

## AEROPLANE FLIGHT MANUAL

### CS 25J1583 Operating limitations

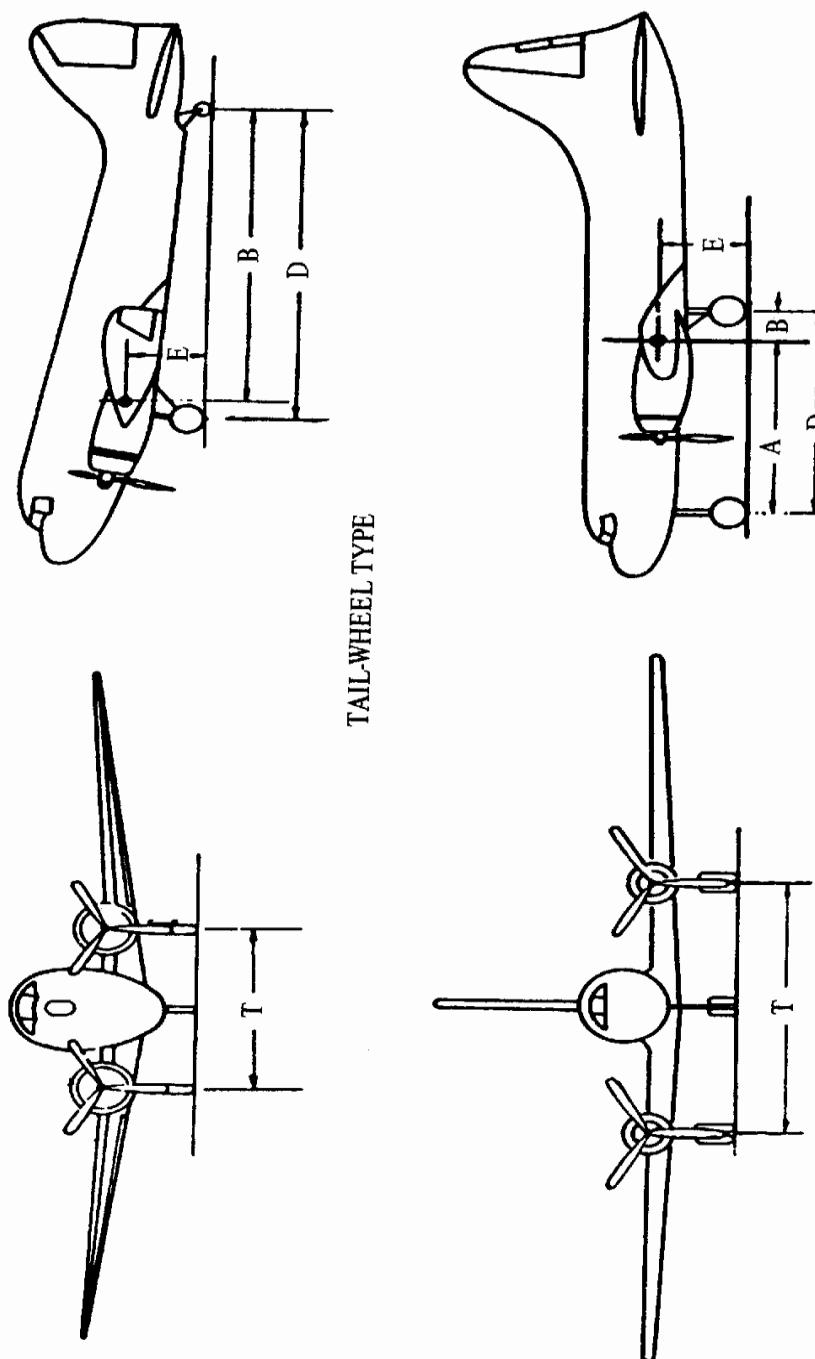
*ED Decision 2005/006/R*

APU limitations established under [CS 25J1521](#) and information to explain the instrument markings provided under [CS 25J1549](#) and [CS 25J1551](#) must be furnished.

