottles may be used for three engine or four engine flight, and must be used when the autopilots or flight directors are used in an approach mode.

Engagement - The autothrottle is engaged by selecting the switches on the autothrottle controller. Successful engagement in either the basic or prime modes is indicated by the solenoid-held switches remaining in the engaged position.

If the autopilot is not engaged, or is engaged in a compatible mode, the autothrottle will engage in its basic mode of IAS HOLD.

If the autopilot is engaged in the ALT ACQ prime mode the autothrottle switches will hold on but no lights will come on. This indicates that the autothrottles are primed and will hold the airspeed at which the autopilot starts to acquire a new altitude.

As the autopilot captures its new altitude the autothrottle IAS HOLD light will come on and the throttle levers move, to hold the speed at capture.

If the autopilot is engaged in a speed mode, engagement of the autothrottle will cause the autopilot to revert to PITCH HOLD unless the ALT ACQ is also primed.

Climb - Autothrottle is not normally used during the climb unless it is intended to carry out a subsonic cruise. In this case as soon as the autopilot or flight director is in the ALT ACQ prime mode, the autothrottle switches can be engaged.

If the autothrottle is not engaged when the autopilot or flight director starts to capture the selected altitude, the red AT lights on the warning and landing displays will flash.

Subsonic Cruise - Level subsonic segments of flight are usually carried out with the autothrottle engaged. If the autothrottle is engaged in its basic mode of IAS HOLD, the autothrottle datum adjust on the pedestal can be used to alter airspeed by up to 22 kts.

If the autothrottle is in the MACH HOLD mode, the autothrottle datum adjust can alter the datum by ± 0.06 M.

If a greater change of speed is required, the desired figure can be set on the autothrottle SPEED SELECT and the IAS ACQ light pressed.

NOTE: When the IAS ACQ light is pressed, the bar which partially obscures the numbers in the speed select window is removed. The IAS ACQ mode once engaged will remain engaged until another mode selection is made or the autothrottle is disengaged. The speed range available on SPEED SELECT is 130 to 400 kts.

Level Supersonic Cruise - On passing through M = 2.00 engage the autothrottle in MACH HOLD.

Supersonic Cruise Climb - On achieving M = 1.7 prime the autothrottle associated with the autopilot in use. At the corner point between 530 kts and M = 2.00 or T_{MO}, the autothrottle will engage in MACH HOLD. See AUTOPILOT for AP/AT combination in supersonic cruise climb.

AUTOTHROTTLE

Deceleration and Descent - Throttles are manually controlled during the descent until below M = 1.00 when they are fully closed. When cleared to a subsonic flight level this level should be set on the ALTITUDE SELECT, the autopilot or flight director selected to the ALT ACQ mode and the autothrottle switches engaged.

When the selected altitude is captured the autothrottle will engage in the IAS HOLD mode and maintain the IAS at capture.

Approach - The normal four and three engine approach on Concorde is with both autothrottles engaged, if for some reason autothrottle is not available special care must be taken. Final approach is carried out with AT in IAS ACQ and desired speed set in the IAS ACQ window.

NOTE: When a new speed is selected in IAS ACQ mode and a discrepency of approx 10 kts or more exists between the selected speed and the actual speed, the amber light on the ASIs will be on.

Final Approach - Speed should be reduced to the target speed in one step, particularly in the event of an intended autoland. If this is not possible the speed should be reduced from intermediate approach speed, e.g. 190 knots, to the target speed in not more than two steps aiming to achieve the target speed at, but not lower than, 700 feet.

On a manual approach the autothrottles must be disengaged at 40 feet, the power at disengagement being maintained until 15 feet.

NOTES: The above procedure is necessary because if, during the final approach, the speed is reduced in small steps at short intervals, such that the difference between the selected speed and the actual speed remains less than 12 knots, a cumulative error can be built up which will cause the achieved final approach speed to be lower than that selected. The magnitude of this error will depend on the number of steps and the interval between them, but could be up to 12 knots.

Autothrottles must not be used:

(a) In the IAS HOLD mode below 185 kts.

OR

(b) With 2 engines inoperative.

Automatic Landing - Speed on the approach is controlled in IAS ACQ using the SPEED SELECT control.

At 15 feet radio altitude the throttle levers will close at the rate of 4^{O} per second to the minimum autothrottle limit.

At mainwheel contact disconnect the autothrottles using an instinctive disconnect button on the outboard throttles and fully close the throttles.

Apply reverse thrust in the normal manner.

Reduced Noise Approach - On reducing to 190 kts engage AT in IAS HOLD. Preset V_{TT} in IAS ACQ window and upon reaching 800 ft R.A. engage AT in IAS ACQ.

AUTOTHROTTLE

<u>Disengagement</u> - When autothrottle is no longer required, it is cancelled by using an instinctive disconnect button. Whenever the autothrottle is disengaged the AT red lights on the warning and landing displays will start to flash. These flashing lights can be cancelled by operating an autothrottle disconnect button again.

Individual autothrottles can be disengaged by the switches on the overhead panel.

The slip clutches in the autothrottle mechanism allow direct manual override.

<u>Destabilising Effect of Autothrottle</u> - Autothrottle is of considerable benefit when hand flying particularly at lower speeds, provided that attitude changes are kept small. It should be remembered however, that there is a "destabilising effect" which becomes more apparent with large attitude changes.

Without autothrottle, the aircraft has a normal tendency to return to its original speed following a disturbance or change in attitude.

With autothrottle, speed is maintained following a disturbance or change in attitude, but the power change which achieves this, produces a change in trim which tends to sustain the divergence.

This effect increases the need to monitor attitude carefully in order to prevent divergence from the desired flight path. This need is particularly noticeable in the approach phase and is also noticeable in turns.

(Deletion)

AUTOPILOT

The aircraft installation consists of two autopilots, which can operate from 500 ft on climb out, throughout the flight to decision height on approach or to a fully automatic landing. Normally the autopilot appropriate to the handling pilot would be used and only in LAND mode can both autopilots be engaged.

Engagement - Above 500 ft in the climb or 1000 ft in cruise the appropriate AP switch may be engaged. Successful engagement is indicated by the switch remaining engaged with its associated AP light (green) on.

Successful engagement requires:-

1. Turn control in detent.
2. An electric trim.
3. Associated relay jack serviceable and hydraulic system pressurised.
4. Associated INS serviceable.
5. Associated compass coupler serviceable.
6. Associated ADC serviceable.
7. All three axes of the associated autostabilisation system serviceable.
8. No excess incidence or pitch attitude warnings.

On engagement the autopilot will be in its basic modes of PITCH HOLD and HDG HOLD.

If the aircraft is manoeuvring at engagement, the autopilot will level the wings and regain the heading at engagement while maintaining pitch attitude. In the basic modes, turns up to 35° of bank are accomplished using the AUTOPILOT TURN knob, and pitch attitude changed by using the autopilot datum adjust.

NOTES: 1. Operation of the AP TURN knob will cause the autopilot to revert to basic modes from any modes except LAND and GO AROUND.

2. BACK BEAM is only a flight director mode, the autopilot will not engage in this mode.

Navigation - After engagement navigation can be achieved by:-

1. In HDG HOLD using the TURN knob.

OR

2. Selecting the desired heading or track, using the HDG PULL/TRK PUSH selector appropriate to the engaged autopilot and pressing TRK HDG. Subsequent movement of the HDG PULL/TRK PUSH selectors with this mode engaged, will cause the aircraft to turn onto the selected heading or track.

OR

3. Pressing INS, the autopilot will acquire and hold the track between the waypoints set in the associated INS.

OR

AUTOPILOT

4. Pressing VOR LOC. The autopilot will, if on a suitable heading, acquire and hold the VOR radial or localizer set on the associated nav. radio and VOR/LOC REF selector. During acquisition the triangular prime light only will be on. Successful capture of the radial is indicated by the VOR LOC light illuminating and the prime light going out.

Climb - After engagement the vertical flight profile can be achieved by:-

1. In PITCH HOLD using the autopilot datum adjust knob to control pitch attitude.

OR

2. Pressing IAS HOLD. The IAS at engagement will be held but a change of ± 20 kts is available using the AUTOPILOT DATUM ADJUST.

OR

3. Pressing MACH HOLD. The mach number at engagement will be held but a change of ± 0.06 M is available using the AUTOPILOT DATUM ADJUST.

OR

4. Pressing VERT SPEED. The vertical speed on engagement will be held, as displayed by the white command bug and index on the associated VSI. The autopilot datum adjust will alter the demanded vertical speed to a maximum of 6,000 ft/min climb or descent, and display the demand on the VSI.

OR

5. Pressing MAX CLIMB when at or near V_{MO}. Speed will be controlled to V_{MO}. The datum can be varied by ± 17.3 Kts, using the autopilot datum adjust. It may take up to six minutes for the aircraft to settle at the new datum. MAX CRUISE will engage and MAX CLIMB disengage at the flight envelope "corner point" between 530 knots and M = 2.00 or T_{MO}.

NOTE

At the automatic disengagement of MAX CLIMB any datum shift inserted while in that mode will be zeroed.

OR

6. Pressing ALT HOLD, holds the altitude at engagement. This altitude may be adjusted ± 600 ft using the autopilot datum adjust.

OR

Continued......

AUTOPILOT

7. Pressing ALT ACQ initiates the acquisition of the altitude set on the ALTITUDE SELECT. The ALT ACQ prime light will indicate that this mode is primed and the autopilot will remain under the control of the previous mode (except ALT HOLD). As the aircraft approaches the selected altitude the ALT ACQ light will come on and the prime light and previous mode lights go off. At the selected altitude the ALT ACQ light will go off and the ALT HOLD light will come on.

NOTE: If during an autopilot or flight director ALT ACQ manoeuvre the autothrottle is not engaged at the time of capture initiation, then the red AT light will flash on both warning and landing displays.

OR

8. Pressing TURB. The turbulence mode should only be used in very severe turbulence conditions when the use of PITCH HOLD results in autopilot disconnects. It will hold existing pitch attitude and heading and reduce the trim rate of the electric trim system.

Subsonic Cruise - Navigation can be achieved as previously described.

Level subsonic cruise will normally be carried out in ALT HOLD with the speed controlled by the autothrottles in MACH HOLD or IAS mode as appropriate.

Climb or descent to a different subsonic level can be accomplished by:-

Selecting the new cleared altitude on the ALTITUDE SELECT and pushing the ALT ACQ light; the ALT ACQ prime light and the

VERT SPEED light will come on and the ALT HOLD will go off. The aircraft will start to change height towards the selected level at 800 FPM. The vertical speed can be changed using the autopilot datum adjust and the command bug on the associated VSI shows the selected vertical speed. The aircraft will capture and stabilise at the selected level in ALT HOLD mode.

Transition from Subsonic Cruise to Supersonic Flight - When clearance is obtained for climb and acceleration:

1. Set the ALTITUDE SELECT to the cleared level or 60,000 ft.
2. Press PITCH HOLD.
3. If within 15 kts of V_{MO} increase pitch attitude by 3^{o}.
4. Disengage autothrottles and select climb power.
5. Climb at V_{MO}.
6. At 0.93 M increase pitch attitude a further 2^{o} and select reheats on, two at a time.
7. Use autopilot datum adjust to achieve V_{MO}.
8. At V_{MO} engage autopilot in MAX CLIMB mode.
9. At M = 1.70 prime the associated autothrottle.
   At M = 1.70 or after 15 minutes operation cancel reheat.

Uninterrupted Climb - The ideal Concorde climb is at V_{MO} until the cruise climb is started at M = 2.00 or T_{MO}.

As soon as the restrictions of ATC and noise abatement allow, apply climb power and fly the aircraft to V_{MO} using the PITCH HOLD mode. In level flight it is necessary to anticipate arrival at V_{MO} by about 15 kts and to pitch the aircraft up to about 10°, using the datum adjust. Stabilise the speed close to V_{MO} and engage the MAX CLIMB mode, At M=1.70 prime the associated autothrottle.

CAUTION

IN MAX CLIMB AND MAX CRUISE MODES COMBINED USE OF AUTOPILOT 1 WITH AUTOTHROTTLE 2 OR AUTOPILOT 2 WITH AUTOTHROTTLE 1 IS PROHIBITED BECAUSE SMALL DIFFERENCES BETWEEN THE OUTPUTS FROM ADC 1 AND ADC 2 MAY JEOPARDIZE THE PROPER SIMULTANEOUS FUNCTIONING OF THE AUTOPILOT AND AUTOTHROTTLE.

Reheat is selected, two at a time, at M = 0.93 and is used to M = 1.70 or for 15 minutes. The MAX CLIMB mode of the autopilot should cope satisfactorily with the thrust changes involved.

Supersonic Cruise Climb - Providing the autopilot is engaged in MAX CLIMB mode the autopilot will, at the "corner point" between 530 kts and M = 2.00 or T_{MO}, automatically engage in MAX CRUISE. This engagement will be observed at or before 50,200 feet. At the same time the autothrottle will engage in MACH HOLD. The autopilot/autothrottle combination is programmed to increase Mach number to 2.02 and return to 2.00. The autothrottle MACH HOLD light will not go off until the throttles are again fully open and the Mach number has reduced to 2.01 or 100 seconds have elapsed.
When the limiting cruise climb condition is T_{MO}, the climb phase immediately following the corner point will be achieved at a speed for which TMO may be exceeded by a few degrees. This exceedance will only be observed at high ambient temperature and low weight and will be of short duration. The exceedance should be tolerated provided the high speed warning is not activated.

NOTES:

As soon as MAX CRUISE engages the datum adjust facility is inhibited and if the datum has been shifted during the MAX CLIMB segment, the shift is automatically zeroed when MAX CRUISE engages.

Also at engagement of MAX CRUISE the flight director not assoicated with the Autopilot in control no longer displays pitch information.

A sustained turn or increasing ambient temperature during the cruise will cause the Mach Number to fall. In attempting to regain the cruise condition the aircraft will descend. The rate of descent will be in proportion to the initial reduction in Mach Number.

Throughout the cruise climb if an overspeed starts to develop, the primed autothrottle will become active and the MACH HOLD light will come on.

If an autothrottle is inadvertently left primed at the end of the cruise, retarding the throttles will cause the primed autothrottle to intervene and take the throttles back to the fully forward position.

NOTES

1. If the autopilot is selected to MAX CLIMB at altitudes above 50,200 feet the autothrottle/autopilot will perform the normal MAX CRUISE engagement cycle.
2. If the autopilot is disconnected when in MAX CRUISE, either inadvertently or deliberately, the autothrottle will automatically engage in MACH HOLD mode.
3. If the autopilot MACH HOLD or IAS HOLD modes are selected when in MAX CRUISE mode the autothrottle will automatically disconnect.
4. If the autopilot PITCH HOLD, ALT HOLD, VERT SPEED or ALT ACQ modes are selected when in MAX CRUISE mode the autothrottle will automatically engage in MACH HOLD mode.

Supersonic Cruise Climb without Autothrottle

Capture - When approaching the "corner point" between 530 kts and M = 2.00 or T_{MO} with the autopilot engaged in MAX CLIMB, observe the average rate of climb.

IF....the average rate of climb exceeds 500 ft/min wait until the MAX CRUISE mode light comes on. Then retard the throttles to decrease N_2 by 1% per 250 ft/min in excess of 500 ft/min. Continue to adjust N_2 until an average rate of climb of 500 ft/min at a speed not exceeding M = 2.00 is established. Then apply full power.

IF....the average rate of climb is 500 ft/min or less leave the throttles at full power and observe the MAX CRUISE light comes on.

(Completely Revised)

Cruise - With the MAX CRUISE light on and the throttles fully forward continue to monitor the rate of climb and speed.

Sudden temperature or wind shears may lead to an increase in Mach Number accompanied by a pitch up. In these conditions it is prudent to control the likely overspeed by reducing N_2 by 1% per .01M in excess of M = 2.00. As the Mach Number reduces to M = 2.00 re-apply full power.

Overspeed - If the overspeed warning is activated, retard the throttles to 18° or 24°. When the warning ceases slowly increase power in order to achieve full throttle at M = 2.00.

NOTE

In the case of an abnormally large overspeed, i.e. M = 2.10 or if the overspeed is sustained with the throttles retarded to 18° or 24°, the throttles may be retarded to flight idle.

Optimum Stepped Cruise Procedure - This procedure minimises fuel penalties and should be used whenever possible if stepped cruise is essential.

On passing through M = 2.00.

1. Engage autothrottle in 'MACH HOLD'.

2. Select 'VERTICAL SPEED' hold.

3. Prime 'ALTITUDE ACQUIRE' for 1500 ft below estimated aircraft ceiling.

4. When the aircraft is established in altitude hold, check the aircraft's height relative to its ceiling from the actual ambient temperature. If the aircraft is outside the range of 1200 to 1800 ft below its ceiling, adjust as necessary using the altitude acquire mode.

5. Cruise in ALTITUDE HOLD and autothrottle.

NOTE

From estimation or observation on the climb, it may be obvious that in warm conditions the aircraft initial cruise altitude will be reached at a Mach No. less than M = 2.00. In this case prime ALTITUDE ACQUIRE for the estimated ceiling and when the ALTITUDE ACQUIRE light illuminates, engage the autothrottle in MACH HOLD. Check the altitude relative to the ceiling as before.

(Completely Revised)

This procedure may result in the aircraft holding a slightly lower Mach No. than desirable and the fuel penalty may be increased. For this and the general reason that fuel penalties for operating below ceiling are greater in hot conditions, cruise/climb should be used whenever possible.

