(G) Maximum demonstrated crosswind.

(1) If the maximum demonstrated crosswind is considered to be limiting for either take-off or landing, the crosswind limitation must be stated in the Limitations Section. If the crosswind value is considered to be limiting for one type of operation (e.g. autoland) but not for another, the crosswind limitation may also state the specific operations to which it applies.

(2) If the maximum crosswind value demonstrated under CS 25.237 is considered to be not limiting for both take-off and landing operations, the demonstrated crosswind value may be presented in a section other than the Limitations Section.

(H) Runway slope. Limitations and performance information should normally be restricted to runway gradients up to ±2 percent. Limitations for runway slopes greater than ±2 percent may be approved if the effects of the larger slopes are validated in a manner acceptable to the EASA.

(I) Runway surface type (smooth and hard-surfaced, or any other type approved).

(ii) En route Flight Paths.

(A) Maximum altitude.

(B) Ambient atmospheric temperature (maximum and minimum).

(C) In accordance with CS 25.123(a), en route flight path data must be presented in the AFM for all altitudes and temperatures within the operating envelope limits of the aeroplane.

(4) Centre-of-Gravity Limits. Indicate by using tables or graphs the centre of gravity (c.g.) limits for taxi, take-off and landing, zero fuel weight, and for any other practicably separable flight condition. As appropriate, data should be provided for a range of weights between the maximum taxi weight and the minimum in-flight weight. The data should be shown with the appropriate gear position for the phase of flight, and gear effects on the centre-of-gravity should be built into the charts. Data may be presented for gear-extended position only if there is proper accounting for the moment change due to gear retraction. The c.g. limits should be presented in terms of either the distance-from-a specified datum or as a percentage of the mean aerodynamic chord (MAC). Either the location of the datum or the length and location of the MAC should be stated, as applicable. If alternate forward c.g. limits have been approved, these limits should be presented and appropriately identified.

(5) Fuel Limitations. A statement in accordance with CS 25.1585(d) must be included. Operating limitations due to fuel related considerations (e.g. lateral fuel imbalance, fuel management, fuel temperature) and their effects on altitude limitations (e.g. boost pump(s) inoperative, fuel type) should also be provided.

(6) Powerplant Limitations.

(i) State all limitations necessary to ensure safe operation of engines, propellers, fuel systems and powerplant accessories, including auxiliary powerplants (see CS 25.1521 and 25J1521). If the use of reduced or derated

take-off thrust or power is requested, then any associated operating or performance limitations should be included in accordance with acceptable reduced and derated takeoff thrust or power procedures. Limitations related to the use of reverse thrust in flight or on the ground should be clearly identified. Any engine limitations associated with operations in adverse weather (heavy rain, hail, turbulence, lightning, etc.) should be specified. Any icing conditions that may impact the normal operation of the engine should also be defined.

(ii) Because engine ice protection is critical to safety in icing conditions, a statement should be included in the Limitations Section that the engine ice protection must be on during all ground and flight operations when icing conditions exist or are anticipated. The following definition of icing conditions should also be included in the Limitations Section:

Icing conditions – Icing conditions exist when outside air temperature (OAT) on the ground and for take-off, or total air temperature (TAT) in flight, is 10 degrees C or below and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet or ice crystals).

Icing conditions also exist when the OAT on the ground and for take-off is 10 degrees C or below when operating on ramps, taxiways, or runways where surface snow, ice, standing water or slush may be ingested by the engines or freeze on engines, nacelles or engine sensor probes.

(7) Airspeed and Mach Number Limitations. All airspeed limitations should be in terms of indicated airspeed and in units of knots or Mach number, where applicable and should be consistent with cockpit indication. If airspeed or Mach number limitations vary with altitude or loading conditions, such variation must be shown. Limitations data must be included for at least the following:

(i) Maximum operating limit speed, V_{MO}/M_{MO}, together with a statement that this speed limit may not be deliberately exceeded in any regime of flight (climb, cruise or descent), unless a higher speed is authorised for flight test or pilot training. The last phrase (unless a higher speed is authorised for flight test or pilot training) may be omitted at the option of the applicant.

(ii) Manoeuvring speed (established under CS 25.1507) together with statements, as applicable to the particular design, explaining that:

(a) full application of pitch, roll, or yaw controls should be confined to speeds below the manoeuvring speed; and

(b) rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw, and full control inputs in more than one axis at the same time, should be avoided as they may result in structural failures at any speed, including below the manoeuvring speed.

(iii) Flap-extended speed, V_{FE}, for each approved flap and high lift device position.