[Amdt 25/1]

# APPENDICES TO CS-25

## APPENDIX A

*ED Decision 2003/2/RM*

**FIGURE 1 BASIC LANDING GEAR DIMENSION DATA**

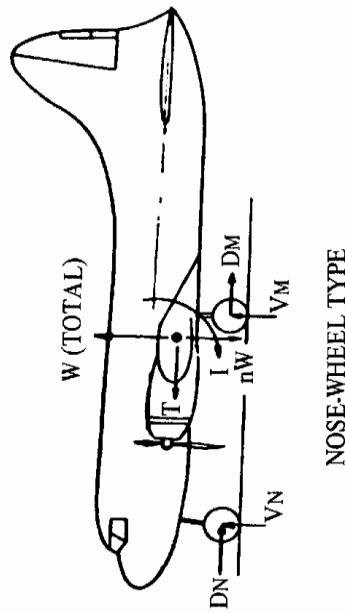
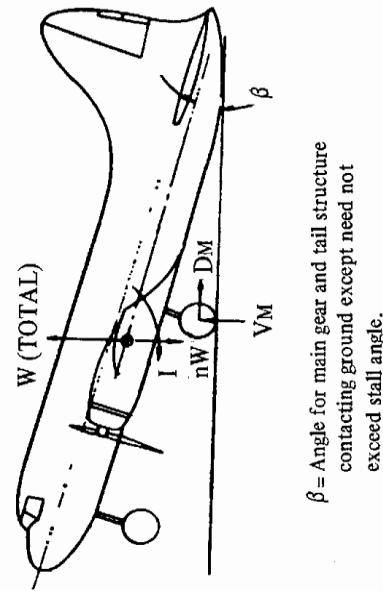
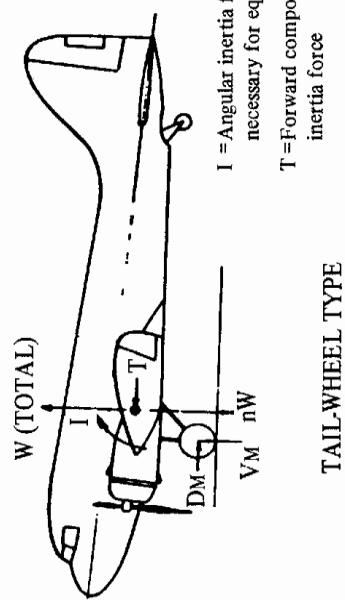


FIGURE 2 LEVEL LANDING



$\beta$  = Angle for main gear and tail structure contacting ground except need not exceed stall angle.