6. Using ALTITUDE ACQUIRE increase cruise altitude by 1000 ft for every 8000 Kgs of fuel burnt, using the start of cruise fuel weight as datum.

NOTE

If cruising into increasing ambient temperature, it may not be possible to increase altitude as described. In these cases the procedure should be adjusted to maintain the aircraft 1200 to 1800 ft below its ceiling at the time when altitude changes are required.

Using this procedure, the aircraft is maintained well within the weight/altitude/temperature band, where the use of autothrottle in supersonic cruise is allowed by the Flight Manual.

Overspeed - In cruise with autothrottle, the number of high speed warnings is reduced. However, should there be a high speed warning which is not immediately corrected by the autothrottle, then carry out the procedure detailed previously.

Alternative Stepped Cruise Procedure - Air Traffic Control constraints in particular may demand cruise at constant altitude for long periods, with stepped altitude changes of at lease 4000 ft. The same procedures for climb and cruise acquisition as detailed above should be used as far as possible.

Cruise -

1. On acquiring assigned altitude, continue cruise in ALTITUDE HOLD and autothrottle in MACH HOLD.

2. On reaching the combination of weight/altitude/temperature, where autothrottle is not permitted, disconnect autothrottle and control the Mach No. by manual throttle using small movements of the throttles and allowing the Mach No. to vary in the range M = 1.98 to M = 2.02. Above 50,000 ft the approximate weight to meet these conditions is 125,000 kgs.

(Unch ed)

3. Use VERT SPEED and ALTITUDE ACQUIRE for stepped altitude changes with either autothrottle in MACH HOLD, if its use is permitted, or manual throttle.

NOTE

Fuel penalties can become significant especially in temperatures above ISA + 5°C.

The reason for the restriction of autothrottle in certain combinations of weight/altitude/temperature, is due to the ability of the autothrottle system, following an atmospheric disturbance, to close the throttles beyond the normal throttle closure limit (i.e. 18° or 24° throttle angle depending on ambient temperature). This could result in a 'pop' engine surge.

Supersonic Cruise below 47,000 ft - In the remote event of a radiation warning, it is necessary to cruise at 47,000 ft or below. It is important not to lose speed in the descent, otherwise it may be extremely difficult or even impossible to achieve V_{MO} at the desired flight level.

Procedure

1. Disengage autopilot.
2. Descend at M = 2.0 to 50,000 ft and then at V_{MO} until reaching cruising level. Rate of descent should be limited to 2,000 ft/min maximum.
3. Re-engage autopilot.
4. Select 'ALT HOLD' and autothrottle to maintain cruise at V_{MO}.

NOTE

If the cruising level is below 45,000 ft care must be exercised not to exceed V_{MO} in the descent passing through 44,000 ft where V_{MO} starts to decrease from 530 kt.

Deceleration and Descent - When cleared to a subsonic level:-

1. Set the ALTITUDE SELECT to the cleared level.
2. Engage ALT HOLD; the other autopilot pitch modes will disengage.
3. Retard throttles to initial descent power.
4. When speed has reduced to 350 kts engage the autopilot IAS HOLD mode.

NOTE

Speed initially falls off slowly but at an increasing rate. Since V_{LA} at cruise altitudes is 300 kts attention must be paid to speed during this manoeuvre.

5. Press ALT ACQ and note that the prime light comes on.

6. Set both autothrottle switches to engage.

NOTE

Engagement of autothrottles, when ALT ACQ is selected, will only arm the autothrottles. The autothrottle will automatically engage in IAS HOLD at the altitude capture point.

7. Throttles are adjusted manually during the descent.

Acquisition of the selected height is indicated by the following.

1. The ALT ACQ light on, and the ALT ACQ prime light and autopilot IAS HOLD light off.

2. The autothrottle IAS HOLD light comes on and the throttles open to maintain speed.

3. At the selected altitude the ALT HOLD caption comes on and ALT ACQ goes off.

NOTE

If a prolonged subsonic cruise is necessary speed should be adjusted to the required cruise speed using the autothrottle IAS ACQ and MACH HOLD modes.

<u>Subsonic Stepped Descent</u> - On re-clearance to a lower altitude:-

1. Set the cleared altitude on the ALTITUDE SELECT.

2. Press the ALT ACQ light. The ALT HOLD light goes off and the ALT ACQ prime light and VERT SPEED light come on.

NOTE

Vert speed is automatically engaged upon selection of ALT ACQ from ALT HOLD. The aircraft will start to change altitude at a rate of 800 fpm.

3. Set the required rate of descent on the appropriate VSI command bug using the autopilot datum adjust.

4. When approaching the selected altitude, the ALT ACQ light will come on and the ALT ACQ prime light and VERT SPEED light will go off.

5. At the selected altitude the ALT HOLD will engage and the ALT ACQ disengage.

6. The autothrottles will maintain the selected speed throughout the manoeuvre.

If re-clearance to a lower altitude occurs while the ALT ACQ light is on and before ALT HOLD engages:-

1. Set the ALTITUDE SELECT to the new cleared altitude.

NOTE

Resetting the altitude select during a capture phase will engage the PITCH HOLD mode.

2. Press VERT SPEED light and adjust the vertical speed to a desired value using the autopilot datum adjust.

3. Altitude capture will occur as previously described.

Initial Approach -

1. The most convenient mode to use when following radar vectors or carrying out a procedural let down is TRK HDG. The aircraft heading being adjusted on the HDG PULL/TRK PUSH selector.

   However, if desired HDG HOLD and the autopilot TURN knob could be used.

2. Speed is controlled with the autothrottle in the IAS ACQ mode and using the SPEED SELECT control, except for Reduced Noise Approach when AT in IAS HOLD is employed.

3. Altitude is maintained in ALT HOLD and changed as previously described in stepped descent.

ILS Approach

1. On VHF NAV control units set required frequencies. Verify identifications and set localiser headings using the VOR LOC REF controls.

2. Using TRK HDG mode select a heading to give an intercept angle that satisfies the capture envelope.

3. Press VOR LOC light and observe the prime light comes on. At localiser capture the VOR LOC light will come on, the prime light and the TRK HDG lights will go off.

4. When established on the localiser, engage GLIDE mode and observe the prime light comes on.

(Unchanged)

5. At glide slope capture the GLIDE light will come on, the glide prime light go off and ALT HOLD disengage.

NOTE

If the GLIDE light is pressed before LOC VOR, both LOC VOR and GLIDE modes will be primed.

If the LAND light is pressed, the LOC VOR and GLIDE and LAND modes will be primed.

6. Speed is controlled throughout the approach by the autothrottle in the IAS ACQ mode using the SPEED SELECT control, except for Reduced Noise Approaches when AT in IAS HOLD is used down to 800 ft R.A., at which stage AT IAS ACQ is engaged.

When established on the localiser (but not on Reduced Noise Approach), LAND may be pressed instead of GLIDE. In this case LAND prime and GLIDE prime lights come on. On glide slope capture the LAND light comes on and VOR LOC & GLIDE lights go off. LAND mode progressively reduces bank angle limits and beam sensitivity during descent on the glide slope.

Go-Around - If an overshoot is required after GLIDE or LAND lights are on:-

1. Disconnect the autothrottles using an instinctive disconnect button on the outboard throttles.

2. Push the throttles fully forward. This will engage the autopilot in the GO AROUND mode. The aircraft will pitch up to 15° and level the wings.

3. At 1,000 ft select HDG HOLD then PITCH HOLD. This will take the autopilot out of the GO-AROUND mode and put it into the basic modes of PITCH HOLD and HDG HOLD.

4. Re-engage other autopilot modes as desired.

5. When required speed and altitude attained, engage both autothrottles.

Autoland -

1. If land 3 capability is required, the SSB and Battery selectors must be set to SPLIT and ESS MAIN SPLIT respectively.

The LAND 2 and LAND 3 lights are armed. The ILS excess deviation lights are armed once the associated flags are cleared.

(Unchanged)

2. Position the aircraft onto the localiser as described in ILS approach.
3. When the localiser is captured the VOR LOC light will come on, LAND prime and GLIDE prime lights will remain on.

   Reduce the autothrottle selected speed to V_{REF} + 30 kt or 190 knots, whichever is the greater.
4. Carry out the AP changeover check.
5. At glide slope capture, the GLIDE prime light will go off, the GLIDE light will come on and the previous pitch mode will disengage. At one dot glide deviation reduce the autothrottles selected speed to target approach speed.

   NOTE

   The autopilot can capture a glide slope from above or below providing the vertical speed is between minus 2000 and plus 500 ft per min.
6. At glide slope capture, providing that the aircraft has been on the localiser for 15 seconds, LAND will come on and the land prime and GLIDE light will go off.

   NOTE

   At this stage in the automatic approach the AFCS panel status will be as follows:-

   Autothrottles engaged in IAS ACQ mode
   LAND light on
   Both autopilots engaged
   At lease one flight director engaged.
7. At glide slope capture the flare law in both autopilots is automatically checked.
8. If at 700 ft LAND light is not on, revert to GLIDE mode and continue approach.
9. At 300 ft confirm the capability is LAND 2 or LAND 3.

   NOTE

   Below 300 ft the capability indications are latched on except in the event of loss of both autopilots.
10. The flare height is dependant on rate of descent but will be at about 50 feet.

(Delet

11. At 30 feet automatic decrab commences.

12. At 15 feet the autothrottles will start to close at 4^{o} per second.

13. At mainwheel contact; disconnect the autopilots and autothrottles, close the throttles fully and apply reverse in the normal manner.

Disengagement - Autopilots may be disengaged by using the AP DISC push buttons on the control columns or by using the AP1/AP2 switches on the AFCS controller.

Disengagement of the autopilot is accompanied by an audio (cavalry charge) and the AP light on both warning and landing displays. These warnings can be cancelled by pressing the control column button again.

(Deletion)

FLIGHT DIRECTOR

The two flight directors use the same input signals as the corresponding autopilots, and can be used regardless of the engagement state of the autopilots.

Engagement - Above 500 ft in the climb or 1,000 ft in cruise, either or both flight directors may be engaged. Successful engagement is indicated by the switch remaining on.

If a flight director is engaged prior to autopilot engagement, the flight director will engage in its basic mode of PITCH HOLD, and only the pitch command bar will show on the appropriate ADI.

If a flight director is engaged when an autopilot is already engaged, the flight director will assume the existing modes.

If an autopilot is engaged after the flight director, the autopilot basic modes will engage and the flight director command bars will be removed. However, if the flight director is in LAND mode the autopilot will also engage in LAND mode.

Navigation - Selection of any navigational mode will bring the roll command bar into view. By following these commands normal navigation can be achieved. The flight director also has a BACK BEAM facility which is not available to the autopilot.

Climb Cruise & Descent - The flight director can be used to follow the vertical profile in exactly the same way as described under Autopilot, with the following differences:

1. If both FDs are engaged in the VERT SPEED mode, only the captain's pitch command bar will be visible and the captain's VSI white command bug will control the vertical speed demand.
2. The TURB mode is not available to the flight director.
3. With only the flight director engaged, use of the auto-pilot datum adjust zeroes the FD pitch command bar.

Approach, Landing and Go Around - The approach, landing and go around are selected on the flight director in the same way as for the autopilot, with the additional facility of BACK BEAM.

NOTE: In order to obtain LAND 3 capability on the autopilot, it is necessary to have at least one flight director engaged.

Switching - The normal position of the FD1/FD2 switches is outboard so that the captain has FD1 selected and the first officer FD2. The FD in use is indicated by a flag on each ADI. It is possible for either FD to supply both ADIs by use of the FD1/FD2 switches. However an interlock will prevent both FD switches being in the inboard position at the same time.

Disengagement - Flight directors are normally disengaged using the switches on the AFCS controller. They will automatically disengage at an aircraft pitch attitude of 20° or an incidence of 18° accompanied by the FD flags on the ADIs.

INERTIAL NAVIGATION SYSTEM

Normal Procedures - Those INS procedures which are carried out either during cockpit preparation or as check list items, are described in the NORMAL PROCEDURES section of the Flying Manual.

Navigation - The aircraft will normally be operated during the en-route phase of flight with the autopilot engaged in the INS mode.

When following subsonic airways, the primary navigational aid will be the point source airways facilities i.e. VOR, NDB, DME. The autopilot may still be used in the INS mode, but at least one HSI should be selected to RAD and the aircraft's position monitored by reference to the airways facilities.

Accuracy - To prevent placing sonic booms outside the flight corridor, it is necessary that the supersonic portion of the flight should be flown with the greatest accuracy.

Mix - To assist in accurate route flying, the INS are always used in the Mix mode.

DME Updating - To further increase the accuracy of the INS, the Mixed position may be updated by ranges from either one or two DME stations.

Automatic Data Entry Unit (ADEU) - An ADEU card reader may be used to insert the DME station data and waypoints into the computers of numbers 1 and 2 INS.

(To insert DME station data refer to the Flying Manual NORMAL PROCEDURES).

ADEU ERROR Light Illumination During Card Insertion - The ERROR light on the ADEU will illuminate if the ADEU detects a card read error. Before starting another card read operation the ERROR light must be pressed and put out. If necessary the ADEU can be restarted by pressing the AUX START button.

INS WARN Light Illumination During Card Insertion - The CDU warn light will illuminate if the data from the ADEU fails a reasonableness test. If this occurs set data selector to DSRTK/STS and verify that action code 05 with malfunction code 55 are present. The malfunction code should be cleared and the card reinserted.

DME Station Data Verification - Verification that the DME station data has been correctly loaded must be carried out separately for each INS, except that if the data has been loaded by the REMOTE function, only the receiving INS need be verified.

DME Data Display - To display DME station data for verification:

1. Set waypoint/DME selector to desired DME station number.
2. Set data selector to WAY PT.
3. Press keys 7 and 9 simultaneously.
   The latitude and longitude of the DME station appear in the lefthand and righthand data displays respectively.
4. Press keys 3 and 9 simultaneously.
   The altitude of the DME station in thousands of feet, and the frequency of the DME station in MH_z appear in the lefthand and righthand displays respectively.

   (e.g. ------- 8 = 8,000 ft. $11^{o}05.0$ = 110.50 MH_z).

Manual Insertion of DME Station Data - If no DME data card is available the DME station data may be inserted manually as follows:-

1. Set data selector to WAY PT.
2. To insert data into INS numbers 1 and 2 simultaneously press REMOTE keys on both INS.
3. Set waypoint/DME selector to the number of the DME station to be loaded. (This number may be chosen quite arbitrarily provided a different number is used for each DME station).
4. Simultaneously press keys 7 and 9.
5. Load latitude of DME station and INSERT.
6. Load longitude of DME station and INSERT.
7. Simultaneously press keys 3 and 9.
8. Press key 2 or 8. This enables DME station altitude to be loaded.
9. Load DME station altitude to nearest thousand feet (e.g. 6,800 ft = 7, 12,300 ft = 12) and INSERT.
10. Press key 4 or 6 to enable DME station frequency to be loaded.
11. Load DME frequency by pressing the appropriate five keys in sequence (e.g. 117.5 MH_z = 11750) and INSERT.
12. Repeat steps 3 - 11 for each DME station.

Pre-Start Checklist - The Captain will read the present position from the Aerodrome Folder and this should be checked on his own INS by each crew member who will circle the present position written on his own Flight Log.

The Captain will then read from his own Flight Log the name of the first waypoint and this will be checked and numbered by each crew member on his own Flight Log. The Captain will read out the co-ordinates of that waypoint which will be checked by each crew member and when confirmed correct he will circle the number for that waypoint.

This procedure will be used to check a minimum of three waypoints at this time. The remaining waypoints may be checked if time is available (awaiting load sheet possibly) but they MUST be checked at a convenient time before that leg becomes active.

Mix Mode - Providing that all three INS are serviceable in the NAV mode, the INS positions are intermixed and the optimum position used by each INS in its individual computations. Each CDU displays this optimum position. Mixing is not possible with only two INS serviceable.

To select the Mix Mode refer to the NORMAL PROCEDURES section of the Flying Manual.

DME Updating - No.1 DME provides data to No.1 INS and No.2 DME provides data to No.2 INS.

To select a DME station for updating:

1. Tune DME to selected DME station.
2. Set data selector to DIS/TIME.

3. Set waypoint/DME selector to number of selected DME station.

4. Simultaneously press keys 7 and 9. The FROM side of FROM-TO display goes blank and the number of the previously selected DME station flashes on and off in TO side.

5. Verify that the distance to the selected DME station as displayed in lefthand data display agrees approximately with the corresponding DME reading on the DME indicator.

6. Press WY PT CHG key. The WY PT CHG and INSERT keys light and TO side of FROM-TO display stops flashing.

7. Press key corresponding to number of selected DME station. The selected DME station number appears in TO side of FROM-TO display.

8. Press INSERT key. The INSERT and WY PT CHG keys go out and TO side of FROM-TO display flashes on and off.

9. If a second DME station is available repeat the above steps on the second INS.

NOTE: The RNAV light will be on only while DME up-dating is taking place.
When INS 1 or INS 2 is receiving DME data it will pass the data to the other two systems. If these systems are in Mix mode (MI=4), they will independently perform the DME update function.

Position Update Eradication (FLUSHING) - Position update eradication is not considered a common procedure. It should only be used when an operational error has resulted in an erroneous position fix.

To select the mode:-

1. Set data selector to DSRTK/STS.

2. Press key 1 and INSERT.

The INS is now in the Position Update Eradication mode, and all position correction data, including DME derived data is removed. The INS automatically reverts to independent and operation (MI=5).
To return to normal Mix operation in which position updates will be accepted:-

Press key 4 and INSERT.

