AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

TABLE 2.—FLIGHT LENGTH DISTRIBUTION—Continued

Flight length (NM)		Airplane maximum range—nautical miles (NM)									
From	To	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
9200	9400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
9400	9600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
9600	9800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
9800	10000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

(c) Overnight Temperature Drop. For airplanes on which FRM is installed, the overnight temperature drop for this appendix is defined using:

(1) A temperature at the beginning of the overnight period that equals the landing temperature of the previous flight that is a random value based on a Gaussian distribution; and

(2) An overnight temperature drop that is a random value based on a Gaussian distribution.

(3) For any flight that will end with an overnight ground period (one flight per day out of an average number of flights per day, depending on utilization of the particular airplane model being evaluated), the landing outside air temperature (OAT) is to be chosen as a random value from the following Gaussian curve:

TABLE 3.—LANDING OUTSIDE AIR TEMPERATURE

Parameter	Landing outside air temperature °F
Mean Temperature	58.68
negative 1 std dev	20.55
positive 1 std dev	13.21

(4) The outside ambient air temperature (OAT) overnight temperature drop is to be chosen as a random value from the following Gaussian curve:

TABLE 4.—OUTSIDE AIR TEMPERATURE (OAT) DROP

Parameter	OAT drop temperature °F
Mean Temp	12.0
1 std dev	6.0

(d) Number of Simulated Flights Required in Analysis. In order for the Monte Carlo analysis to be valid for showing compliance with the fleet average and warm day flammability exposure requirements, the applicant must run the analysis for a minimum number of flights to ensure that the fleet average and warm day flammability exposure for the fuel tank under evaluation meets the applicable flammability limits defined in Table 5 of this appendix.

TABLE 5.—FLAMMABILITY EXPOSURE LIMIT

Minimum number of flights in Monte Carlo analysis	Maximum acceptable Monte Carlo average fuel tank flammability exposure (percent) to meet 3 percent requirements	Maximum acceptable Monte Carlo average fuel tank flammability exposure (percent) to meet 7 percent part 26 requirements
10,000	2.91	6.79
100,000	2.98	6.96
1,000,000	3.00	7.00

[Doc. No. FAA–2005–22997, 73 FR 42495, July 21, 2008]

APPENDIX O TO PART 25—SUPERCOOLED LARGE DROP ICING CONDITIONS

This Appendix consists of two parts. Part I defines this Appendix as a description of supercooled large drop icing conditions in which the drop median volume diameter (MVD) is less than or greater than 40 μm, the maximum mean effective drop diameter (MED) of Appendix C of this part continuous maximum (stratiform clouds) icing conditions. For this Appendix, supercooled large drop icing conditions consist of freezing drizzle and freezing rain occurring in and/or below stratiform clouds. Part II defines ice accretions used to show compliance with the airplane performance and handling qualities requirements of subpart B of this part.

PART I—METEOROLOGY

In this Appendix icing conditions are defined by the parameters of altitude, vertical and horizontal extent, temperature, liquid water content, and water mass distribution as a function of drop diameter distribution.

(a) Freezing Drizzle (Conditions with spectra maximum drop diameters from 100μm to 500 μm):

(1) Pressure altitude range: 0 to 22,000 feet MSL.

(2) Maximum vertical extent: 12,000 feet.

(3) Horizontal extent: Standard distance of 17.4 nautical miles.

(4) Total liquid water content.

NOTE: Liquid water content (LWC) in grams per cubic meter (g/m^3) based on horizontal extent standard distance of 17.4 nautical miles.

(5) Drop diameter distribution: Figure 2.

(6) Altitude and temperature envelope: Figure 3.

(b) Freezing Rain (Conditions with spectra maximum drop diameters greater than 500 μm):

(1) Pressure altitude range: 0 to 12,000 ft MSL.

(2) Maximum vertical extent: 7,000 ft.

(3) Horizontal extent: Standard distance of 17.4 nautical miles.

(4) Total liquid water content.

NOTE: LWC in grams per cubic meter (g/m^3) based on horizontal extent standard distance of 17.4 nautical miles.

(5) Drop Diameter Distribution: Figure 5.

(6) Altitude and temperature envelope: Figure 6.

(c) Horizontal extent.