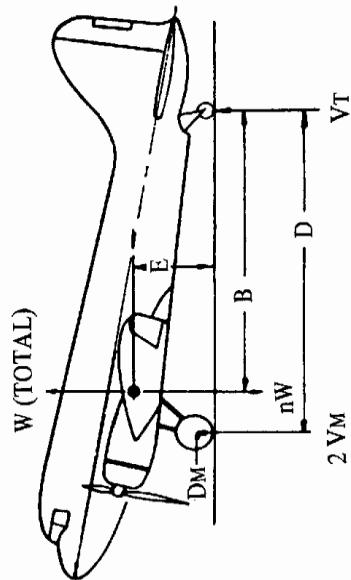
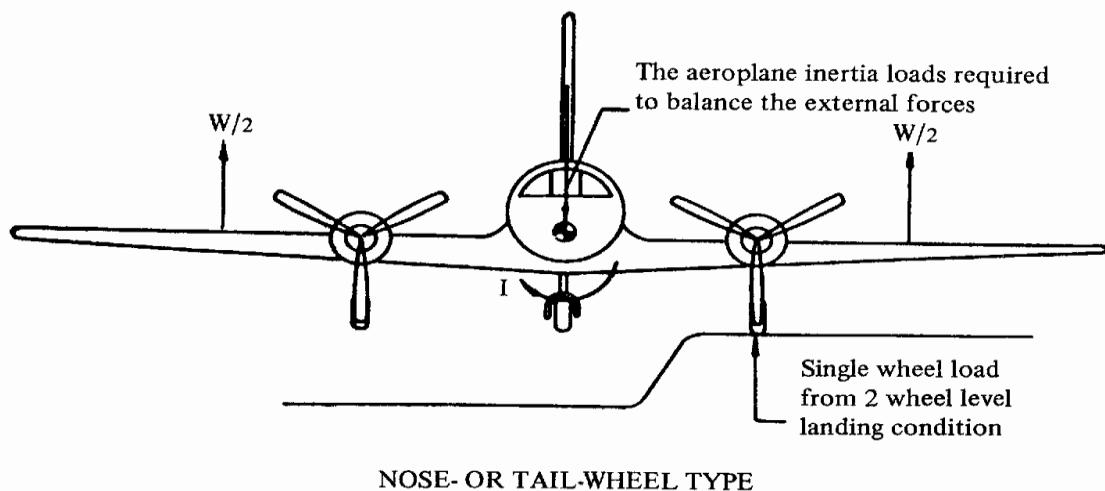
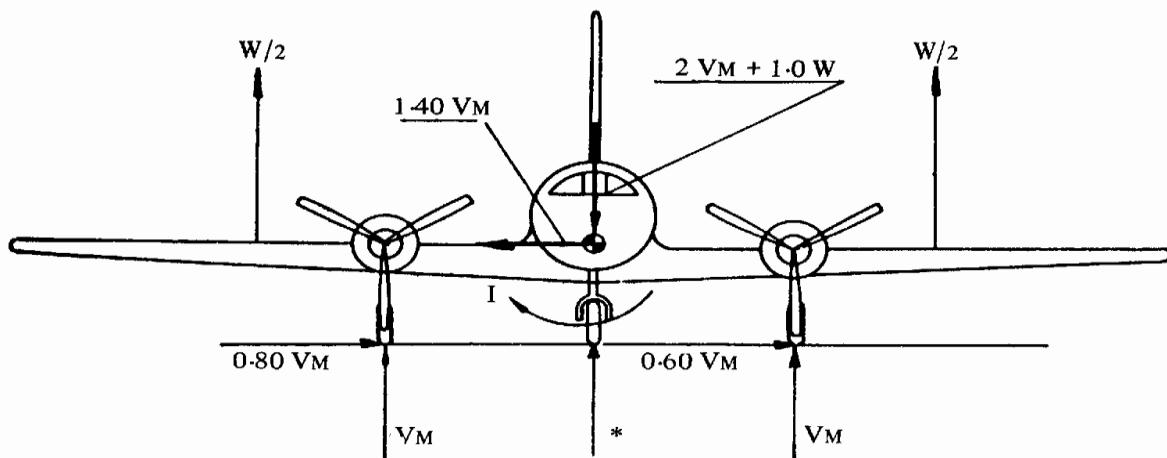
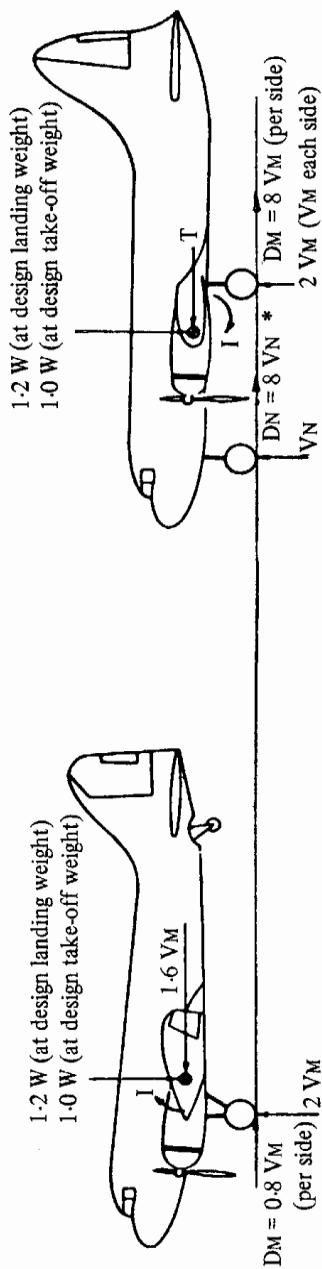