OR

To return to unmixed mode
Press key 5 and INSERT.

Present Position Check -

1. Set data selector to POS.

2. Press HOLD key when aircraft passes over a known position.

NOTE: If more than one INS is being checked and updated, the HOLD keys on all INS should be pressed simultaneously.

3. Compare displayed latitude and longitude with latitude and longitude of known position.

4. Press HOLD key to return the INS to normal operation.

To Display Present Inertial Position After Updating or Mixing

1. Set data selector to WAY PT.
2. Press HOLD key.

   The HOLD key will light and latitude and longitude of present inertial position will be displayed.
3. To return INS to normal operation, press HOLD key. The HOLD key light will go out.

To Confirm Presence of In Flight Update -

1. Press HOLD key.
2. Set data selector to POS and then WAY PT. If displays change an in flight update is present.

Insertion of Additional Waypoints - If not inserted during Cockpit Preparation or if flight plan is changed, additional waypoints may be inserted manually or by card reader using the same procedure as in Cockpit Preparation. Refer to Flying Manual NORMAL PROCEDURES. To avoid immediate automatic switching to a new leg, do not insert new waypoint data into a waypoint shown in the FROM-TO indicator.

Manual Flight Plan Change - The flight plan can be changed at any time. If the change is made between waypoints, 0 will normally be loaded in the FROM side of the FROM-TO display. When this is done, the present position co-ordinates that exist when the INSERT key is pressed will be entered into waypoint 0. The new desired track will be the great circle between the new waypoint 0 and the waypoint shown in the TO display.

If a waypoint other than 0 is loaded in the FROM display, the new desired track will be a great circle between the FROM and TO waypoints regardless of the aircraft's present position. Cross track error and track angle error outputs will be related to this desired track.

To change the waypoints in the FROM-TO display:

1. Press WY PT CHG, the WY PT CHG and INSERT keys light.
2. Select new FROM and TO waypoints by pressing corresponding keys in sequence. New waypoint numbers appear in FROM-TO display as keys are pressed.
3. Press INSERT key, WY PT CHG and INSERT keys go out.

Distance and Time - To display distance and time to the next waypoint rotate the data selector to DIS/TIME. The distance displayed in the lefthand display is that from the present position to the next waypoint (i.e. the waypoint appearing in the TO display). The time displayed in the righthand display is that required to fly to this waypoint at the current ground speed.

Continued........

If the distance and time is required between the waypoints displayed in the FROM-TO display, press the WY PT CHG key. The WY PT CHG and INSERT keys will light, and the distance and time will be displayed in the lefthand and righthand displays respectively. Any two previously inserted waypoints may now be loaded into the FROM-TO display. The distance and time between these two waypoints will be displayed.

CAUTION: DO NOT PRESS THE INSERT KEY UNLESS A CHANGE OF TRACK IS REQUIRED.

To revert to the original distance time display press the CLEAR key.
The WY PT CHG and CLEAR key lights will go out.

In Flight Accuracy Index Number - In the NAV mode, the 5th digit of the status display indicates, with DSR TK/STS selected, the degree of confidence that can be placed in the navigational accuracy. Confidence is greatest at 1, least at 9.

Action Code 02 - Malfunction Code 56 - This is caused by an I.N.U. detected difference, between updated C.D.U. displayed position and raw data position, of greater than 3 + 3t. (i.e. 3 nm + 3 times flight time in hours). The red warning light will be cancelled by the test button during interrogation of the Malfunction Code.

ALL WEATHER OPERATION

Category 2 and 3

General - Concorde is certificated to operate to Category 3 minima.

BA policy requires that any approach which is commenced with the intention of non-visual flight below Cat 1 minima, (DH 200 ft. RVR 600 m) must be initiated as an automatic landing.

The procedures defined in this section assume the full use of autoland. Failure cases, and procedures are specified.

Concorde Navigation Manual specifies all the authorised autoland runways, with instructions covering unserviceability of facilities, flight initiation rules for Cat 2 and 3 operations, the visual reference required at decision height, use of RVR reports, initiation of missed approach, and the determination of decision height.

Refer to "Autopilot" in this section of the Flying Manual for normal operating procedures of autoland, and go-around modes.

Pilots and Flight Engineers have been issued with the BA Booklet "The Background to All Weather Operations". The Flying Manual covers fully the basic requirements and limitations for Category 2 and 3 Autoland. Complete familiarity with these documents is essential.

The use of minima as low as 100 ft DH/400m RVR (cat 2) and 15 ft DH/250m RVR (cat 3) calls for clear cut decision making at low altitude. It must be borne in mind that Category 2 is still "see to land". When below decision height whenever the visibility is inadequate to comply with the monitoring requirements for alignment with approach and runway lights or markings, a go-around MUST be commenced.

If, during a Category 2 or Category 3 approach, it becomes necessary to revert to manual control above ILSC decision height, ILSH RVR will apply. If manual reversion occurs at or below ILSC decision height, the approach may be continued provided that the RVR is at or above that required for a coupled approach The exceptions to the above are:-

(a) If complete autopilot disconnect occurs in the flare in Category 2 RVR conditions and the aircraft is over the runway so that a safe manual landing and roll out are feasible, the landing may be continued.

(b) In Category 3 conditions, if a total autopilot disconnect occurs during the flare above decision height, a go-around is assumed.

Below decision height, the landing may be continued at the Captain's discretion.

The cat 3 RVR/DH (250m/15ft) relationship should allow a pilot to expect to establish visual contact at not less than 40 ft and to see an increasing sequence of lights to a minimum of three consecutive lights by decision height of 15 ft.

Bear in mind that go-around can be safely commenced from the flare and initial touchdown.

NOTE: When an autocoupled approach and landing in conditions better than Cat 2 or 3 is made, it is the pilots responsibility to check that the sensitive area is clear of other aircraft.

ALL WEATHER OPERATION

Authorisation - Each Captain and First Officer will only be trained in his own Category 2 or 3 duties. Authorisation will be limited to that capacity. Only Training Captains and Nucleus Group Captains may act as First Officer if the weather is worse than Category 1. A First Officer may not handle the controls for such an approach.

Procedures

Before Flight - Comply with the flight initiation requirements as stated in the Concorde Navigation Manual.

The minimum equipment level for initiation of an autoland in Cat 2 or 3 conditions, must be confirmed as available before departure if planning to use either destination or alternate in Cat 2 or 3 weather. Consult the minimum equipment list. Pre-flight checks should always cover these items.

Before Approach - Check the wind is within limits. Crosswind 15 kt max, tailwind 10 kt max, and headwind 25 kt max. Check that the equipment required for the approach is serviceable, so that Category 2 or 3 capability can be achieved by the autopilot system.

Land 3 status requires,

LAND mode engaged.
Both Autopilots engaged.
Flare law test successful.
One Landing Display serviceable.
All elevons in electrical signalling mode.
PCUs serviceable.
One autothrottle in IAS ACQ mode.
Both ADCs serviceable.
One Flight Director serviceable and engaged.
INS comparator serviceable.
INS 3 serviceable in NAV or ATT mode.
Relay Jack hydraulic pressure (Green or Yellow) satisfactory.
ILS QDM set on VOR/LOC selectors identical.
AC and DC electrics split.

Land 2 status requires:

LAND mode engaged.
One Autopilot engaged.
Flare law test successful.
One Landing Display serviceable.
All elevons in electrical signalling mode.
PCUs serviceable.
One Autothrottle in IAS ACQ mode.

Continued.....

ALL WEATHER OPERATION

Localiser Interception - Initial approach should be flown using HDG TRK and ALT HOLD modes. Landing Displays will indicate deviations when the AP or FD is selected to an approach mode, and ILS signals are strong enough to withdraw flags.

WARNING: THE AUTOPILOT WILL CAPTURE THE FIRST GLIDE SLOPE AND LOCALISER SIGNALS RECEIVED. PREMATURE SELECTION OF LAND MODE MAY RESULT IN CAPTURE OF FALSE BEAMS.

Close in interception of the ILS localiser is not recommended due to the turning radius at the minium recommended airspeed of V_{REF} + 30. Advise ATC of the intention to commence an auto-land, and request a minimum intercept distance of 10 n.m. This should be satisfactory for intercept angles of up to 45 degrees.

The autopilot will capture a glide slope from above, provided the rate of descent does not exceed 2000 ft/min

Select LAND mode when close to the ILS centreline, having checked from ADF, VOR, or other information sources that alignment is correct. The second autopilot may now be engaged. Prime lights will illuminate for LAND, VOR/LOC, AND GLIDE modes. ILS deviations are displayed on the landing displays.

Localiser Capture - This is indicated by illumination of VOR/LOC light (prime light off), and the appropriate indications of localiser displacement on deviation displays, ADIs and HSIs.

Confidence Check - This should be made to confirm the changeover from AP 1, the controlling autopilot, to AP 2, by disengaging AP 1 switch. The autopilot system should remain in capture mode and the Landing Displays indicate Land 2. Re-engage AP 1 and confirm status still Land 2, or Land 3 with AC and DC electrics split.

Glideslope Capture - This is indicated by a momentary illumination of GLIDE light followed by illumination of LAND light (prime light off) and extinguishing of the VOR/LOC light. The ALT HOLD light will also extinguish. Monitor the flight instruments for correct indications of ILS displacement. Complete the landing check and begin to reduce airspeed towards the target.

Beam Sensitivity Reduction - With LAND mode engaged, beam sensitivity is reduced progressively within the autopilot, to compensate for increased ILS beam sensitivity as the aircraft descends. The localiser beam reduction is 1/3 from 1000 ft to 100 ft, and the glide slope reduction is 1/6 from 2000 ft to 100 ft. Bank angle limits are reduced from 30° at 1000 ft to 2° at 100 ft.

(Deletion)

Height Warnings - Audio warning approaching DH starts at DH + 70 ft and increases in intensity progressively until ceasing at bugged DH. The DH amber light on each ADI indicates that the aircraft is at or below the bugged height on either of the radio altimeters.

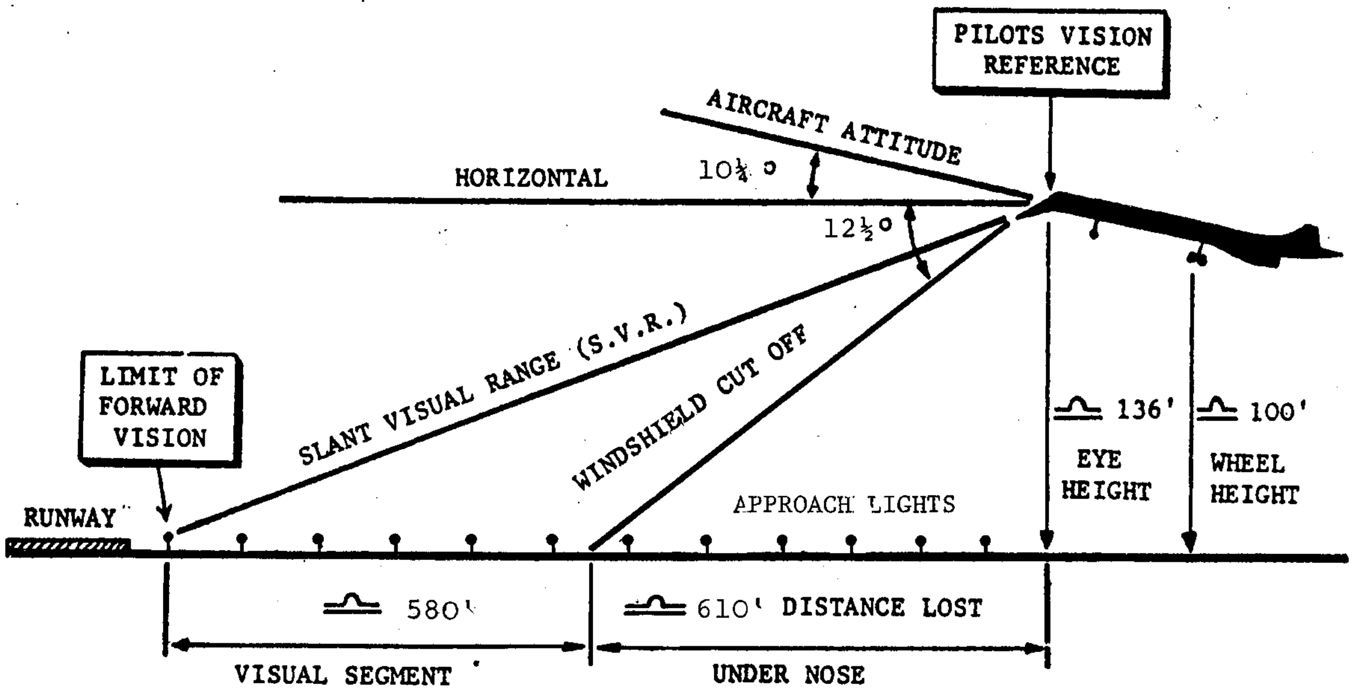
The DH circular amber lights on the Landing Displays indicate that the aircraft is at or below the bugged height on the associated radio altimeter.

ALL WEATHER OPERATION

The rising runway symbol on each ADI begins to indicate in 50 ft increments at 200 ft RA. The Captains radio altimeter supplies the First Officer's ADI and vice versa.

VISUAL REFERENCE TERMINOLOGY

Note that the visual segment is the horizontal component of the Slant Visual Range (SVR) less the distance cut-off by the coaming - the latter decreasing with height.



12½° NOSE DROOP

WHEEL HEIGHTS OVER THRESHOLD (ASSUMING AIRCRAFT IS IN CENTRE OF ILS GLIDESLOPE, GLIDE SLOPE ZERO POINT IS 1000 FT. FROM THRESHOLD AND PITCH ATTITUDE IS 10¼°

EXAMPLE:-

ILS	3° GLIDESLOPE
WHEEL Ht	31.6 Ft
GLIDESLOPE AERIAL Ht.	52.4 Ft.

(Unchanged)

VARIATIONS IN THESE VALUES CAN OCCUR DUE TO

1. WINDSHEAR EFFECT.
2. GROUND INSTALLATION TOLERANCES
3. SPECIFIC INSTALLATIONS e.g. DIFFERING REFERENCE POINTS.

WARNING: REFER TO AUTHORISED LIST OF AUTOLAND RUNWAYS IN NAV. MANUAL AND UPDATED BRIEFING INFORMATION BEFORE LANDING. OBSERVE WIND COMPONENT LIMITS.

ALL WEATHER OPERATION

Crew Duties

Flight Engineer - Monitors N2 gauges during final approach, and must immediately call "engine failure" if applicable. He should monitor warning lights, AUTO LAND lights, and Landing Displays, and call a failure should the First Officer fail to do so. He should also make the standard height calls. See 08.33.13.

First Officer - Monitors the instruments EXCLUSIVELY down to and including the flare. He will call any failure indications when detected, and will monitor the raw ILS displacement indications for significant deviation.
He will be briefed to call:
(a) Alert height Cat 3 (or Cat 2 or Cat 1 as appropriate) at 300 ft RA.
(b) "100 feet to go" at Decision Height + 100 ft R.A.
(c) "Decision Height" at Decision Height R.A.

He will call "go-around mode" when the caption illuminates in the event of an automatically controlled go-around.

Captain - Before commencing an approach in Cat 2 or 3 (or potentially below Cat 1) weather, he must establish that his First Officer is qualified.

The Cat 3 and 2 DH and RVR must be nominated, and the Cat 1 DH and RVR should be noted for use in the event of reversion.

He will utilise the AFCS to position the aircraft on to the ILS beam, with LAND mode engaged, check that correct indications are obtained on the Landing Displays, and other flight instruments.

The confidence check and flare test will be completed and the status on the Landing Displays must be noted. The LAND caption must in any event be illuminated by 700 feet.

The pilot is the master monitor, and progress should be continuously assessed. He should follow through on the flying controls and autothrottles during the final approach below 1000 ft R.A.

At 300 ft., the Alert Height, should the Co-pilot's call be "Cat 1," the autopilot should be disengaged by 100 ft R.A. at the latest, and a manual go-around or landing carried out, using Cat 1 minima.

(Deletion)

At the Alert height (300 ft R.A) he should begin to include the outside forward view in his scan, (it is imperative that First Officer and Flight Engineer's scans remain firmly inside the flight deck to observe and call immediately any failure indications which would necessitate a go-around). He is required to assess the availability of satisfactory visibility to continue the approach to a landing, and that the aircraft is correctly aligned.

Concorde criteria are:

1. A minimum of 3 centre line approach lights or runway lights should be visible at all times below Decision Height, to enable assessment of alignment and cross track rate.

ALL WEATHER OPERATION

2. The lateral alignment of the aircraft on achieving visual contact, shall be such that the flight deck is positioned within the approach light pattern, and tracking close to the centreline in order to secure a landing well within the runway width.

At Decision Height. Announce "Continuing" or "Go-around" as applicable.

Be ready to initiate go-around action below Decision Height should visibility deteriorate.

At 100 ft R.A. glide slope signals are no longer used for guidance, which is now provided by inertially computed and augmented vertical velocity information, assessed to determine engagement of Flare Mode. With vertical velocity within normal limits the flare should commence at 50 ft R.A. The flare would be delayed if vertical velocity was lower than normal, but should always commence at 35 ft R.A. at the latest.

On main wheel contact, disconnect the ATs, and AP. Close the throttles fully, as they will still be at the autothrottle idle stop of $37\frac{1}{2}^{\circ}$, and lower the nosewheel smoothly onto the ground. Use normal reversing technique.