The liquid water content for freezing drizzle and freezing rain conditions for horizontal extents other than the standard 17.4 nautical miles can be determined by the value of the liquid water content determined from Figure 1 or Figure 4, multiplied by the factor provided in Figure 7, which is defined by the following equation:

S = 1.266 − 0.213 log10(H)

Where:

S = Liquid Water Content Scale Factor (dimensionless) and

H = horizontal extent in nautical miles

FIGURE 1 — Appendix O, Freezing Drizzle, Liquid Water Content

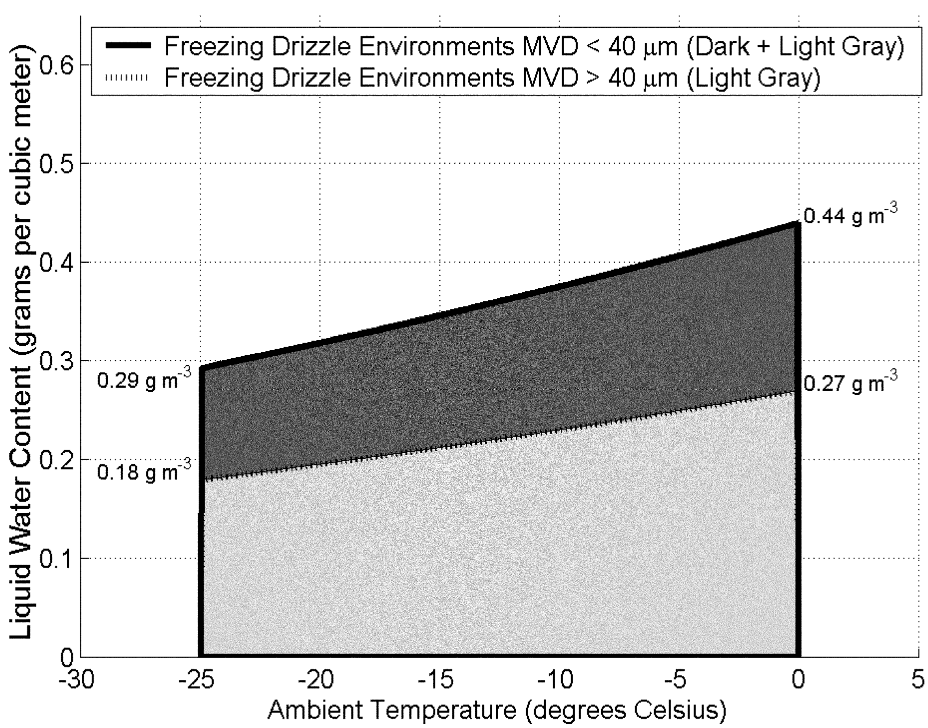


FIGURE 2 — Appendix O, Freezing Drizzle, Drop Diameter Distribution

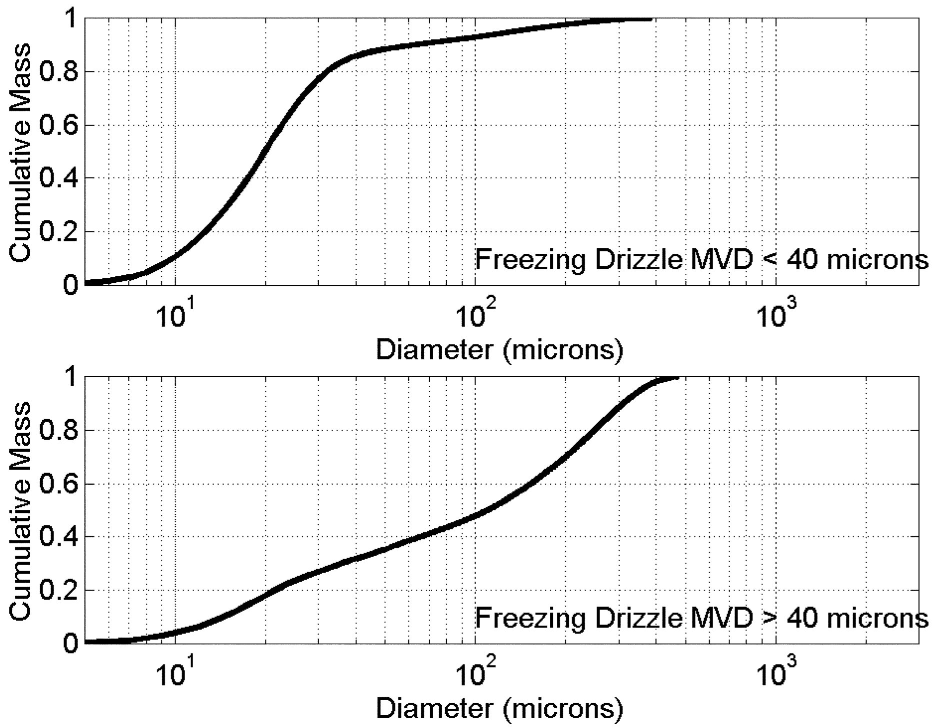


FIGURE 3 — Appendix O, Freezing Drizzle, Temperature and Altitude

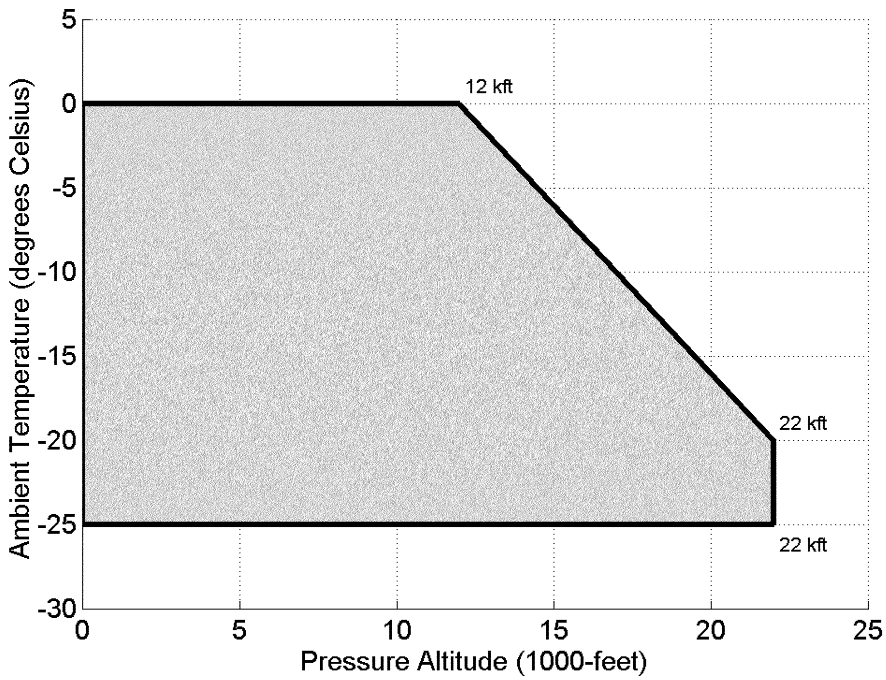


FIGURE 4 — Appendix O, Freezing Rain, Liquid Water Content