FIGURE 3 TAIL-DOWN LANDING


**FIGURE 4 ONE-WHEEL LANDING**

**FIGURE 5 LATERAL DRIFT LANDING**

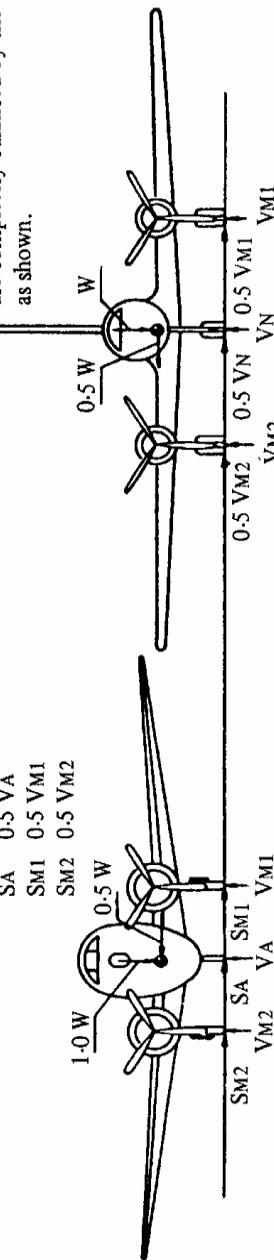
$T$  = inertia force necessary to balance the wheel drag  
 $*DN = 0$  unless nose wheel is equipped with brakes  
 For design of main gear  $V_N = 0$   
 For design of nose gear  $I = 0$



TAIL-WHEEL TYPE

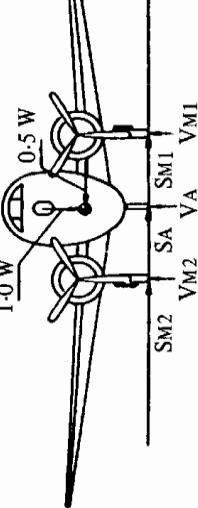
FIGURE 6 BRAKED ROLL

The aeroplane inertia factors at centre of gravity are completely balanced by the wheel reactions as shown.

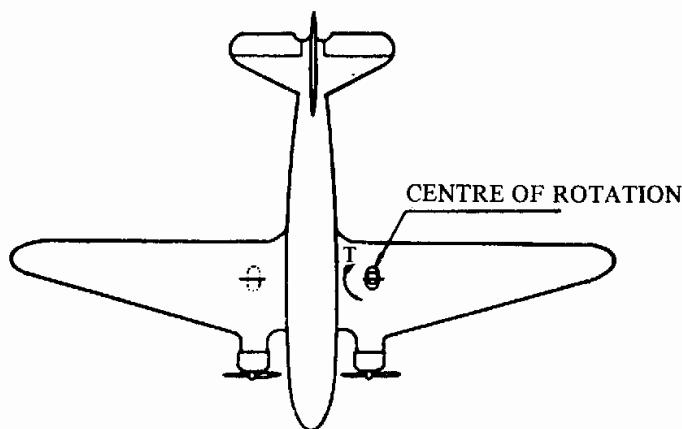


NOSE-WHEEL TYPE

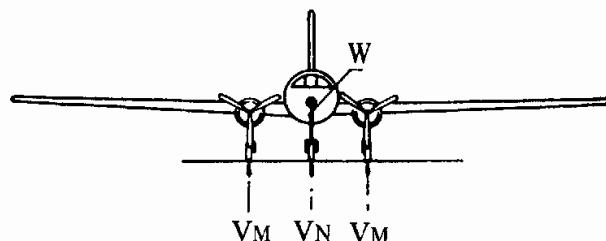
FIGURE 7 GROUND TURNING



TAIL-WHEEL TYPE



V<sub>N</sub> AND V<sub>M</sub> ARE STATIC GROUND REACTIONS. FOR TAIL-WHEEL TYPE THE AEROPLANE IS IN THE THREE POINT ATTITUDE. PIVOTING IS ASSESSED TO TAKE PLACE ABOUT ONE MAIN LANDING GEAR UNIT.