During rollout use rudder inputs to maintain alignment close to runway centreline. As speed is reduced monitor INS groundspeed. Avoid sharp turns in reduced visibility, unless at low speed. Be careful to identify correct turn off.

Automatic Go-Around - The Captain calls "Go-around", disconnects autothrottles, and advances throttles fully. Any two throttles advanced to more than the 95% N2 position will engage GO AROUND mode.

The caption will illuminate, pitch attitude of 15° will be acquired, wings level, constant heading, with bank angle authority limited to 10°.

The mode must be disengaged by 1000 ft above airport level, this being achieved by selecting HDG HOLD, then PITCH HOLD or by disengagement of AP. Landing gear should not be selected up until a positive climb is confirmed.

The First Officer must monitor instruments and call "Go around mode" when caption illuminates.

At 250 kts engage autothrottles. Confirm that go-around height has been set on the Altitude Select, then prime ALT ACQ.

Go-around Manual Undirected - The Captain calls "Go-around", disconnects autothrottles, and advances throttles fully. Rotate the aircraft to pitch attitude 15°, and accelerate to V_{REF} + 50.

Landing gear should not be selected up until a positive climb is established.

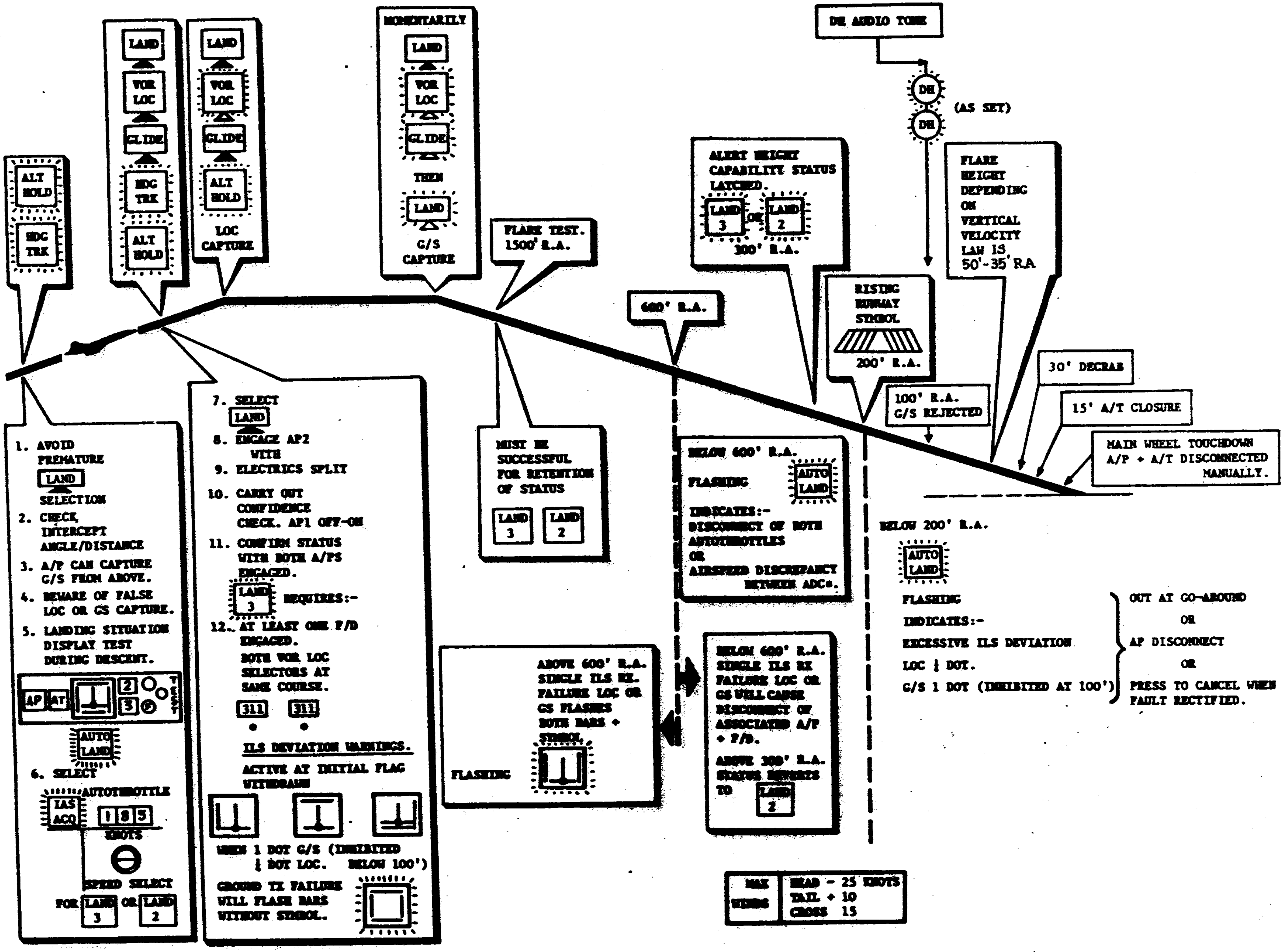
Power should be reduced as required once V_{REF} + 50 has been achieved, to contain climb rate. Maximum pitch attitude should be 20°.

Anticipation of power reduction requirement is necessary, particularly when go-around heights are lower than 3000 ft above airfield height.

(Unchanged)

ALL WEATHER OPERATION

(Unchanged)



Failure Warnings

AUTO LAND red flashing lights indicate:

Below 600 ft R.A.

1. Total loss of autothrottle system.
2. Airspeed discrepancy.

Below 200 ft R.A.

1. or 2 above
3. Excess ILS localiser or glide slope deviation.
4. ILS ground transmitter failure.
5. Double ILS receiver failure.

ACTION -

Without visual reference	- Automatic Go-around
With visual reference (provided RVR at or above ILSH minimum)	- Disengage AP and ATs. Continue manually. (If below 500 ft use existing target speed).

WARNING: IF ADS WARNING RECEIVED, USE STANDBY ASI IMMEDIATELY.

The AUTO LAND lights are cancelled by engagement of Go-Around mode, disengagement of autopilot and Flight Directors, or by pressing either light provided failure condition has been removed.

AP red lights - Indicate total loss of autopilot control. Accompanied by brief audio cavalry charge. Operation of either control column instinctive disconnect will cancel the lights.

ACTION -

Without visual reference	- It is permitted to re-engage AP if above 1000 ft. Below 1000 ft, revert to manual minima, and continue approach manually provided within minima, or go-around manually.
With visual reference	- Provided RVR within manual minima continue approach manually, otherwise go-around manually.

CAUTION: ALWAYS MONITOR TOUCHDOWN RVR. EVEN THOUGH SLANT VISIBILITY ON FINAL APPROACH MAY BE ACCEPTABLE, HORIZONTAL VISIBILITY CAN REDUCE CONSIDERABLY IN DEEPENING FOG CONDITIONS.

ILS Deviation Lights - In the event of discrepancy between signals fed to each Landing Display, a comparator ensures that the least favourable case is shown on both displays. The system is set to warn with a localiser deviation of ¼ dot, and glide slope deviation of 1 dot (inhibited below 100 ft R.A.). These indications are accompanied by the aircraft amber symbol light.

Monitor HSI and ADI indications.

NOTE: It is possible to transfer ILS signals from Captains HSI to First Officer's HSI and vice versa. The autopilots are however hard wired to the appropriate side and cannot use transferred information.

Flashing Deviation Lights

1. Indicate ground transmitter failure.
   Aircraft symbol remains extinguished.
   Below 200 ft. R.A. this warning is accompanied by the AUTOLAND lights flashing.
2. When accompanied by the aircraft amber symbol light indicate an aircraft ILS receiver failure.
   Below 600 ft. in LAND mode automatic disengagement of the associated AP and FD will occur.

AT red flashing lights - Indicate total loss of autothrottle control (also that AT has not been primed when ALT ACQ capture mode is engaged, if using AP or FD, or if AT not selected at instant of glide slope engagement during automatic approach).

The warning is accompanied by the AUTO LAND lights if below 600 ft R.A.

Disengage AP and continue manual approach, or go-around automatically. (If below 500 ft use existing target speed).

Autopilot Disconnect Failure of ILS data

Below 600 ft R.A.

Single glide slope or localiser failure of aircraft receiver will disconnect the associated AP and FD.

ACTION -

When using both APs, the other AP will takeover. Check status, if Land 2 continue automatic approach and landing to Cat 2 minima

When using single AP, continue approach manually, or go-around.

NOTE: ABOVE 600 FT R.A. a single glide slope or localiser failure will not disconnect AP. Localiser or glide slope indications will disappear, warning flags will appear and the aircraft will continue along the flight path immediately preceding the failure. The associated F.D. bar is withdrawn.

(Unchanged)

ACTION -

Above 1000 ft

1. Disengage associated AP by engage switch.
2. Engage other AP.

Below 1000 ft Single AP operation

1. Disengage associated AP by engage switch.
2. Continue manual approach.

Below 1000 ft Dual AP operation

1. Disengage associated AP by engage sw.

2. Continue automatic approach.

Below 200 ft R.A.

Double simultaneous failure of localiser or glide slope receivers will be recognised as a transmitter failure and will not disconnect AP, but will illuminate the AUTOLAND red flashing lights. This allows an automatic GO AROUND selection.

RADIO ALTIMETER FAILURE

CAPTAIN's R.A. FAILURE

Both A.D.I decision height warning lights are operative. The audio D.H. warning and Captain's rising runway symbol are operative from Co-pilot's R.A.

In LAND mode API would disengage below 1500.

ACTION

Use AP2 normal drills. Land 2 status is available.
E/O will make normal R.A. calls down to and including 50' from Co-pilots R.A., below which parallax precludes further calls.

CO-PILOTS R.A. FAILURE

Both ADI Decision Height Warning lights are operative. The audio D.H. warning and co-pilots rising runway symbol are operative from Captains R.A.
In LAND mode AP2 would disengage below 1500'.

ACTION

Use AP1. Normal Drills.
Co-pilot calls "100 to go" and "Alert Height" on the basis of E/O's normal calls and "Decision Height" from ADI DH light and audio. Co-pilot must stay on instruments throughout and avoid breaking his scan by reference to Captains RA.

GPWS PULL-UP OR GLIDESLOPE WARNING

If a "Pull-up" warning occurs during an automatic approach carry out an immediate go-around. This can be an automatic go-around provided that LAND or GLIDE mode is engaged.

If a "Glideslope" warning occurs during an automatic approach regain the glideslope expeditiously. Continue approach or go-around as conditions permit.

Additional Background Information. All Weather Operations

The Training Manual Vol.1 contains further information, which is referred to during the ground training syllabus. Subjects include:

Fog characteristics, RVR, Safety analysis, Visual segment lengths versus apparent pitch attitude, ILS standards, Protected areas, ATC separation standards.

Alert Height

Alert Height is defined as a height based on the characteristics of the aircraft and its equipment, above which a Cat 3 approach must be discontinued by go-around or adjustment of minima, if a significant degradation occurs in the system required for a cat 3 landing.
Thus below 300 ft the Land 2 or 3 capability is designed to be latched, 300 ft being the alert height for our aircraft.

Category 2 and 3 Briefing

Suggested form

This is reproduced on the clipboard aide memoire.

Minimum DH/RVR for approach is ..... In the event of reversion to Cat 1 or ILSH minima DH/RVR become ....." Go-around if required will be automatic except after autopilot failure.

If ILS deviation lights flash	**)**	**BELOW 200 ft and DH**
AUTO LAND lights flash	**)**	**GO-AROUND IS MANDATORY**
AP disconnect warning	**)**	**unless visual reference is satisfactory with RVR in excess of ILSH minimum.**

**The First Officer must stay on instruments throughout.
Routine calls will be ....'
The Flight Engineer will monitor N2 gauges and warning lights.**

(Unchanged)

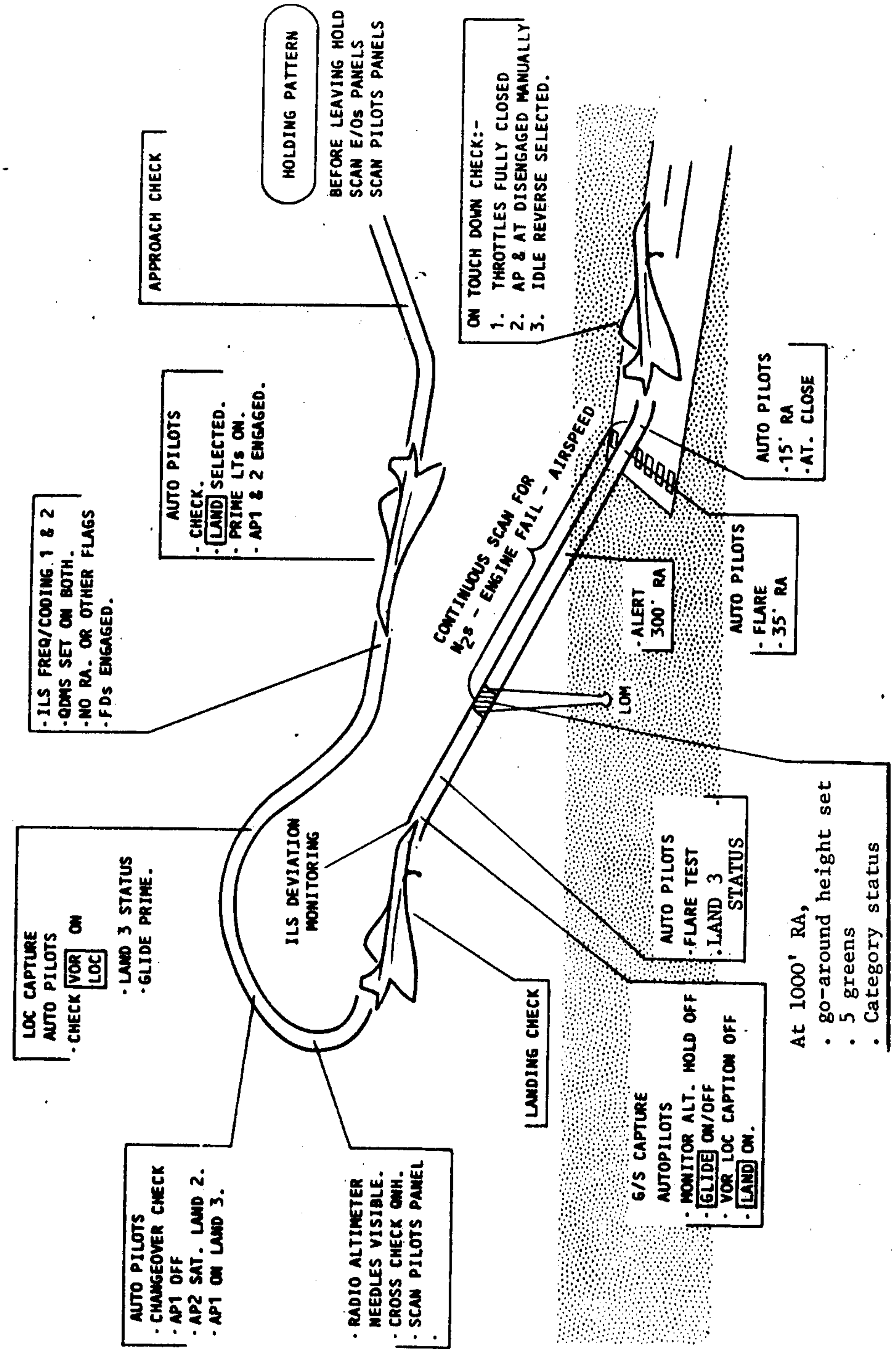
3 Engined Approach to Cat.2 and 3 Minima (Pre-meditated)

No special procedure is required. A full autoland is preferable to disengagement of AP at low altitude, as any residual trim problems will be minimised.
The rudder trim should be set to zero by 500 feet at the latest. (Remember to maintain rudder/sideslip co-ordination in the event of AP disengagement prior to touchdown). VREF + 5 Target Speed with VREF + 10 maximum.

Engine Failure during automatic approach and landing. Cat.2 and 3 minima

The autopilot should contain an engine failure during coupled approach, and is certified to Category 3 standard for 3 engined approach and autoland. Tests have shown that only very small deviations from the localizer and glideslope are likely.

All drills and procedures, including the normal landing check, must be completed before 600 feet R.A., or the approach should be discontinued, and a go-around initiated.



AUTOLAND CAT 3 - APPROACH PROFILE

(Deletion)

AUTO PILOT
GLIDE & LAND MODES
ABNORMAL PROCEDURES

WARNING	CAUSE	ACTION	
		WITHOUT VISUAL REFERENCE	WITH VISUAL REFERENCE
A P red + audio	Both APs disengaged	CAT 1. Go-around or continue under manual control CAT 2.) Go-around CAT 3.)	Continue under manual control Note: If above 1,000ft. an attempt may be made to re-engage one or both autopilots.
A T red flashing	Both ATs disengaged	CAT 1. Auto-go-around or disengage AP & FD and continue under manual control CAT 2.) Auto go-around CAT 3.)	Disengage AP & FD and continue under manual control
AUTO LAND red flashing	Unsatisfactory ILS performance, ILS failure or ADS failure	Auto go-around	Disengage AP & AT and continue under manual control. Note: If accompanied by ADS warning, revert to standby ASI immediately
Capability indicators blank at 300ft. (No LAND 2 or LAND 3 indication)	Necessary crew actions incomplete or failure of essential system	Disengage AP at not less than 100ft. and make a manual landing	

WARNING	CAUSE	ACTION — WITHOUT VISUAL REFERENCE	ACTION — WITH VISUAL REFERENCE
 One bar + symbol - steady	Excessive deviation from ILS centre line	Check ILS deviation. If error persists: CAT 1. Auto go-around or continue under manual control CAT 2.) CAT 3.) Auto go-around	Check flight path. If unsatisfactory disengage AP and continue under manual control.
Two opposite bars + symbol - flashing	Failure of ILS receiver associated with controlling AP	CAT 1. Auto go-around or continue under manual control using serviceable receiver CAT 2.) CAT 3.) Auto go-around Note: If above, 1,000ft. the second AP may be engaged.	Disengage controlling AP & continue under manual control
Two opposite bars - flashing Symbol not illuminated	Failure of ILS transmitter	Auto go-around	Disengage controlling AP & continue under manual control.