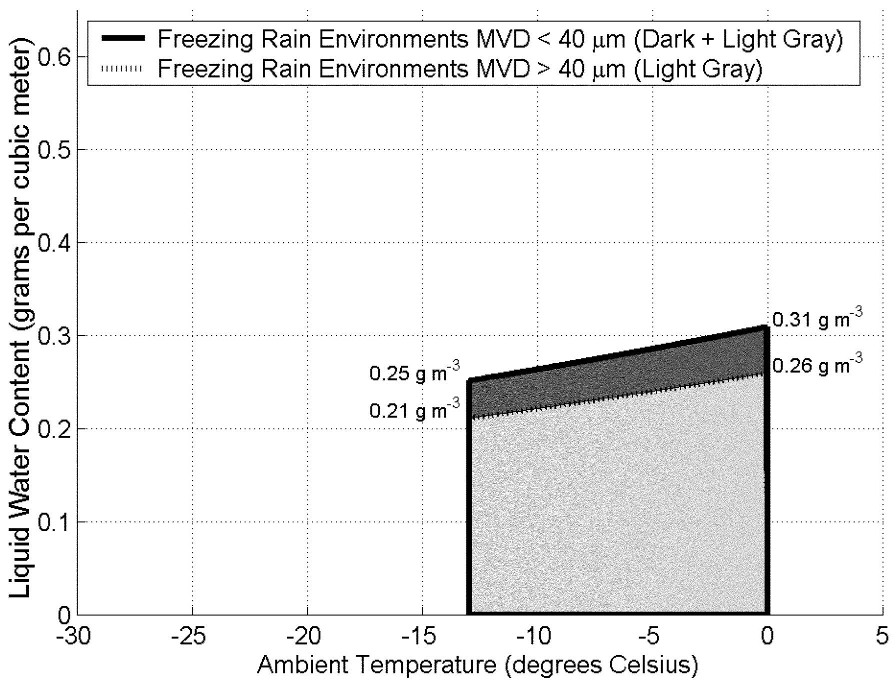


FIGURE 5 — Appendix O, Freezing Rain, Drop Diameter Distribution

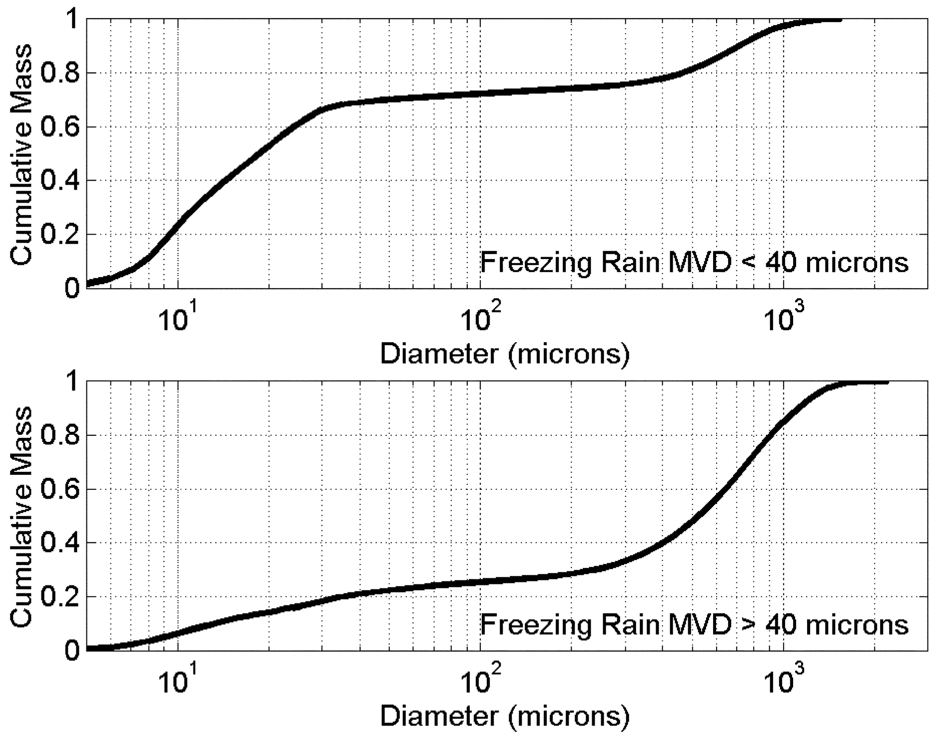


FIGURE 6 — Appendix O, Freezing Rain, Temperature and Altitude

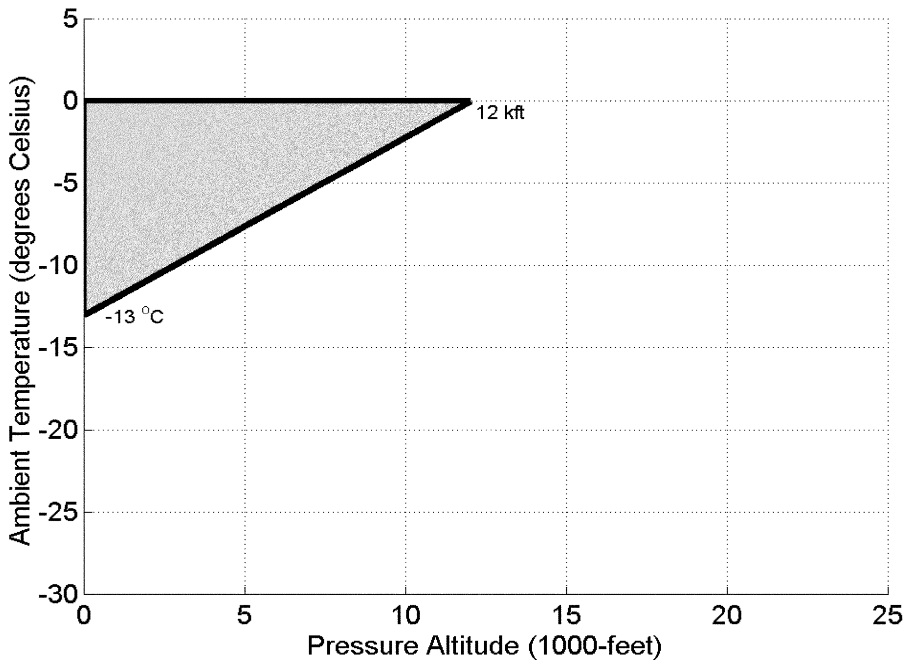
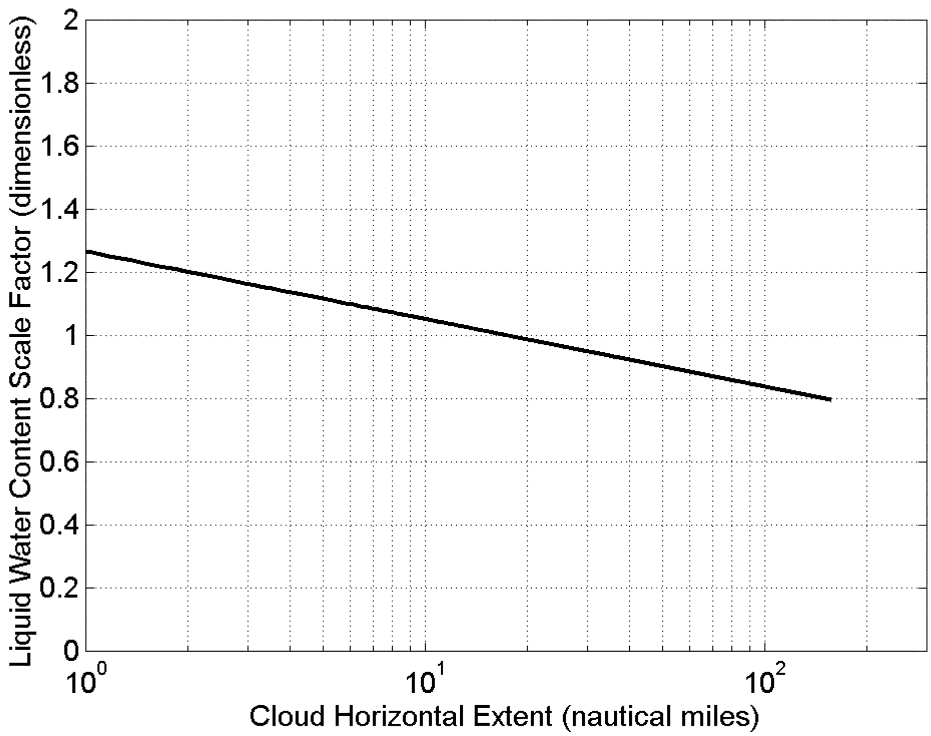


FIGURE 7 — Appendix O, Horizontal Extent, Freezing Drizzle and Freezing Rain



PART II—AIRFRAME ICE ACCRETIONS FOR SHOWING COMPLIANCE WITH SUBPART B OF THIS PART

(a) *General.* The most critical ice accretion in terms of airplane performance and handling qualities for each flight phase must be used to show compliance with the applicable airplane performance and handling qualities requirements for icing conditions contained in 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 drop diameter