**FIGURE 8 PIVOTING, NOSE- OR TAIL-WHEEL TYPE**

## APPENDIX C

### Part I – Atmospheric Icing Conditions

*ED Decision 2007/010/R*

- (a) Continuous maximum icing. The maximum continuous intensity of atmospheric icing conditions (continuous maximum icing) is defined by the variables of the cloud liquid water content, the mean effective diameter of the cloud droplets, the ambient air temperature, and the interrelationship of these three variables as shown in Figure 1 of this Appendix. The limiting icing envelope in terms of altitude and temperature is given in Figure 2 of this Appendix. The interrelationship of cloud liquid water content with drop diameter and altitude is determined from Figures 1 and 2. The cloud liquid water content for continuous maximum icing conditions of a horizontal extent, other than 32.2 km (17.4 nautical miles), is determined by the value of liquid water content of Figure 1, multiplied by the appropriate factor from Figure 3 of this Appendix.
- (b) Intermittent maximum icing. The intermittent maximum intensity of atmospheric icing conditions (intermittent maximum icing) is defined by the variables of the cloud liquid water content, the mean effective diameter of the cloud droplets, the ambient air temperature, and the interrelationship of these three variables as shown in Figure 4 of this Appendix. The limiting icing envelope in terms of altitude and temperature is given in Figure 5 of this Appendix. The interrelationship of cloud liquid water content with drop diameter and altitude is determined from Figures 4 and 5. The cloud liquid water content for intermittent maximum icing conditions of a horizontal extent, other than 4.8 km (2.6 nautical miles), is determined by the value of cloud liquid water content of Figure 4 multiplied by the appropriate factor in Figure 6 of this Appendix.
- (c) Takeoff maximum icing. The maximum intensity of atmospheric icing conditions for takeoff (takeoff maximum icing) is defined by the cloud liquid water content of 0.35 g/m<sup>3</sup>, the mean effective diameter of the cloud droplets of 20 microns, and the ambient air temperature at ground level of minus 9 degrees Celsius (-9° C). The takeoff maximum icing conditions extend from ground level to a height of 457 m (1500 ft) above the level of the takeoff surface.

[Amdt 25/3]

### Part II – Airframe Ice Accretions

*ED Decision 2015/008/R*

- (a) Ice accretions - General. The most critical ice accretion in terms of aeroplane performance and handling qualities for each flight phase must be used to show compliance with the applicable aeroplane performance and handling requirements in icing conditions of subpart B of this part. Applicants must demonstrate that the full range of atmospheric icing conditions specified in part I of this appendix have been considered, including the mean effective drop diameter, liquid water content, and temperature appropriate to the flight conditions (for example, configuration, speed, angle-of-attack, and altitude). The ice accretions for each flight phase are defined as follows:
  - (1) Take-off Ice is the most critical ice accretion on unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, occurring between the end of the take-off distance and 122 m (400 ft) above the take-off surface, assuming accretion starts at the end of the take-off distance in the take-off maximum icing conditions of Part I, paragraph (c) of this Appendix.