Notes : (1) Below 600ft. in LAND mode failure of an ILS receiver causes disengagement of the associated AP and the bars and symbol do not flash.

(2) Below 200ft. excessive ILS deviation and ILS transmitter failure case the AUTOLAND warning to flash. Actions appropriate to that warning must be taken.

CRESW INCAPACITY

General - Incapacitation in any crew member may not be immediately apparent. Proper monitoring is the best means of ensuring that partial or total incapacity is not ignored. When doubt exists question the individual concerned, repeating once if necessary, and if no responsible reply is received incapacitation may be assumed.

Cabin crew should be summoned to remove the crew member from his seat except during those stages of flight e.g. take-off and landing, when it would be safer to lock the pilot's harness and move his seat to the fully aft position. The engineer officer should always be moved from his seat.

Procedures -

(1) The first action is to maintain the required flight path making optimum use of the automatic pilot. If on approach go-around action might be advisable.

(2) If the Captain is incapacitated the nominated second in command should clearly state "I have command". He should handle the aircraft from the right hand seat.

(3) If the Flight Engineer is incapacitated the First Officer should occupy the engineer's seat.

(4) Declare an emergency to get maximum assistance from the ground.

(5) Any supernumerary crew member may be used to carry out any duties consistent with his training and qualifications.

TAXY POSITIONING OF AIRCRAFT

Occasions will arise when aircraft have to be re-positioned from one part of an airfield to another by taxying; the minimum crew in this case is Captain and Flight Engineer.

The following items summarise the procedural changes that apply:-

PRE-START

1. At London the crew will be required to provide their own Flying Manual, Vols. 2A and 2B.

2. Normal transit procedures will apply, omitting items that have no relevance to a taxy positioning manoeuvre.

3. To safeguard aircraft balance, fuel must be distributed in accordance with the appropriate fuel loading table although there is obviously no point in transferring fuel into otherwise empty ' tanks or 11. If fuel on board is less than the minimum published quantity, the collector tanks should have sufficient for the planned manoeuvre and the remainder to be in 9 and/or 10 with at least 4000 kgs. in 9.

4. After doors are closed, arm the front L.H. and R.H. doors.

5. The aircraft may be taxied on two engines provided that each engi is capable of supplying a brake system i.e. green and yellow pressurised and that each engine has a serviceable electrical generation system.

AFTER START

1. After engine start, and on completion of the Afterstart Check, th Flight Engineer should set up the fuel and air conditioning syste then move into the co-pilot's seat to provide starboard look-out.

AFTER SHUT DOWN

1. Whenever an aircraft is taxied for positioning purposes, an entry must be made in the Maintenance Log as follows:-

   (a) Positioning to LHR Central Before Flight

   On the Aircraft Movement Signal, enter aircraft registration sector reference "00", appropriate sequential trip reference chocks away and chocks under.

   On the Sector Defect Log, enter an item, "A/C taxied on .... engines," (state the engine numbers that may subsequently require a debow start).

   (b) Positioning to a Departure Gate Other Than at LHR or Positioning After Flight

   As above, but allocate the next sequential sector reference number.

2. Disarm the front L.H. and R.H. doors and insert the arming lever pins.

GROUND PROXIMITY WARNING SYSTEM

Concorde is equipped with a standard five mode GPWS.

Modes 1 to 4 warn of:

1) Excessive rate descent below 2500 ft RA.
2) Excessive closure rate with the ground.
3) Loss of altitude whilst below 700ft RA after take-off or go-around.
4) Gear not locked down below 500 ft or nose not fully down below 200 ft RA on approach.

The warnings for modes 1 to 4 are, a red flashing PULL-UP (pre-mod TERRAIN) light on each pilots instrument panel and a repetitive audio, "whoop whoop pull-up". The warnings continue until the aircraft is flown out of the hazardous situation.

Whenever such a warning occurs:-

1) On departure
Disconnect the auto-pilot, if applicable, and apply full dry power together with reheat and contingency as required. Level the wings where possible and check and adjust pitch attitude to achieve a minimum speed of V_2 + 40 kts before initiating a climb.

2) En-route or Arrival.
Disconnect the auto-pilot, if applicable, and apply full dry power together with reheat and contingency as required. Level the wings where possible and check and adjust pitch altitude to a minimum of 15° and climb away at not less than V_{REF} + 50 kts.

In either case do not disregard short duration warnings - take immediate action:

When the warning ceases check,

aircraft position,

radio and pressure altimeters,

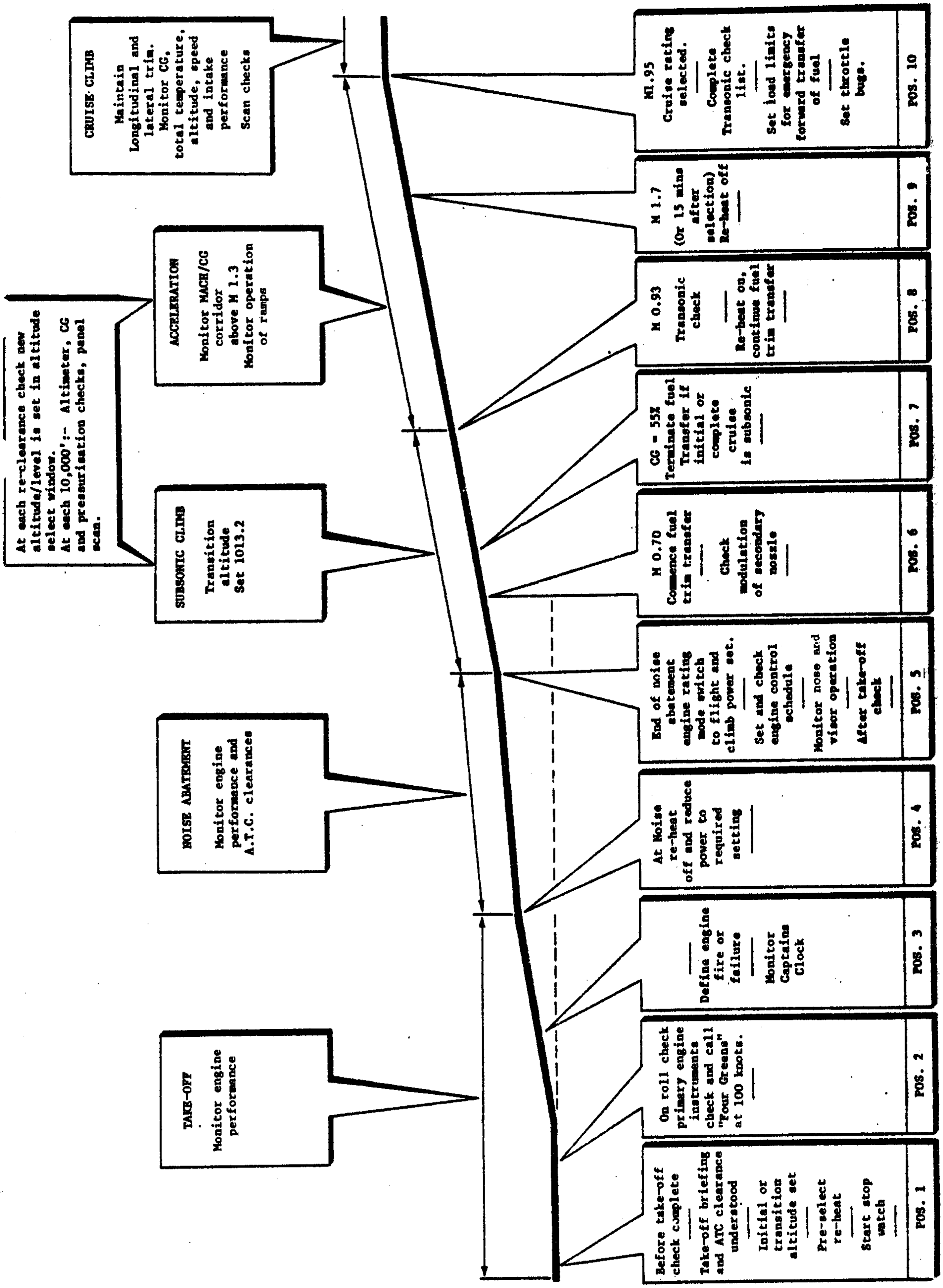
altimeter settings,

minimum safe altitude.

The mode 5 operation makes use of glideslope information and warns of 'duck-under' the glideslope during approach; the warning is audio only and repeats, "glideslope," until the aircraft is flown out of the hazardous situation.

Whenever such a warning occurs, disconnect the autopilot, if applicable. Apply power including reheat and contingency as required and adjust pitch attitude to regain the glideslope expeditiously. Continue approach or go-around as conditions allow.

FLIGHT ENGINEER'S ROUTINE PROCEDURES



FLIGHT ENGINEER'S ROUTINE PROCEDURES

CLIMB CRUISE

Monitor INS, A.T.C. clearances and instructions and No.1 VHF on 121.5 MHz. Obtain weather as requested. Study arrival procedures at destination.

At each re-clearance check new altitude/level is set in altitude select window.
At each 10,000':- Altimeter, CG and pressurisation check, panel scan.

DE-CELERATION AND DESCENT

Monitor MACH/CG corridor.
If cruising at M 0.93 set CG at 55%. Below M 0.93 and landing set 53.5%.
Monitor intakes

DESCENT AND APPROACH

Monitor radio aids, instrument settings, A.T.C. instructions and clearances.

Final approach:- know decision height and go-around procedure.

POS. 11
Shortly before deceleration and descent estimate landing weight

Re-set fuel load limits and re-check throttle lever angle bugs.

Terminal weather and company communication if required

POS. 12
Retard throttle levers to bug setting and commence deceleration and descent check

Switch off tank 11 electric pumps and commence forward transfer of fuel

Reset throttles at M 1.6

POS. 13
At M 1.0, or before descent if subsonic, complete deceleration and descent check

Set throttles as required

Check A.T.I.S.

POS. 14
Transition level

Check QNH set

Check radio aids

POS. 15
Approach and landing checks.

POS. 16
Outer marker

Check height

Call 1000 ft radio height and check four greens, nose and visor down, all flags clear and scan fwd. engine instruments.

check go-around altitude set.

POS. 17
Final approach

Radio altimeter calls:-

500 ft, 400', 300', 200', 100' 50', 40', 30', 20' and 15 ft.

Monitor N_2s between each 100'

POS. 18
Landing

Throttles closed, reverse lights checked

POS. 19
Roll out and Taxi

reverse cancelled

After landing check when clear of runway.

Shut down inboard engines as required.

POS. 20
Parking and stop - over checklist

MONITORING AND CALLOUTS

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS: PILOT NOT HANDLING	CALLS: F.E.	ROUTINE	WARNING
Pre Take-Off	Pre-Start	Pressure Altimeters	Both QNH Indicating Elevation				
		Trim	Check set for Take-Off				
		ASIs	Indices Set				
		Pitch Indices	Check set for Take-Off				
Take-Off	Roll	ASIs	Both Registering 'P' Only	"Airspeed Building"		X	
		ASIs -100 kts		"100 kts"		X	
		Power Check	4 lights		"Power Checked"	X	
					or "Engine Failure"		X
		ASI-V_1		"V_1"		X	
		ASI-V_R		"Rotate"		X	
		ASI-V_2		"V_2"		X	
	Initial Climb	Rad. Alt Climbing 20'		"Positive Climb"		X	
		240 knots		"240"		X	
		Noise Abatement		"3-2-1 NOISE"	(NOISE)	X	
		ASI Decaying to or below min		"Airspeed"			X
		VSI negative R.O.C.		"Rate of Climb"			X
		ADI Bank Angle ±2° from specified		"Bank Angle"			X

MONITORING AND CALLOUTS

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
Climb	Every 10,000 feet	Altimeters	Subscale & Readings CG indication	"Altimeter Check" & CG	"Altimeter Check" & CG	X	
	When Altimeter setting changes	Altimeters	Subscale & Readings	"Transition Altitude"	"Transition Altitude"	X	
	Setting cleared Height	Altitude Select	Correct Height Set	"Cleared Altitude set"	"Cleared Altitude set"	X	
	Approaching Cleared Altitude	Altimeter		"1000 ft to Go"	"1000 ft to Go"	X	
Descent	Every 10,000 feet	Altimeters CG	Subscale & Readings CG. Indication	"Altimeter Check" & CG	"Altimeter Check" & CG	X	
	At 10,000 ft (or FL.100)	Altimeter	Subscale & Readings			X	
	Setting Cleared Height	Altitude Select	Correct Height Set	"Cleared Altitude Set"	"Cleared Altitude Set"	X	
	When Altimeter Setting changes	Altimeter	Subscale & Readings	"Transition Level"	"Transition Level"	X	
	Approaching Cleared Altitude	Altimeters		"1,000 ft to Go"	"1000 ft to Go"	X	

MONITORING AND CALLOUTS

(Unchanged)

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
Approach	Approach Check	ASIs	Indices Set				
		Pressure Altimeter	Index set to QNH DH				
		Pressure Altimeters	QNH Set Alts Agree				
		Radio Altimeters	DH Pointer Set				
		Radio Altimeter	Radio Altimeter		"Radio Altimeter Active"	X	
	Final Approach	HSI Beam Bar Off Stop		"Beam Bar Active"	("Beam Bar Active")	X	
		HSI Glide Bar		"Glide Slope Active"	("Glide Slope Active")	X	
		HSIs	Beam and G/S Bars Agree Both Sides				
		GPWS audio "Glideslope"		"Glideslope"		X	
	At O.M.	Altimeters	Instruments	"Height Checks"		X	
	At 1000 ft RA	Radio Altimeter			"1000 ft radio"	X	
		ALTITUDE SELECT	Go-around altitude set	"Go-around altitude set"	("Go-around) (altitude set")	X	
		Nose /Visor & Landing Gear	Fully down Down & Locked	"5 greens" (1 nose & 4 gear)	("5 greens")	X	
		W&LD	Category Status	"Cat 1, 2 or 3" (autoland only)	("Cat 1, 2 or 3")	X	
						X	

PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
		CAT 1 DH + 100 DH		"100 to Go" "Decision Height"	("100 to Go") ("Decision Height")		
		CAT 2 & CAT 3 300 Radio DH + 100 Radio DH		"Alert Height,cat.." "100 to Go" "Decision Height"	("Alert Height,cat..") ("100 to Go") ("Decision Height")		
Approach	Final Approach Below 1000ft.	VASIS Indicate too high or low		"VASIS"			X
		VSI Excess 1000 F.P.M.		"Rate of descent"			X
		I.A.S. Near Min, Decaying Rapidly, or Approaching Max. Threshold Speed		"Airspeed"			X
		H.S.I. Beam Bar Exceeds 1 Dot Deflection		"Beam Bar"			X
		H.S.I. Glide Slope Exceeds 1 Dot Deflection		"Glide Slope"			X
		Radio Altimeter Reading			"800', 500', 400', 300', 200', 100', 50, 40, 30, 20, 15."	X	
	Flare	ADI, Pitch Attitude exceeds 12.5°		"Attitude"			X