(iv) Landing gear operating speed, V_{LO}, together with a statement that this is the maximum speed at which it is safe to extend or retract the landing gear. If

different speeds are established for extension and retraction, each speed should be listed and defined.

(v) Landing gear extended speed, V_{LE}, together with a statement that this is the maximum speed at which the aeroplane can be safely flown with the landing gear extended and locked.

(vi) Any other limiting speeds for extendable devices other than the landing gear, should be included as applicable (e.g. spoilers, thrust reversers, landing lights, ram air turbine (RAT), windows that may be opened in flight, etc.).

(8) Manoeuvring Load Factor Limitations. The positive and negative flight manoeuvring limit load factors (expressed in terms of 'g's') for which the structure is approved should be provided, including any variation with the position of the high lift devices.

(9) Kinds of Operations. This subsection should contain a statement similar to the following:

This aeroplane is certificated as a Large Turbine-powered Aeroplane and is eligible for the following kinds of operations when the appropriate instruments and equipment required by the airworthiness and operating requirements are installed and approved and are in operable condition.

The approval status of the following should be stated:

(i) Operation in atmospheric icing conditions.

(ii) Extended over-water operation.

(iii) Extended range operations with two-engine aeroplanes (ETOPS).

(iv) Day and night operations under visual flight rules (VFR).

(v) Operations under instrument flight rules (IFR).

(vi) Backing the aeroplane with reverse thrust.

(vii) Category I, II or III operations.

(10) Minimum Flight Crew. The minimum number of flight crew approved to operate the aeroplane should be stated.

(11) Systems and Equipment Limitations. All limitations applicable to systems and equipment installations that are considered necessary for safe operation must be included. Examples of systems and equipment installations for which limitations may be appropriate include, but are not limited to, electrical, hydraulic, pneumatic, cabin pressurisation, air conditioning, airframe fire protection, airframe ice protection, auto braking systems, autopilot, autothrottle, flight director, yaw damper, anti-skid devices, performance or flight management system (including software identifier if displayable), etc.

(12) Miscellaneous Limitations. This item should include any information not specified under the preceding headings but necessary, as a limitation, to ensure safe operation of the aeroplane.

c. *Operating Procedures Section*. The Operating Procedures Section of the AFM should contain, as a minimum, the essential information, peculiar to the particular aeroplane type design, that is needed for safe operation under normal and other-than-normal conditions. Procedures not directly related to airworthiness, or not under control of the flight crew, should not be included in the AFM. A notation similar to the following should be placed at the beginning of the Operating Procedures Section.

The operating procedures contained in this manual have been developed and recommended by the manufacturer and approved by the EASA for use in operating this aeroplane. These procedures are provided as guidance and should not be construed as prohibiting the operator from developing equivalent procedures in accordance with the applicable operating rules.

(1) Procedures Categories. Information should be presented for normal, non-normal, and emergency procedures and be distinctly separated. Procedural tasks considered to be recall or immediate action items, which must be accomplished from memory, should be clearly identified.

(2) Format. Procedures should be presented either in a narrative or a checklist format, depending upon the intended use of the AFM.

(i) Narrative. This format is acceptable if sources of procedures information other than the AFM are intended for flight crew use (e.g. Flight Crew Operating Manual (FCOM)). Procedures presented in this format should be drafted in a manner from which the needed sequence can be easily established.

(ii) Checklist. This format should be used if the AFM is intended to be used directly by the flight crew for operating procedures.

(3) Procedures Development. Prior to initial type certification, it is essential to verify that proposed procedures are technically valid and operationally practicable. It is recognised that such procedures may have had only limited operational exposure at the time of certification and may need to be revised based on service experience.

(4) Procedures Content. The content and level of detail for the normal, non-normal, and emergency procedures provided in the AFM should be based on the intended use of the AFM. More information and detail should be provided in AFMs that are intended to be the flight crew's primary sources of operating procedures information than for AFMs that are not intended to be used directly by the flight crew.

(i) General. Classifying an operating procedure as normal or as non-normal should reflect whether the aeroplane's systems are operating normally. Procedures associated with failed or inoperative systems should be considered non-normal. Procedures associated with glideslope deviation, ground proximity warning, all engines operating go-around, turbulent air penetration, etc, which do not occur routinely, should be placed in the normal procedures subsection, provided the aeroplane's systems are operating normally.