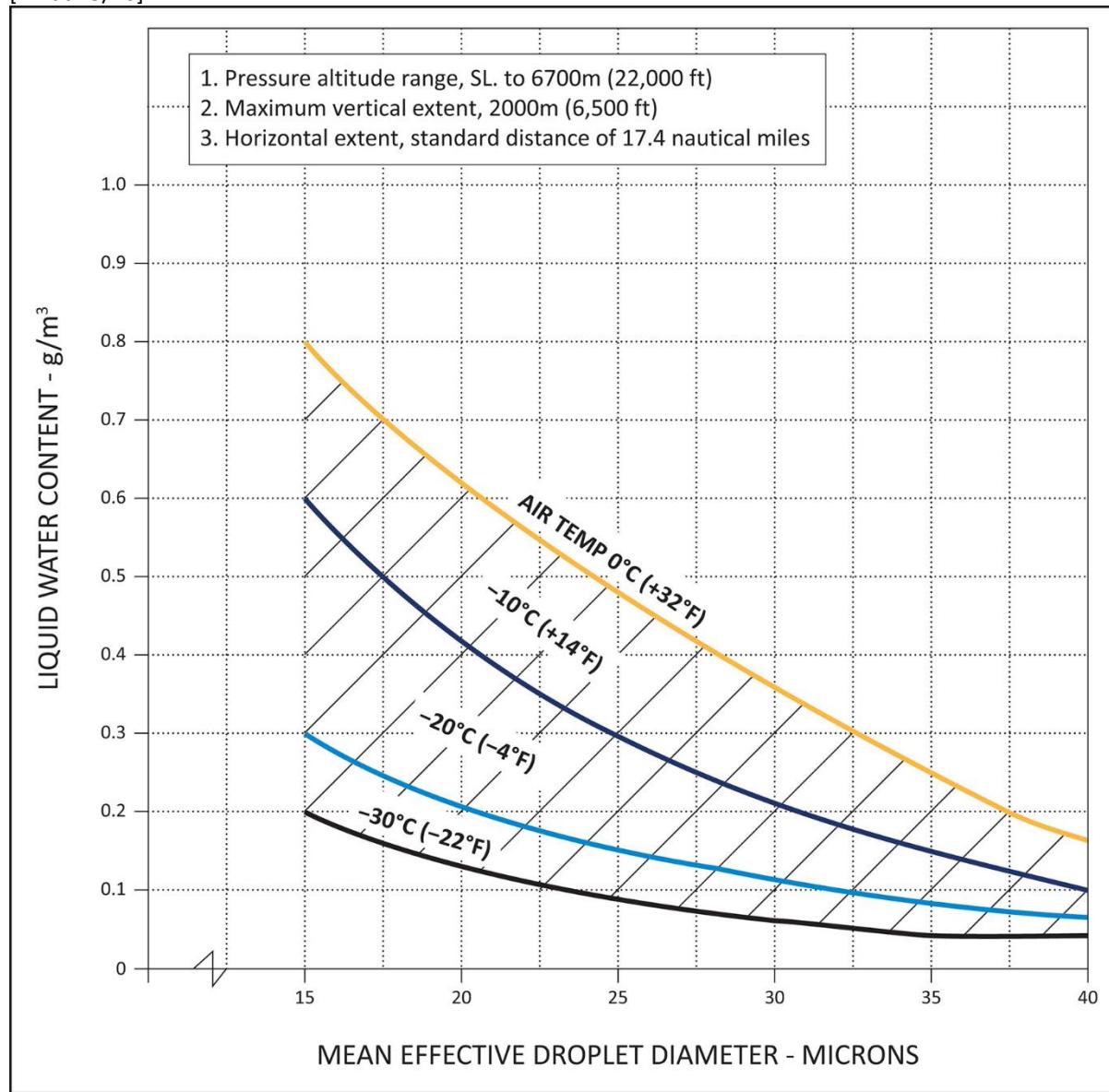
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- (2) Final Take-off Ice is the most critical ice accretion on unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, between 122 m (400 ft) and either 457 m (1500 ft) above the take-off surface, or the height at which the transition from the take-off to the en route configuration is completed and  $V_{FTO}$  is reached, whichever is higher. Ice accretion is assumed to start at the end of the take-off distance in the take-off maximum icing conditions of Part I, paragraph (c) of this Appendix.
- (3) En-route Ice is the critical ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, during the en-route phase.
- (4) Holding Ice is the critical ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, during the holding flight phase.
- (5) Approach ice is the critical ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation following exit from the holding flight phase and transition to the most critical approach configuration.
- (6) Landing ice is the critical ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation following exit from the approach flight phase and transition to the final landing configuration.
- (b) In order to reduce the number of ice accretions to be considered when demonstrating compliance with the requirements of paragraph CS 25.21(g), any of the ice accretions defined in sub-paragraph (a) of this section may be used for any other flight phase if it is shown to be more critical than the specific ice accretion defined for that flight phase. Configuration differences and their effects on ice accretions must be taken into account.
- (c) The ice accretion that has the most adverse effect on handling characteristics may be used for aeroplane performance tests provided any difference in performance is conservatively taken into account.
- (d) For both unprotected and protected parts, the ice accretion for the takeoff phase may be determined by calculation, assuming the takeoff maximum icing conditions defined in appendix C, and assuming that:
- (1) Airfoils, control surfaces and, if applicable, propellers are free from frost, snow, or ice at the start of the take-off;
  - (2) The ice accretion starts at the end of the take-off distance;
  - (3) The critical ratio of thrust/power-to-weight;
  - (4) Failure of the critical engine occurs at  $V_{EF}$ ; and
  - (5) Crew activation of the ice protection system is in accordance with a normal operating procedure provided in the Aeroplane Flight Manual, except that after beginning the takeoff roll, it must be assumed that the crew takes no action to activate the ice protection system until the airplane is at least 122 m (400 ft) above the takeoff surface.

- (e) The ice accretion before the ice protection system has been activated and is performing its intended function is the critical ice accretion formed on the unprotected and normally protected surfaces before activation and effective operation of the ice protection system in continuous maximum atmospheric icing conditions. This ice accretion only applies in showing compliance to [CS 25.143\(i\)](#), [25.207\(h\)](#) and [25.207\(i\)](#).