MONITORING AND CALLOUTS

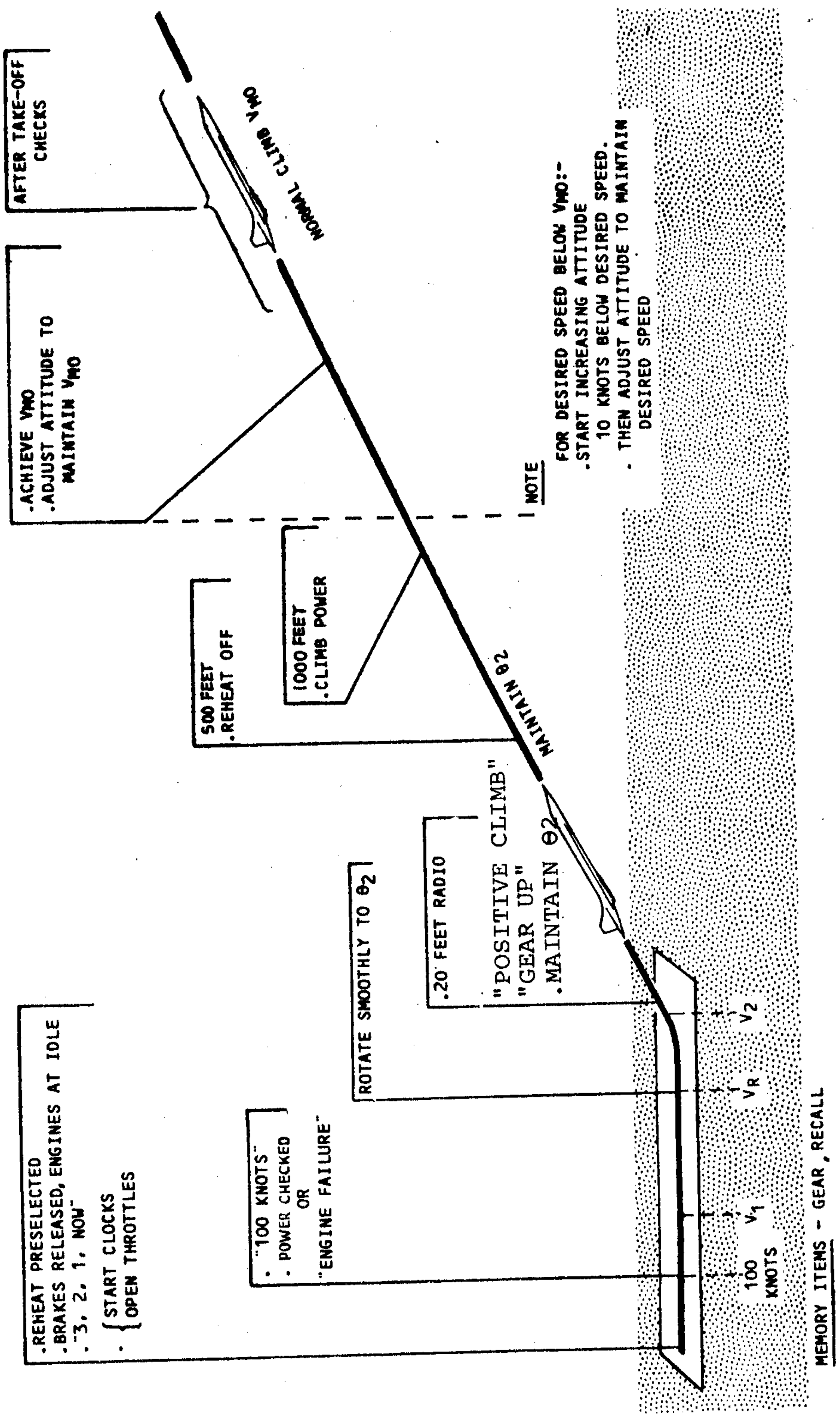
PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS		ROUTINE	WARNING
				PILOT NOT HANDLING	F.E.		
Approach: additional items applicable to Reduced Noise Approach only.		Radio Altimeter AFCS	IAS ACQ selected		**"800 ft"**	X	
		Radio Altimeter ASI, AT & HSI glide bar		"Stabilised"	**"500 ft" ("Stabilised")**	X	
		Radio Altimeter AFCS control panel		"Autopilot" (if AP or FD still engaged)	**"300 ft" ("Autopilot")**	X	

(Unchanged)

MONITORING AND CALLOUTS

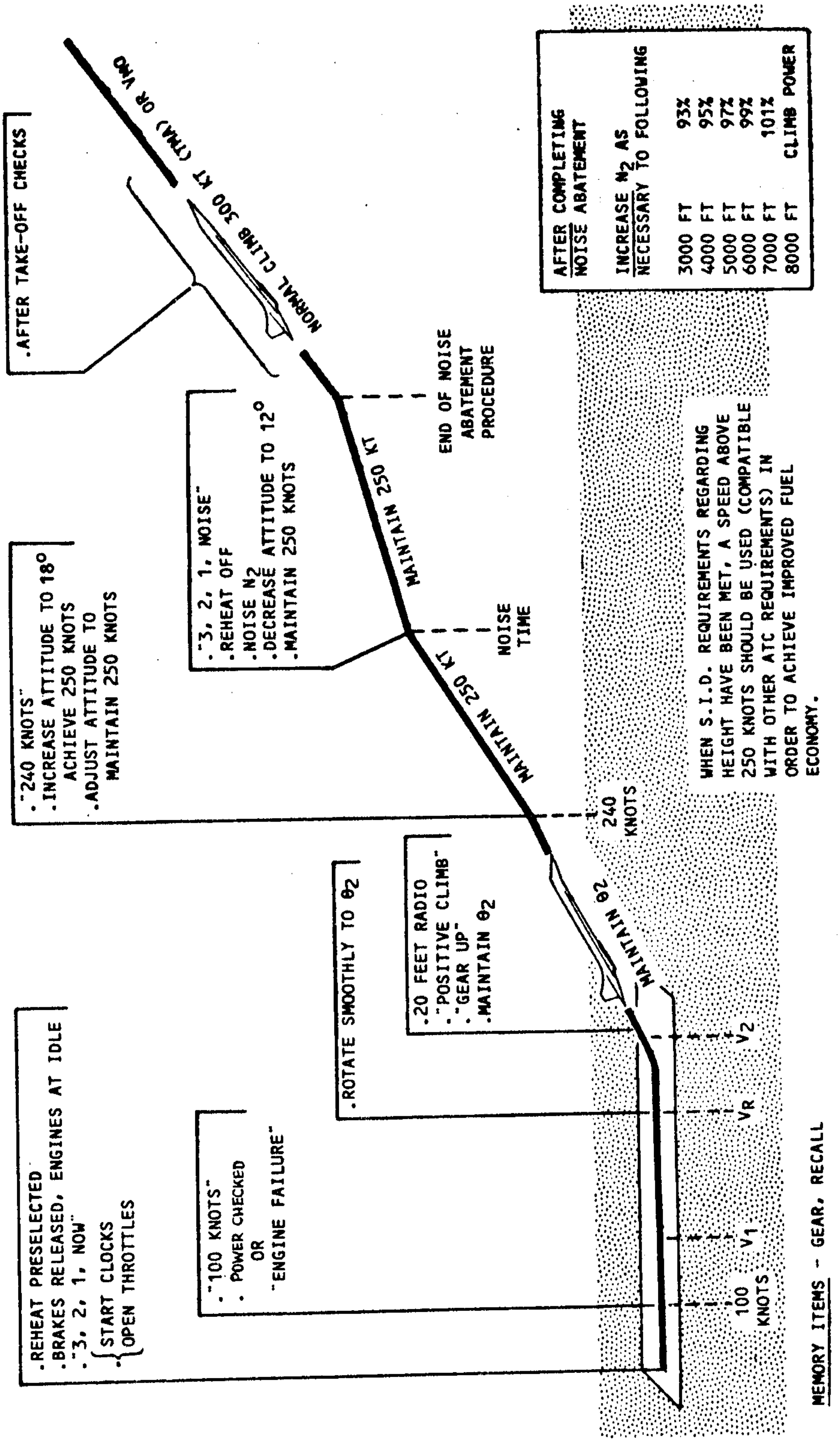
PHASE	STAGE	ITEM/ INDICATION	CROSS-CHECK BY ALL CREW MEMBERS	CALLS: PILOT NOT HANDLING	CALLS: F.E.	ROUTINE	WARNING
Missed Approach	Initial Climb	V.S.I - Climb		"Positive Climb"		X	
		A.S.I Decaying or below min.		"Airspeed"			X
		V.S.I. Negative R.O.C.		"Descending"			X
Landing	Deceleration	A.S.I. 100 knots		"100 knots"		X	
		75 knots		"75 knots"		X	
		HSI Ground Speed 40 knots		"40 knots"		X	
		20 knots		"20 knots"		X	
All Phases as appropriate		ADIs Excessive Roll or		"Bank Angle"			X
		Pitch		"Pitch Attitude"			X
		Altitude Alert Tone and/or light		"Altitude Alert"	"Altitude Alert"	X	X
		G.P.W.S. Pull-up lts (pre-mod, Terrain) plus audio "Pull-up".		"PULL-UP" Warning"			X