(ii) Other Sources of Procedures Information. The flight crew of large transport category aeroplanes typically use other sources of operating procedures information other than the AFM. Examples of other sources of operating

procedures information include manufacturer- or operatorproduced operating manuals, Quick Reference Handbooks (QRH), System Pilot's Guides and Emergency or Abnormal Checklists. For these aeroplanes, items such as cockpit checklists, systems descriptions, and the associated normal procedures should not be presented in the AFM if they are provided in other documents acceptable to the Agency. Normal procedures that are necessary for safe operation should be presented in the AFM, but the remaining normal procedures should be placed in the manufacturer produced FCOM (or other acceptable sources of operating procedures information). The non-normal procedures section of the AFM for these types of aeroplanes should include, as a minimum, procedures dictated by the aeroplane's system and failure modes, and may also include those emergency procedures listed in paragraph 6.c(5) of this AMC. Whenever procedures are provided in another source rather than the AFM, a statement should be placed in the appropriate procedures section of the AFM referencing where the detailed procedures information can be found.

(iii) AFM Used Directly. For those manufacturers and operators that do not produce other sources of procedures information (generally manufacturers and operators of small transports), the AFM is the only source of this information. In this circumstance, the AFM operating procedures information must be comprehensive and include information such as cockpit checklists, systems descriptions and associated procedures.

(5) Emergency Procedures. The emergency procedures can be included either in a dedicated section of the AFM or in the non-normal procedures section. In either case, this section should include the procedures for handling any situation that is in a category similar to the following:

(i) Engine failure with severe damage or separation.

(ii) Multiple engine failure.

(iii) Fire in flight.

(iv) Smoke control. The following should be clearly stated in the AFM:

After conducting the fire or smoke procedures, land at the nearest suitable airport, unless it is visually verified that the fire has been extinguished.

(v) Rapid decompression.

(vi) Emergency descent.

(vii) Uncommanded reverser deployment in flight.

(viii) Crash landing or ditching.

(ix) Emergency evacuation.

d. *Performance Section.* This section of the AFM contains the performance limitations, other data required by the applicable airworthiness and noise regulations, and any special conditions that may apply. Additional information may be provided to assist the operator in complying with the operating rules or for implementing unique operational needs. The performance information should cover the operating range of weights, altitudes, temperatures, aeroplane configurations, thrust ratings, and any other operational variables stated as operational performance limitations for the aeroplane. If additional

performance information is presented for operation at a specific altitude, these performance data should cover a pressure altitude span of at least the specific altitude ±1,000 feet to allow an operator to adequately account for pressure altitude variations. It is recommended that such data be included as a separate section or appendix to the AFM.

(1) General. Include all descriptive information necessary to identify the configuration and conditions for which the performance data are applicable. Such information should include the type or model designations of the aeroplane and its engines, the approved flap settings, a brief description of aeroplane systems and equipment that affect performance (e.g. anti-skid, automatic spoilers, etc.), and a statement indicating whether such systems and equipment are operative or inoperative. This section should also include definitions of terms used in the Performance Section (e.g. IAS, CAS, ISA, configuration, net flight path, icing conditions, etc.), plus calibration data for airspeed (flight and ground), Mach number, altimeter, air temperature and other pertinent information. The airspeed, altitude and air temperature calibration data should be presented for the following ranges:

(i) Take-off configurations:

(A) Ground run, 0·8 V_{1MIN} to V_{2MAX}.

(B) In-flight, V_{2MIN} to V_{FE}.

(ii) Approach and landing configurations:

(A) Approach, 1·13 V_{SR} to V_{FE}.

(B) Landing, 1·23 V_{SR} to V_{FE}.

(iii) En route configuration:

(A) Airspeed and Altimeter: For the take-off/take-off path altitude range, 1.18 V_{SR} to V_{MO}/M_{MO}.

(B) Airspeed and Altimeter: For higher altitudes, from 1.18 V_{SR} or the speed for 1·2 g buffet onset margin, whichever is lower, to V_{MO}/M_{MO}.

(C) Mach Number: From the lowest useful Mach number (generally in the range of 0·4 to 0·5) to M_{MO}.

(D) Total or Static Air Temperature: For Mach numbers corresponding to the speed ranges noted in paragraphs 6.d(1)(iii)(A) and (B) of this AMC.

(2) Performance Procedures. The procedures, techniques and other conditions associated with the AFM performance data should be included. Performance procedures may be presented as a performance subsection or in connection with a particular performance graph. In the latter case, a comprehensive listing of the conditions associated with the particular performance data may serve as procedures if sufficiently complete. The AFM should also include adequate information to enable the operator to show compliance with CS 25.1001 for each take-off.