[Amdt 25/3]

[Amdt 25/7]

[Amdt 25/16]

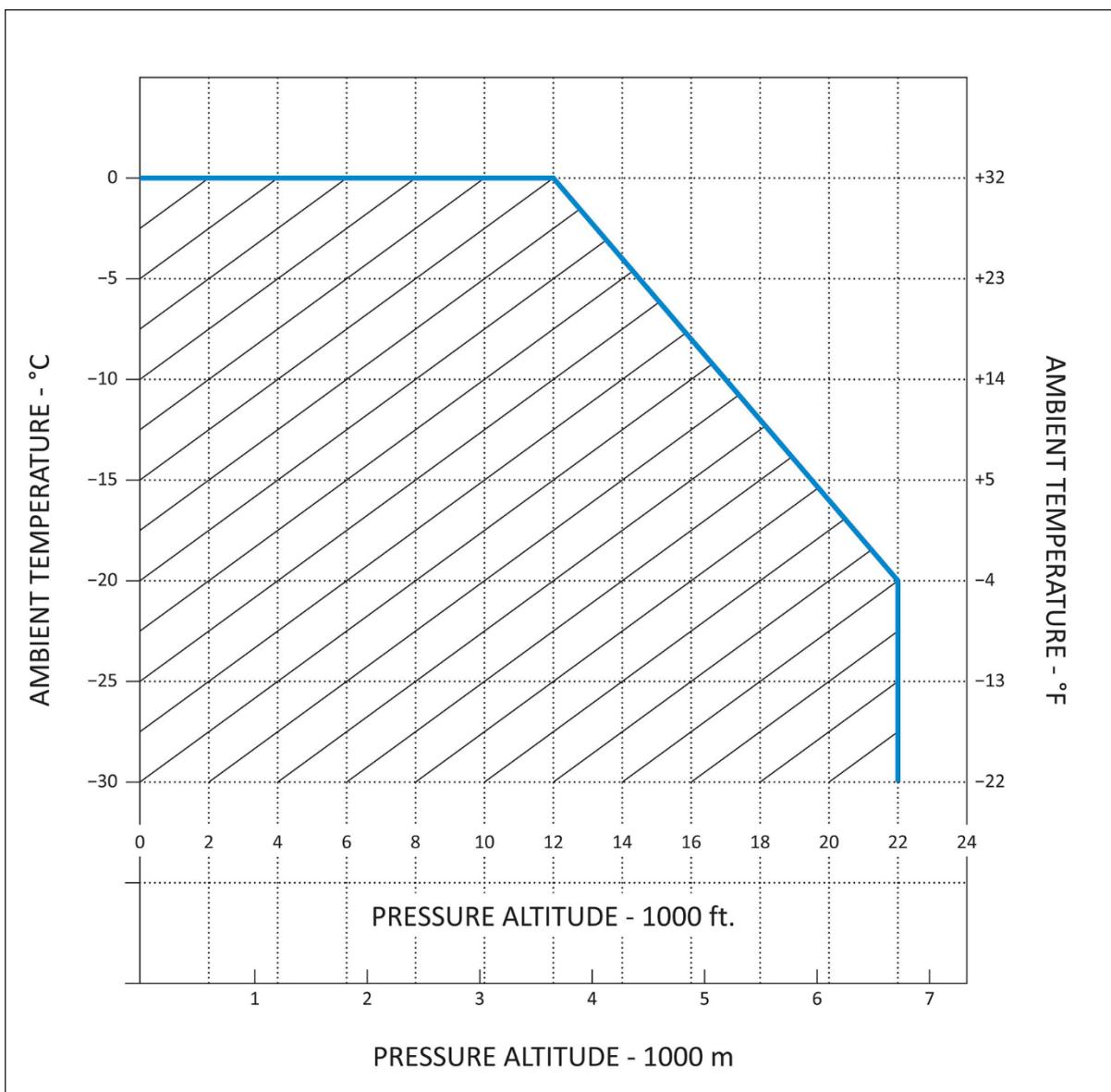


**FIGURE 1**

**CONTINUOUS MAXIMUM (STRATIFORM CLOUDS) ATMOSPHERIC ICING CONDITIONS**

**LIQUID WATER CONTENT VS MEAN EFFECTIVE DROP DIAMETER**

**Source of data – NACA TN No. 1855, Class III –M, Continuous Maximum.**


**FIGURE 2**
**CONTINUOUS MAXIMUM (STRATIFORM CLOUDS) ATMOSPHERIC ICING CONDITIONS**
**AMBIENT TEMPERATURE VS PRESSURE ALTITUDE**
*Source of data – NACA TN No. 2569.*