TAKE OFF AND INITIAL CLIMB
NORMAL TAKE-OFF



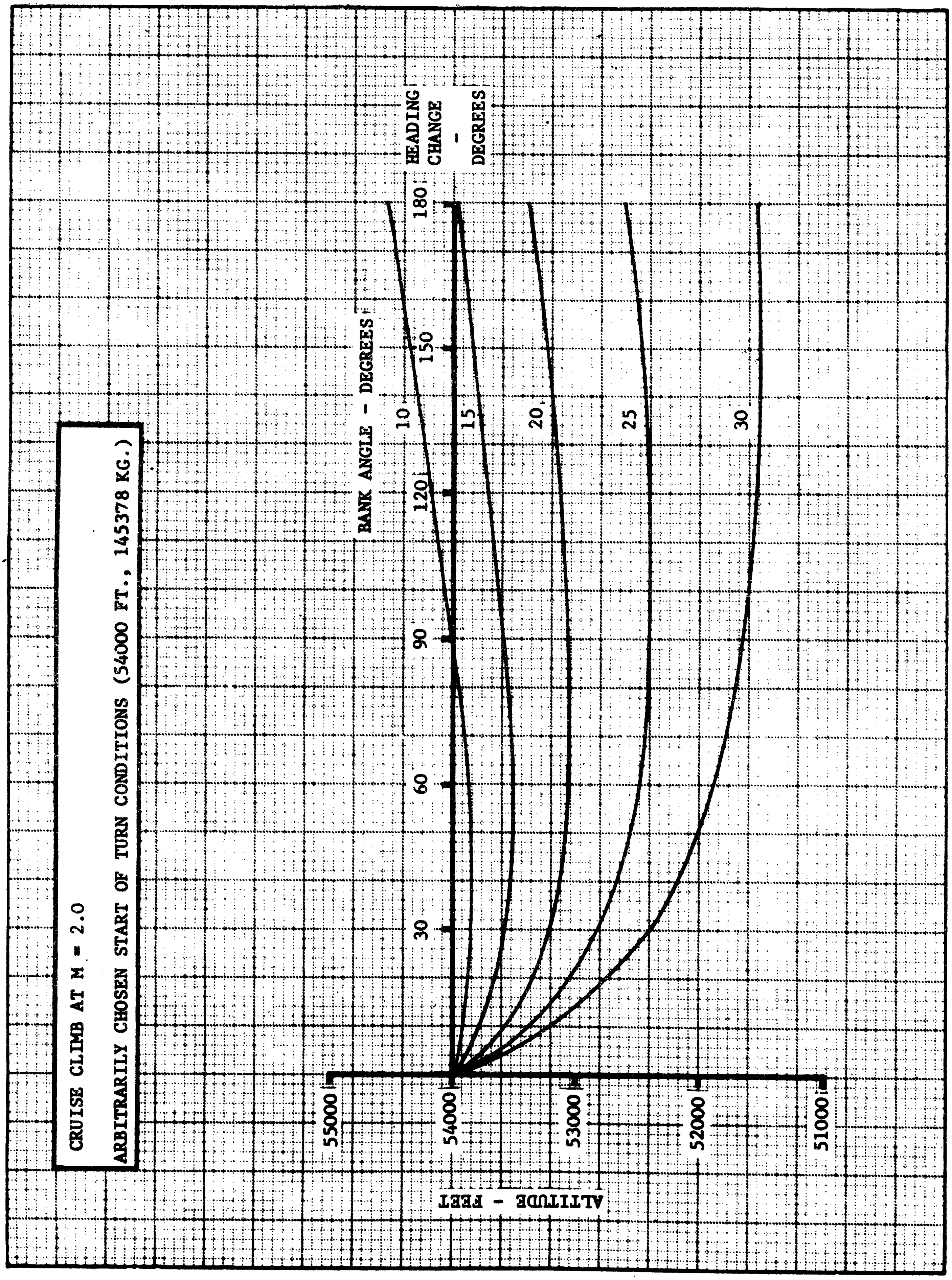
NORMAL TAKE-OFF

TAKE-OFF AND INITIAL CLIMB
NOISE ABATEMENT TAKE-OFF



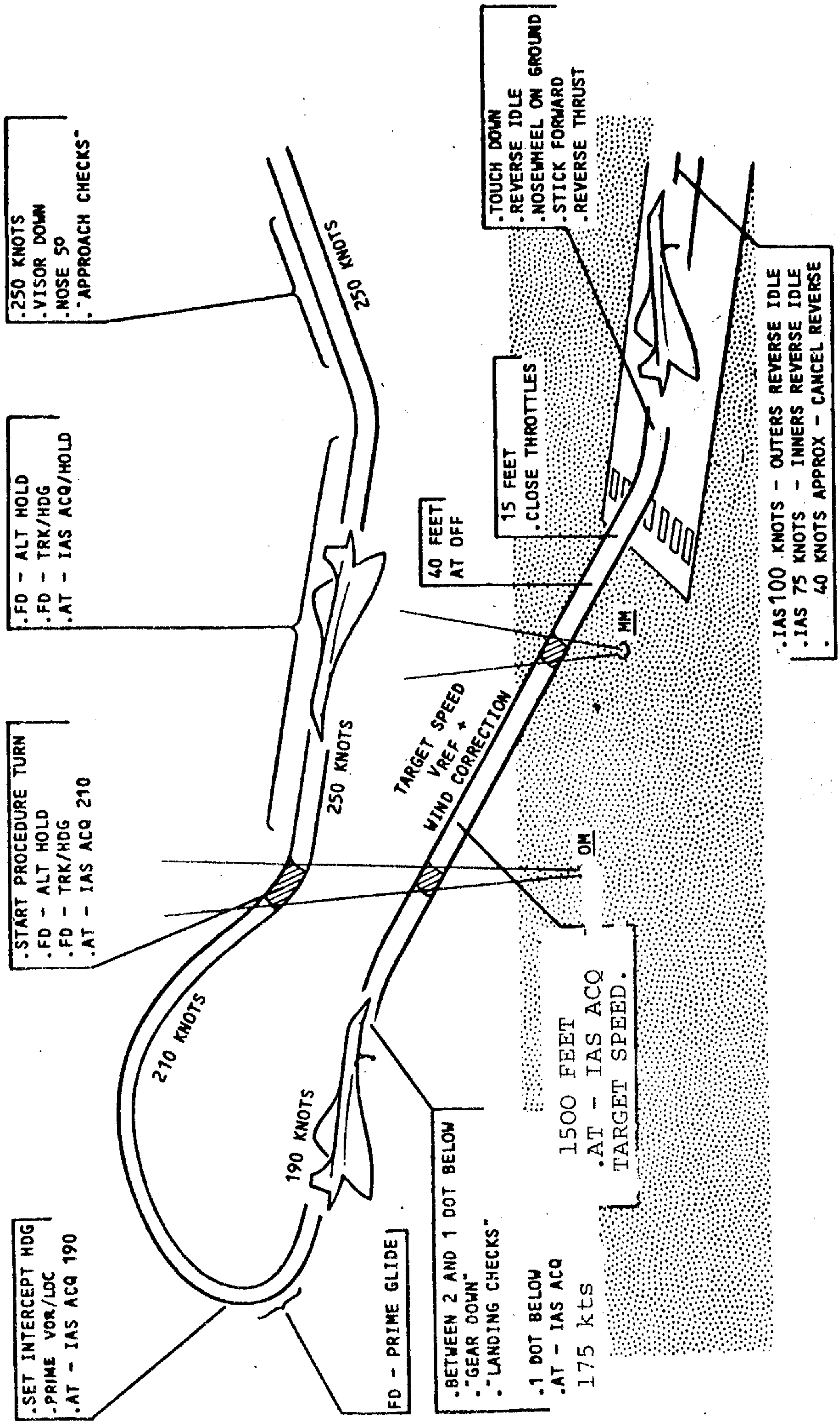
NOISE ABATEMENT TAKE-OFF

SUPERSONIC CRUISE
EFFECT OF BANK ON PERFORMANCE



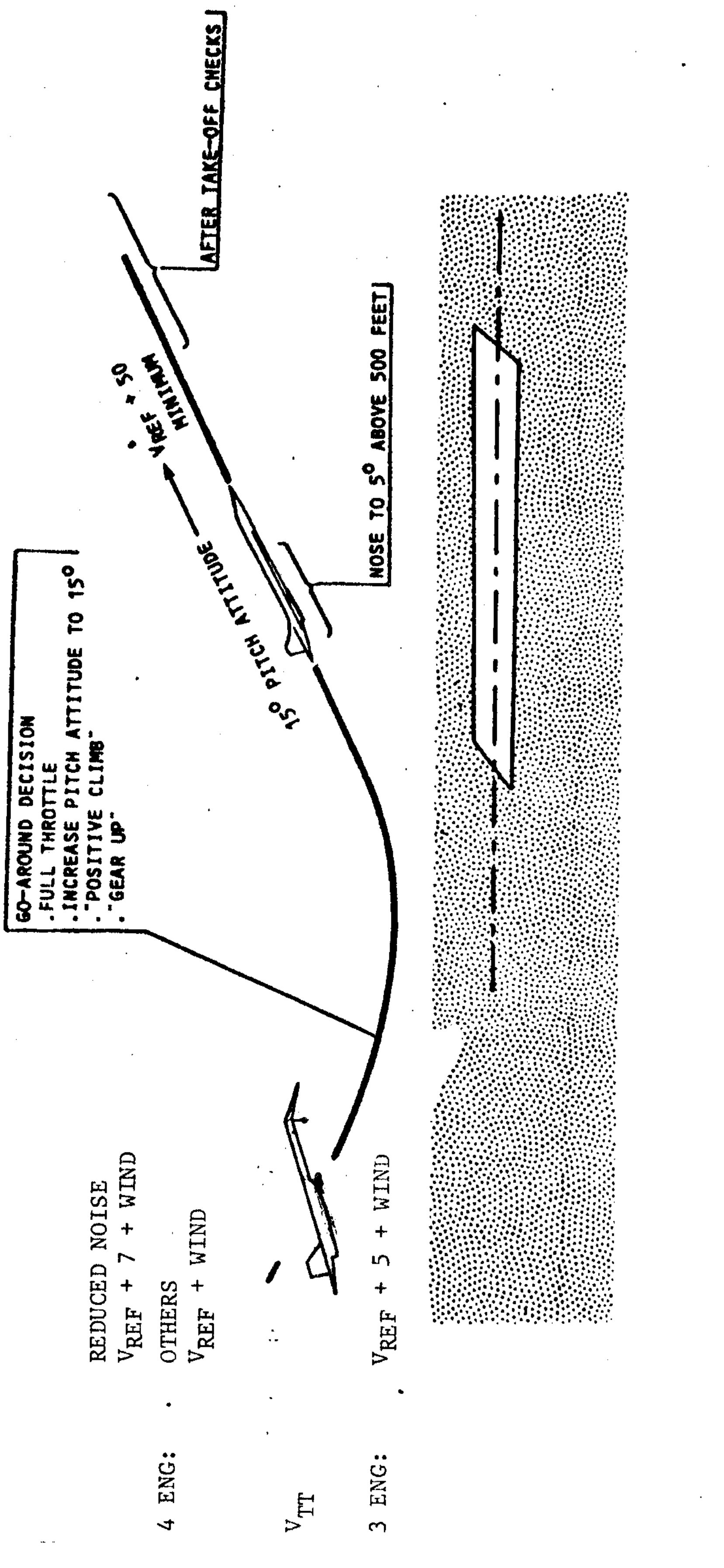
APPROACH AND LANDING

4 ENG. ALL WEATHER ILS



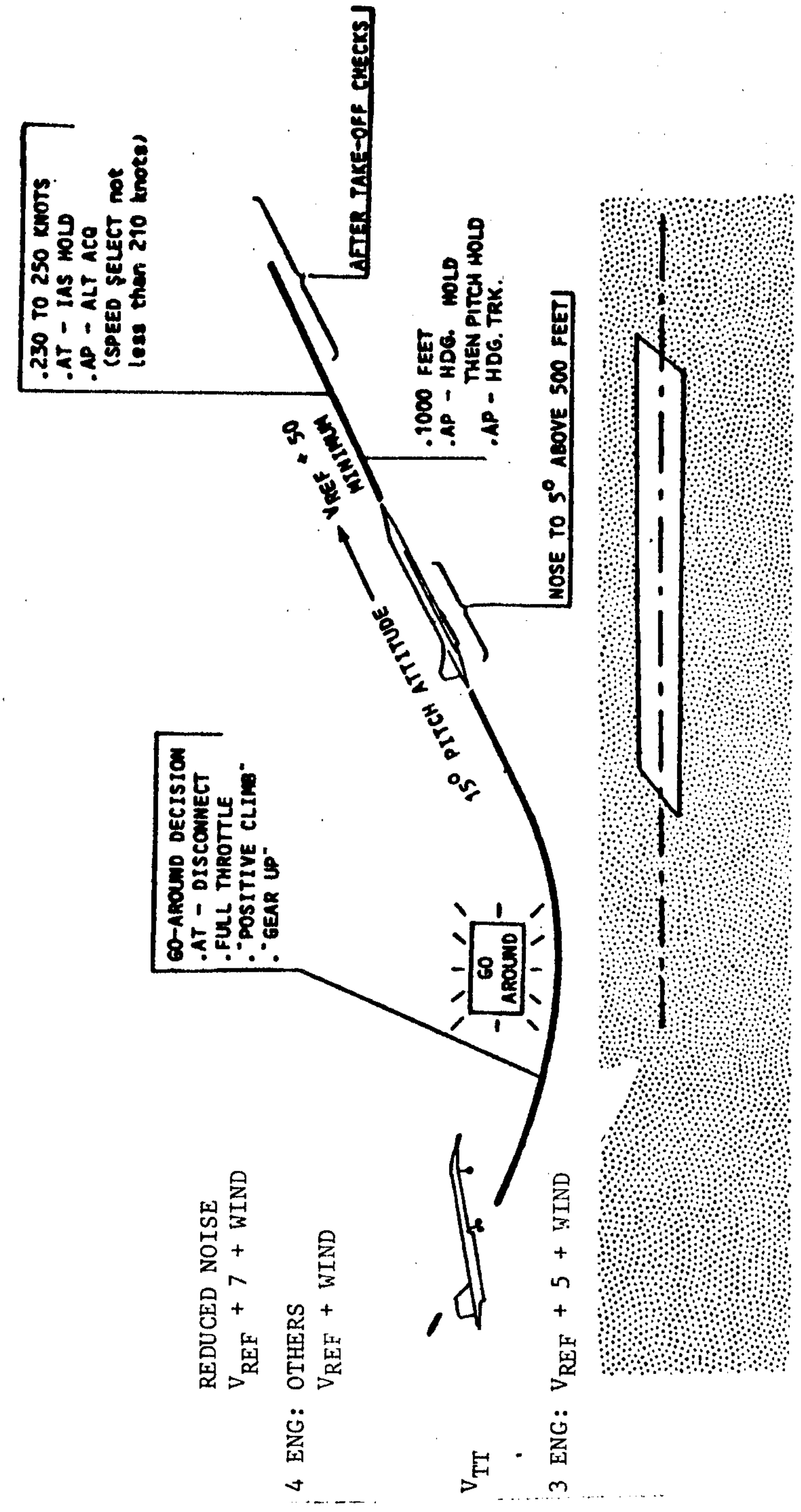
4 ENG ALL WEATHER ILS APPROACH AND LANDING

APPROACH AND LANDING
4 ENGINE AND 3 ENGINE GO-AROUND



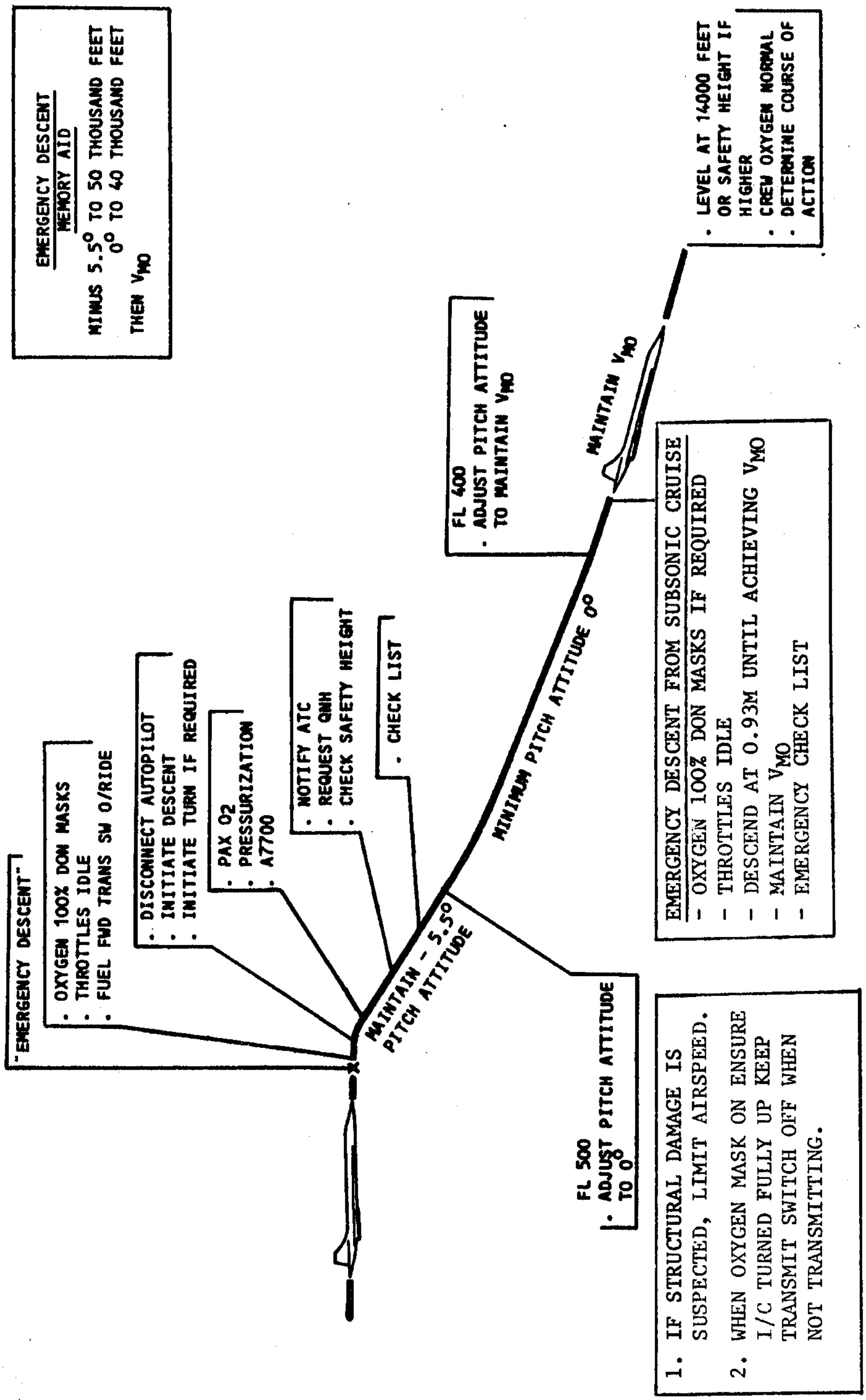
4 ENGINE AND 3 ENGINE GO-AROUND

APPROACH AND LANDING
AUTOPILOT GO-AROUND



AUTOPILOT GO-AROUND

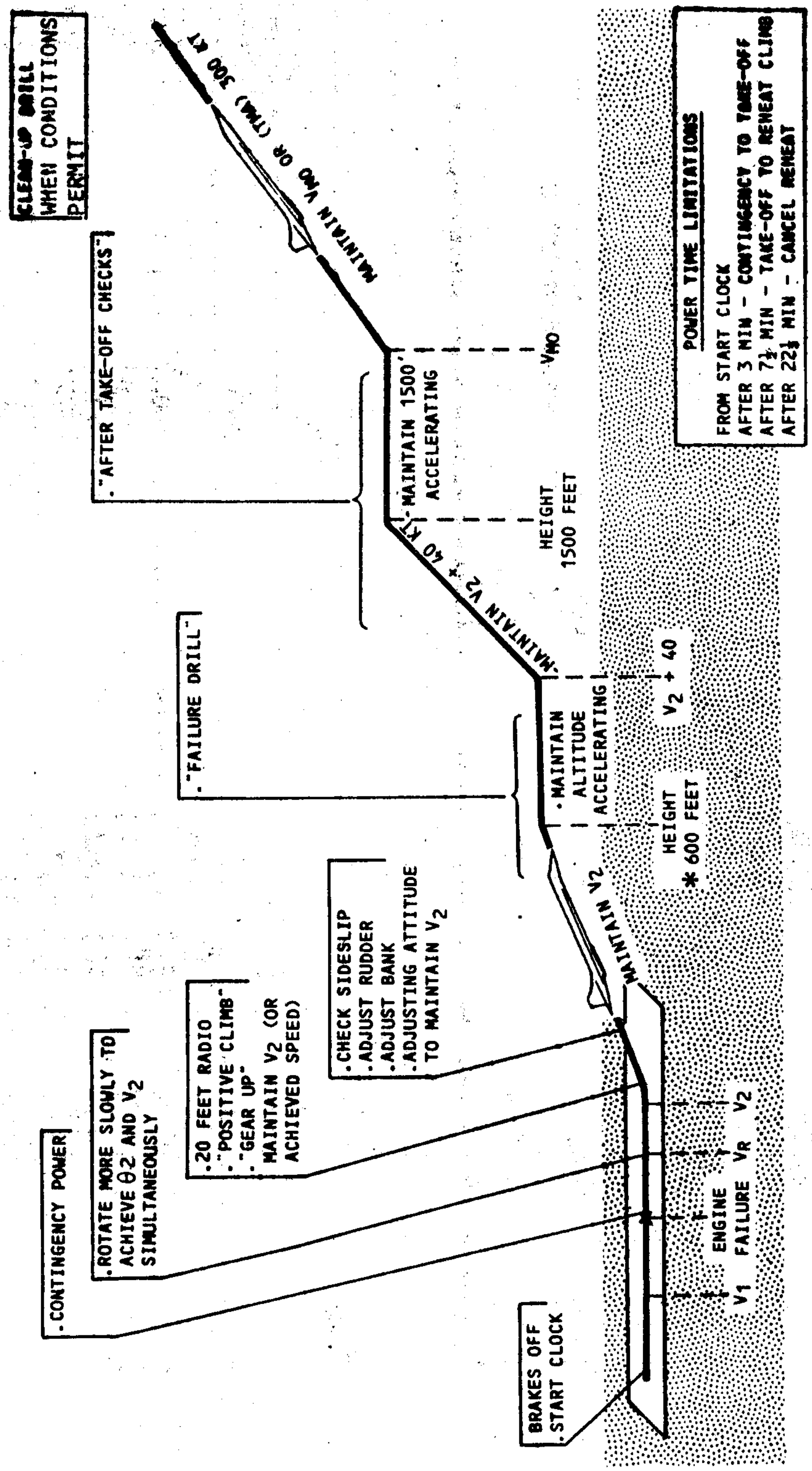
EMERGENCY DESCENT



EMERGENCY DESCENT

(Deletion)

ENGINE FAILURE AFTER V_1 ALTERNATIVE 1

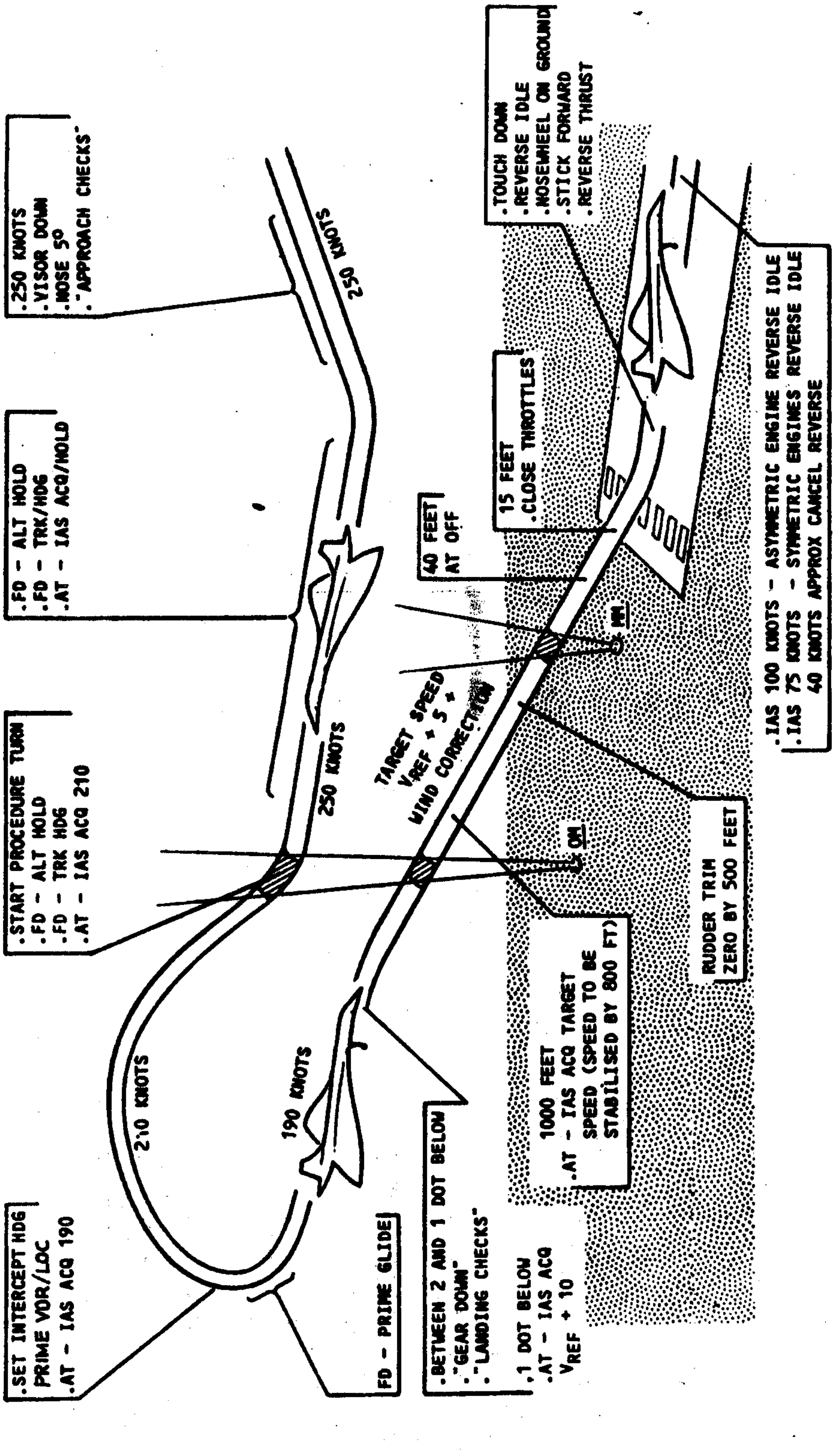


ENGINE FAILURE AFTER V_1 ALTERNATIVE 1

(Deletion)