(3) Thrust or Power Setting. Thrust or power settings should be provided for at least take-off, maximum continuous, and go-around thrust or power, along with the thrust or power setting procedures necessary to obtain the performance shown in the AFM. These data should be shown for each applicable thrust or power setting

parameter. If backing the aeroplane by reverse thrust is proposed, thrust setting limits should be established considering contaminated runway, foreign object damage potential, environmental control system impact, aeroplane weight and c.g., cockpit visibility, effect of braking, etc.

(4) Minimum Control Speeds. Minimum control speed data may be located in the Performance Section with a reference in the Limitations Section as to its location.

(5) Stall Speeds. The stall speeds established in showing compliance with certification requirements should be presented, together with associated conditions. Data should be presented in terms of calibrated airspeed. If applicable, stall speed increments with accreted ice must be provided.

(6) Take-off Speeds. The take-off speeds, V_1, V_R and V_2 must be presented in the AFM, together with the associated conditions. These speeds should be presented in units consistent with cockpit instrument indication. V_1 and V_R speeds should be based upon ground effect calibration data while V_2 speeds should be based upon free air calibration data. The take-off speeds associated with minimum control speeds and the maximum energy absorption capability of the brakes should be included. At the option of the applicant, the AFM may also include the V_1 speeds associated with unbalanced field lengths. At all conditions and aeroplane configurations represented in the AFM (i.e., at all altitudes, temperatures, weights, winds, runway slopes, flap settings, etc.), the accuracy of the V_1 speed should either 1) be within 1·5 knots of the V_1 speed used to calculate the take-off and accelerate-stop distances, or 2) not cause an increase to these distances of more than the greater of 100 feet or the incremental increase resulting from a 1·5 knots variation in V_1 speed.

(7) Take-off and Accelerate-Stop Distances. Take-off and accelerate-stop distances, complying with CS 25.105, 25.109, 25.113, and 25.1591 must be provided. At the option of the applicant, and with concurrence by the Agency, additional data may be provided for operations on other than smooth hard-surfaced runways.

(8) Climb Limited Take-off Weight. The climb limited take-off weight, which is the most limiting weight showing compliance with CS 25.121(a), (b) and (c), must be provided.

(9) Miscellaneous Take-off Weight Limits. Take-off weight limits should be shown for any equipment or characteristic of the aeroplane that imposes an additional take-off weight restriction (e.g. maximum tyre speed, maximum brake energy, fuel jettison consideration, inoperative system(s), etc.).

(10) Take-off Climb Performance. For the prescribed take-off climb aeroplane configurations, the climb gradients must be presented, together with associated conditions. The scheduled climb speed(s) should be included.

(11) Take-off Flight Path Data. Take-off flight paths, or performance information necessary to construct such paths, together with the associated conditions (e.g. procedures and speeds), should be presented for each approved take-off configuration. The presentation should include all flight path segments existing between the end of the take-off distance and the end of the take-off path, as defined in CS 25.111(a). Such data must be based upon net performance, as prescribed in CS 25.115(b) and (c).

(12) En route Flight Path Data. The net flight path gradient data prescribed in CS 25.123 must be presented, together with the associated conditions (e.g. procedures and speeds). Data must be presented for one- and two-engine-inoperative cases, as applicable, throughout the approved operating altitude and temperature envelope.

(13) Climb Limited Landing Weight. The climb limiting landing weight, which is the most limiting weight showing compliance with CS 25.119 and 25.121(d), should be provided.

(14) Miscellaneous Landing Weight Limits. Landing weight limits for any equipment or characteristic of the aeroplane configuration that imposes an additional landing weight restriction should be shown.

(15) Approach Climb Performance. For the approach climb configuration, the climb gradients (CS 25.121(d)) and weights up to maximum take-off weight (CS 25.1587(b)(3)) should be presented, together with associated conditions (e.g. procedures and speeds). The effects of ice accretion on unprotected portions of the airframe and the effects of engine and wing ice protection systems should be provided.

(16) Landing Climb Performance. Data for the landing climb configuration should be presented in a manner similar to that described for the approach configuration above.

(17) Landing Approach Speeds. The scheduled speeds associated with the approved landing distances and operational landing runway lengths (see paragraph 6.d(18) of this AMC) should be presented, together with associated conditions.

(18) Landing Distance. The landing distance from a height of 50 ft must be presented either directly or with the factors required by the operating regulations, together with associated conditions and weights up to the maximum take-off weight. For all landplanes, landing distance data must be presented for smooth, dry, hard-surfaced runways for standard day temperatures. With concurrence by the Agency, additional data may be presented for other temperatures and runway slopes within the operational limits of the aeroplane, or for operations on other than smooth, hard-surfaced runways. For all weather operations, additional landing performance data may be required.