distributions, liquid water content, and temperature appropriate to the flight conditions (for example, configuration, speed, angle of attack, and altitude).

(1) For an airplane certified in accordance with § 25.1420(a)(1), the ice accretions for each flight phase are defined in part II, paragraph (b) of this Appendix.

(2) For an airplane certified in accordance with § 25.1420(a)(2), the most critical ice accretion for each flight phase defined in part II, paragraphs (b) and (c) of this Appendix, must be used. For the ice accretions defined in part II, paragraph (c) of this Appendix, only the portion of part I of this Appendix in which the airplane is capable of operating safely must be considered.

(3) For an airplane certified in accordance with § 25.1420(a)(3), the ice accretions for each flight phase are defined in part II, paragraph (c) of this Appendix.

(b) Ice accretions for airplanes certified in accordance with § 25.1420(a)(1) or (2).

(1) *En route ice* is the en route ice as defined by part II, paragraph (c)(3), of this Appendix, for an airplane certified in accordance with § 25.1420(a)(2), or defined by part II, paragraph (a)(3), of Appendix C of this part, for an airplane certified in accordance with § 25.1420(a)(1), plus:

(i) Pre-detection ice as defined by part II, paragraph (b)(5), of this Appendix; and

(ii) The ice accumulated during the transit of one cloud with a horizontal extent of 17.4 nautical miles in the most critical of the icing conditions defined in part I of this Appendix and one cloud with a horizontal extent of 17.4 nautical miles in the continuous maximum icing conditions defined in Appendix C of this part.