ENGINE FAILURES

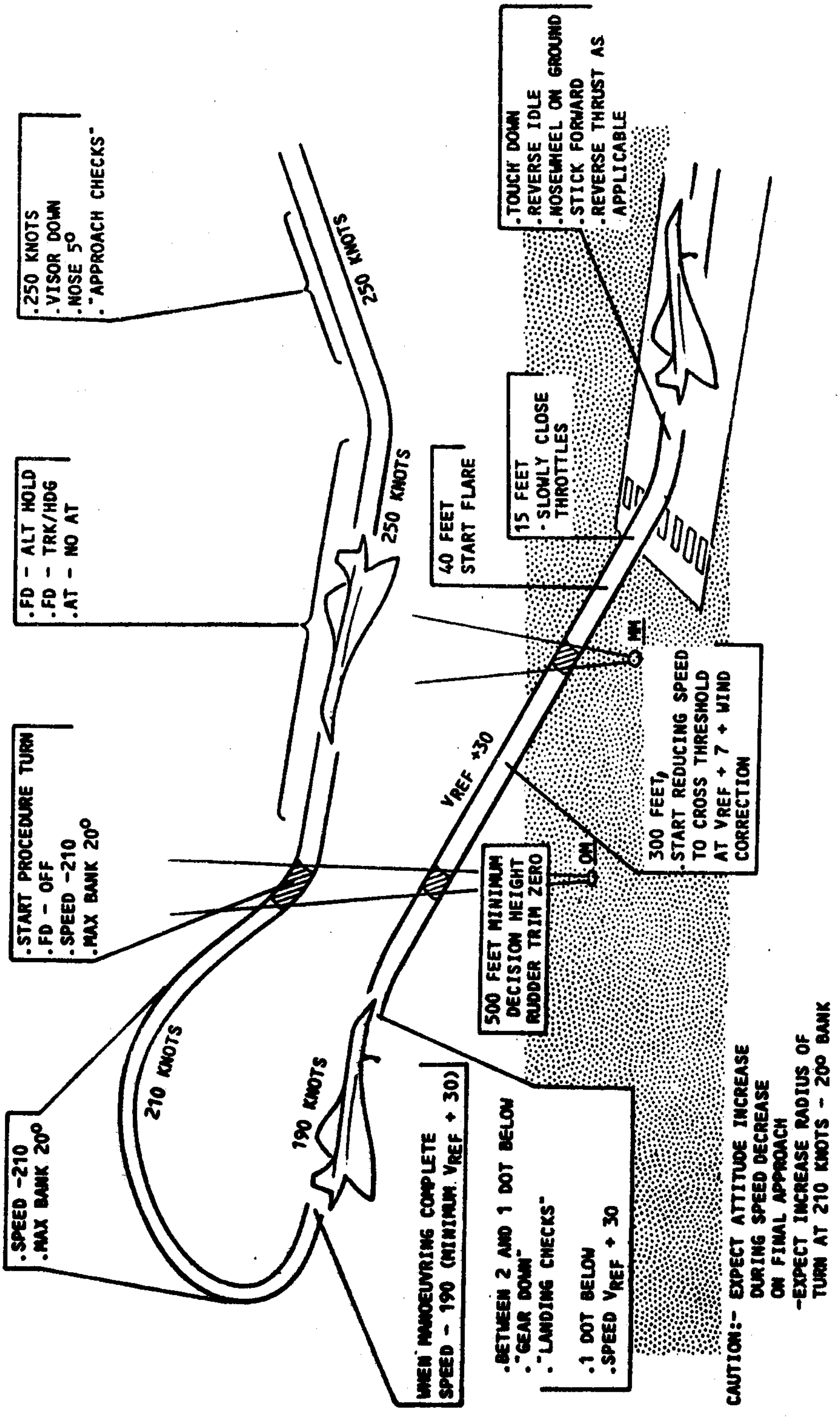
3 ENGINE ILS APPROACH AND LANDING



3 ENGINE ILS APPROACH AND LANDING
MANUAL WITH FLIGHT DIRECTOR

ENGINE FAILURES

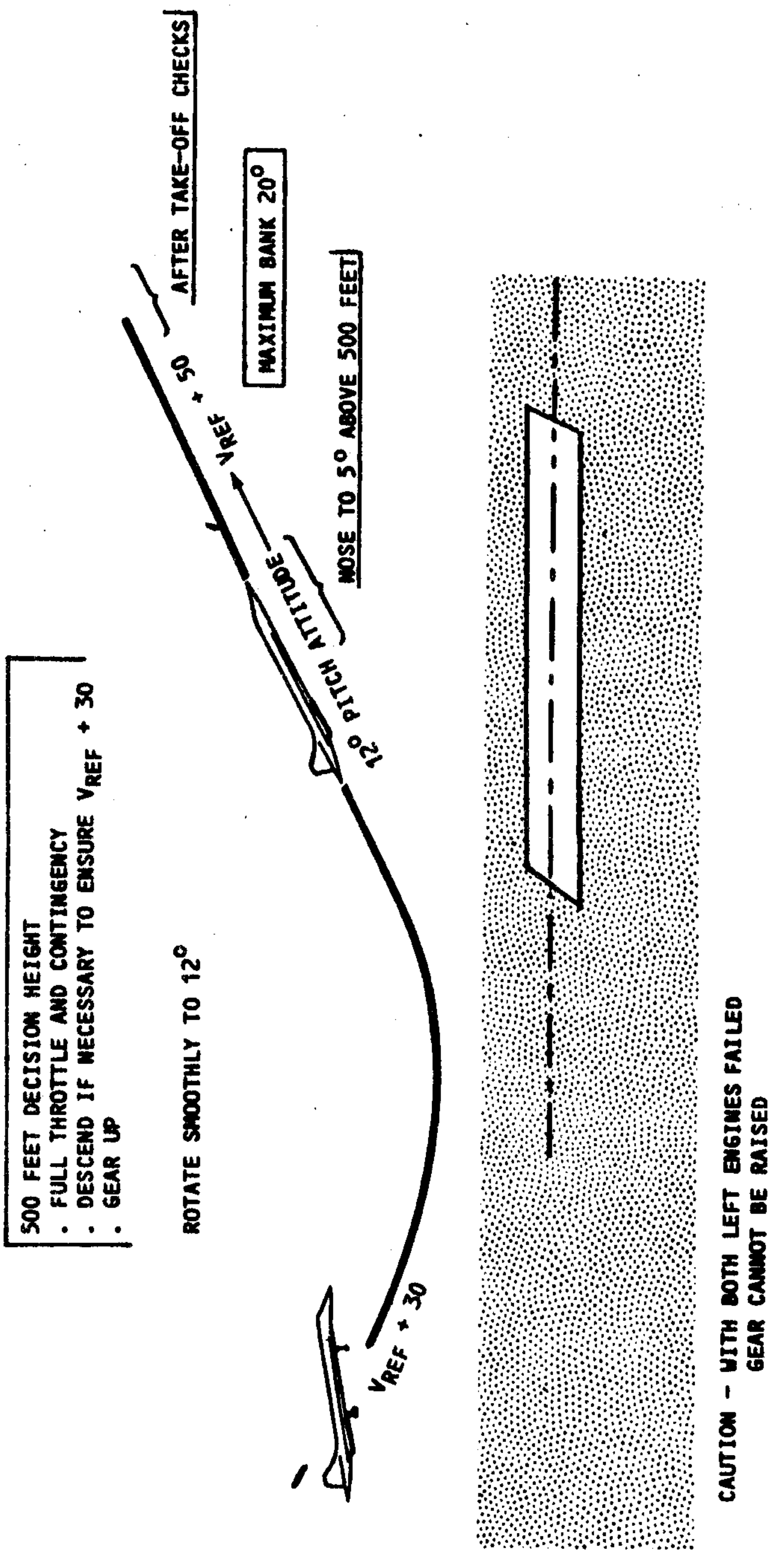
2 ENGINE ILS APPROACH AND LANDING



2 ENGINE ILS APPROACH AND LANDING

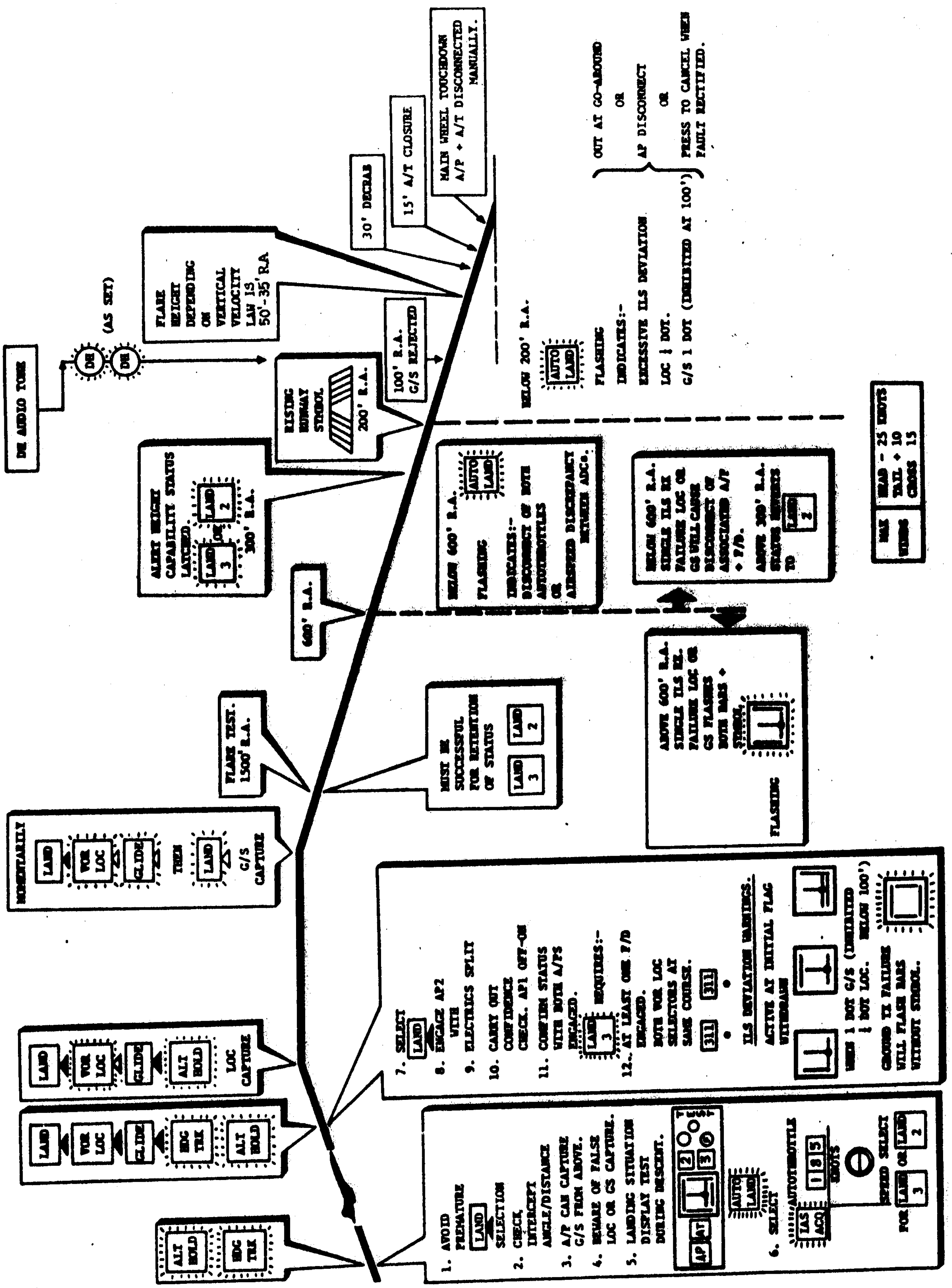
ENGINE FAILURES

2 ENGINE GO-AROUND



2 ENGINE GO-AROUND

ALL WEATHER OPERATION



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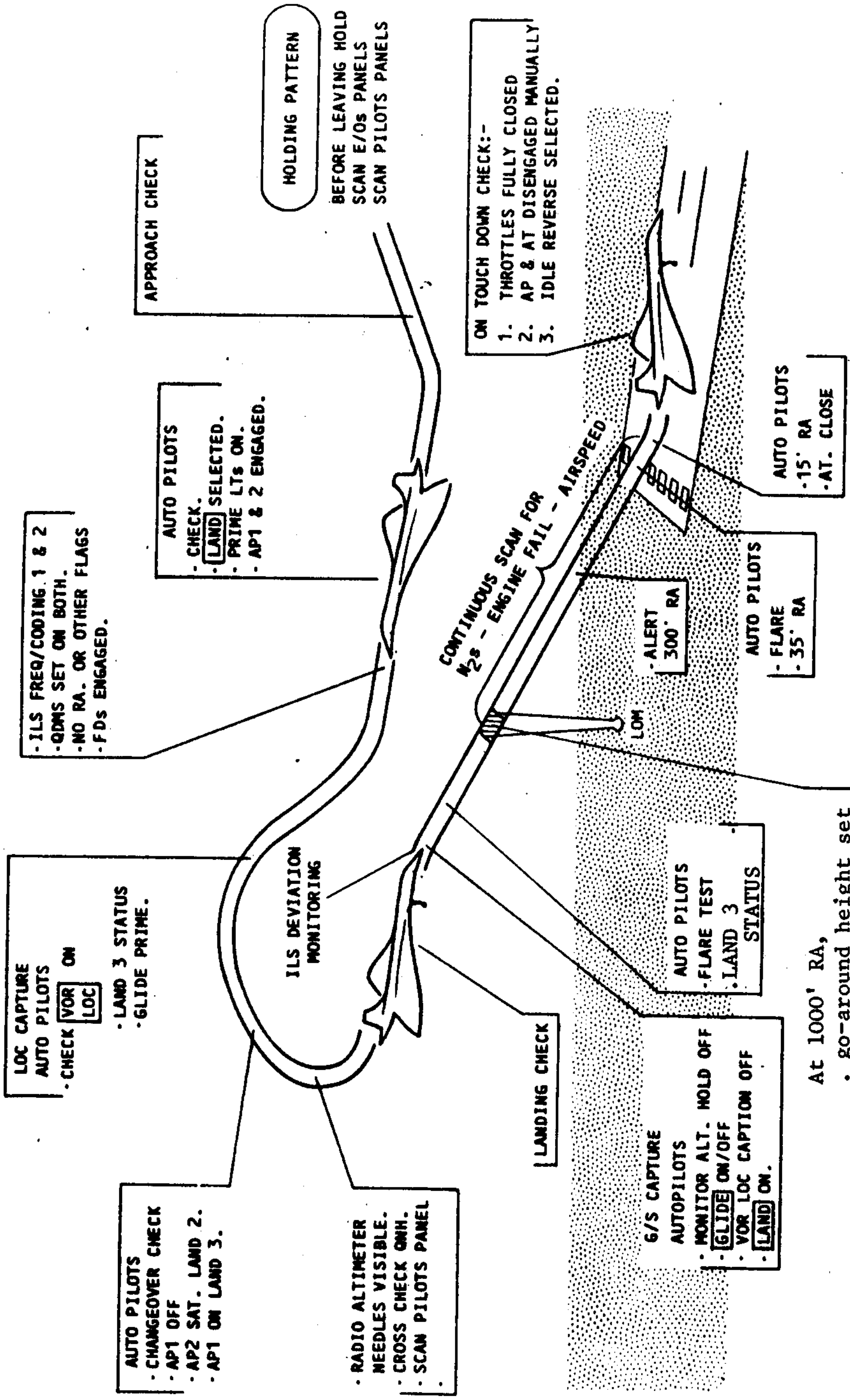

At 1000' RA,
. go-around height set
. 5 greens
. Category status

AUTOLAND CAT 3 - APPROACH PROFILE

AUTO PILOT
GLIDE & LAND MODES
ABNORMAL PROCEDURES

WARNING	CAUSE	ACTION — WITHOUT VISUAL REFERENCE	ACTION — WITH VISUAL REFERENCE
AP red + audio	Both APs disengaged	CAT 1. Go-around or continue under manual control CAT 2.) Go-around CAT 3.)	Continue under manual control
		Note: If above 1,000ft. an attempt may be made to re-engage one or both autopilots.	
AT red flashing	Both ATs disengaged	CAT 1. Auto-go-around or disengage AP & FD and continue under manual control CAT 2.) Auto go-around CAT 3.)	Disengage AP & FD and continue under manual control
AUTO LAND red flashing	Unsatisfactory ILS performance, ILS failure or ADS failure	Auto go-around	Disengage AP & AT and continue under manual control.
		Note: If accompanied by ADS warning, revert to standby ASI immediately	
Capability indicators blank at 300ft. (No LAND 2 or LAND 3 indication)	Necessary crew actions incomplete or failure of essential system	Disengage AP at not less than 100ft. and make a manual landing	

WARNING	CAUSE	ACTION — WITHOUT VISUAL REFERENCE	ACTION — WITH VISUAL REFERENCE
 One bar + symbol - steady	Excessive deviation from ILS centre line	Check ILS deviation. If error persists: CAT 1. Auto go-around or continue under manual control CAT 2.) CAT 3.) Auto go-around	Check flight path. If unsatisfactory disengage AP and continue under manual control.
Two opposite bars + symbol - flashing	Failure of ILS receiver associated with controlling AP	CAT 1. Auto go-around or continue under manual control using serviceable receiver CAT 2.) CAT 3.) Auto go-around Note: If above, 1,000ft. the second AP may be engaged.	Disengage controlling AP & continue under manual control
Two opposite bars - flashing Symbol not illuminated	Failure of ILS transmitter	Auto go-around	Disengage controlling AP & continue under manual control.

Notes : (1) Below 600ft. in LAND mode failure of an ILS receiver causes disengagement of the associated AP and the bars and symbol do not flash.

(2) Below 200ft. excessive ILS deviation and ILS transmitter failure case the AUTCLAND warning to flash. Actions appropriate to that warning must be taken.