The unfactored landing distances for dry and wet runways are minimum normalised values based on certification test procedures. For those distances, a runway surface with no slope at standard day temperature as well as standard landing speeds are assumed.

The AFM should state the following conditions for which the landing distances are valid:

— runway slope,

— temperature,

— landing configuration, and

— thrust or power setting.

The landing distances at the time of arrival (LDTA) reflect the performance that is expected in operational conditions. The AFM should present LDTA as follows:

— for all runway condition codes from 1 to 6,

— for certified landing configurations,

— for final-approach speeds (V_{APP}) including recommended speed increments,

— with and without reverse thrust credit, and

— within the certified flight envelope for:

  — runway slope, and

  — outside air temperature.

The AFM should state that a safety margin should be applied to the landing distances to account for operating practices and expected operational variability.

The performance information that is provided in the AFM to comply with CS 25.1592 and the LDTA concept in the applicable air operations regulations produce a large variety of landing distance data being provided in the AFM. Therefore, the intended use of each piece of the landing-distance information should be properly explained in the AFM.

The AFM should emphasise the need to apply a safety margin, particularly to such landing distances whose method of derivation is the least conservative. Such landing distances are, for example, those determined by a maximum-performance manoeuvre based on data (e.g. flight path angle and touchdown sink rate) that are normalised to specified conditions so that the landing distances achieved in operational conditions may be greater.

(19) Performance Limits and Information Variation with Centre of Gravity. If performance information, (e.g. buffet boundary) is not presented for the most critical c.g. condition, the AFM should present the effect of variation with c.g.

(20) Noise Data. The noise levels achieved during type certification in accordance with the applicable noise requirements should be presented, together with associated conditions and with the following note:

> No determination has been made by the EASA that the noise levels of this aircraft are or should be acceptable or unacceptable for operation at, into or out of any airport.

The noise levels achieved during type certification should be included in the AFM and consist of only one take-off, one sideline, and one approach noise level for each aeroplane model (i.e. hardware build). The noise certification standard complied with should accompany the noise level information to indicate the compliance status. Supplementary information (labeled as such) may be added to the AFM concerning noise levels for other configurations or conditions.

(21) Miscellaneous Performance Data. Any performance information or data not covered in the previous items that are required for safe operation because of unusual design features or operating or handling characteristics should be furnished. For example, the maximum quick turn around weight should be provided.

e. *Loading Instructions.* CS 25.1583 requires instructions necessary to ensure loading of the aeroplane within the established limits of weight and centre-of-gravity, and to maintain the loading within such limits in flight to be presented either in the AFM or included in a separate weight and balance document referenced in the AFM Limitations Section. If applicable, the loading instructions must refer to flight procedures that consider the change to the aeroplane's centre of gravity as fuel is consumed.

(1) Loading Instructions Presented in a Separate Document. If the loading instructions are presented in a separate document, the AFM Limitations Section should contain at least the following:

(i) Maximum taxi weight limits.

(ii) Maximum take-off weight limits.

(iii) Maximum landing weight limits.

(iv) Maximum zero fuel weight limits.

(v) Minimum in-flight weight.

(vi) Centre-of-gravity limits.

(vii) Information required to maintain the aeroplane within the above limits.

(2) Weight-and-Balance Data. Documentation of the weight-and-balance material outlined below is normally adequate for aeroplanes with conventional loading and fuel-management techniques. For aeroplanes that require fuel to be redistributed (other than through normal consumption) to maintain loading within prescribed limits, the loading instructions should be expanded as necessary.

(i) Weight Limits. A list and identification of all weight limitations should be included.

(ii) Centre-of-Gravity Limits. The approved centre-of-gravity range, or ranges, should be presented with due accounting for aeroplane configuration (i.e. landing gear position, passenger loading, cargo distribution etc.) such that loading limits can be maintained.

(iii) Dimensions, Datum and MAC. The dimensions and relative location of aeroplane features associated with weighing and loading of the aeroplane and with weight-and-balance computations should be described or illustrated.

(iv) Configuration Checklist or Equipment List. The aeroplane should be defined or described sufficiently to identify the presence or absence of optional systems, features or installations that are not readily apparent. In addition, all other items of fixed or removable equipment included in the empty weight should be listed.

(v) Fuel and Other Liquids. All fuel and other liquids, including passenger service liquids, that are included in the empty weight should be identified and listed, together with the information necessary to enable ready duplication of the particular condition.

(vi) Weighing Computations. Computation of the empty weight and the empty-weight c.g. location should be included.

(vii) Loading Schedule. The loading schedule should be included, if appropriate.