(2) *Holding ice* is the holding ice defined by part II, paragraph (c)(4), of this Appendix, for an airplane certified in accordance with §25.1420(a)(2), or defined by part II, paragraph (a)(4), of Appendix C of this part, for an airplane certified in accordance with §25.1420(a)(1), plus:

(i) Pre-detection ice as defined by part II, paragraph (b)(5), of this Appendix; and

(ii) The ice accumulated during the transit of one cloud with a 17.4 nautical miles horizontal extent in the most critical of the icing conditions defined in part I of this Appendix and one cloud with a horizontal extent of 17.4 nautical miles in the continuous maximum icing conditions defined in Appendix C of this part.

(iii) Except the total exposure to holding ice conditions does not need to exceed 45 minutes.

(3) *Approach ice* is the more critical of the holding ice defined by part II, paragraph (b)(2), of this Appendix, or the ice calculated in the applicable paragraphs (b)(3)(i) or (ii) of part II, of this Appendix:

(i) For an airplane certified in accordance with §25.1420(a)(2), the ice accumulated during descent from the maximum vertical extent of the icing conditions defined in part I of this Appendix to 2,000 feet above the landing surface in the cruise configuration, plus transition to the approach configuration, plus:

(A) Pre-detection ice, as defined by part II, paragraph (b)(5), of this Appendix; and

(B) The ice accumulated during the transit at 2,000 feet above the landing surface of one cloud with a horizontal extent of 17.4 nautical miles in the most critical of the icing conditions defined in part I of this Appendix and one cloud with a horizontal extent of 17.4 nautical miles in the continuous maximum icing conditions defined in Appendix C of this part.

(ii) For an airplane certified in accordance with §25.1420(a)(1), the ice accumulated during descent from the maximum vertical extent of the maximum continuous icing conditions defined in part I of Appendix C to 2,000 feet above the landing surface in the cruise configuration, plus transition to the approach configuration, plus:

(A) Pre-detection ice, as defined by part II, paragraph (b)(5), of this Appendix; and

(B) The ice accumulated during the transit at 2,000 feet above the landing surface of one cloud with a horizontal extent of 17.4 nautical miles in the most critical of the icing conditions defined in part I of this Appendix and one cloud with a horizontal extent of 17.4 nautical miles in the continuous maximum icing conditions defined in Appendix C of this part.

(4) *Landing ice* is the more critical of the holding ice as defined by part II, paragraph (b)(2), of this Appendix, or the ice calculated in the applicable paragraphs (b)(4)(i) or (ii) of part II of this Appendix:

(i) For an airplane certified in accordance with §25.1420(a)(2), the ice accretion defined by part II, paragraph (c)(5)(i), of this Appendix, plus a descent from 2,000 feet above the landing surface to a height of 200 feet above the landing surface with a transition to the landing configuration in the icing conditions defined in part I of this Appendix, plus:

(A) Pre-detection ice, as defined in part II, paragraph (b)(5), of this Appendix; and

(B) The ice accumulated during an exit maneuver, beginning with the minimum climb gradient required by §25.119, from a height of 200 feet above the landing surface through one cloud with a horizontal extent of 17.4 nautical miles in the most critical of the icing conditions defined in part I of this Appendix and one cloud with a horizontal extent of 17.4 nautical miles in the continuous maximum icing conditions defined in Appendix C of this part.

(ii) For an airplane certified in accordance with §25.1420(a)(1), the ice accumulated in the maximum continuous icing conditions defined in Appendix C of this part, during a descent from the maximum vertical extent of the icing conditions defined in Appendix C of this part, to 2,000 feet above the landing surface in the cruise configuration, plus transition to the approach configuration and flying for 15 minutes at 2,000 feet above the landing surface, plus a descent from 2,000 feet above the landing surface to a height of 200 feet above the landing surface with a transition to the landing configuration, plus:

(A) Pre-detection ice, as described by part II, paragraph (b)(5), of this Appendix; and

(B) The ice accumulated during an exit maneuver, beginning with the minimum climb gradient required by §25.119, from a height of 200 feet above the landing surface through one cloud with a horizontal extent of 17.4 nautical miles in the most critical of the icing conditions defined in part I of this Appendix and one cloud with a horizontal extent of 17.4 nautical miles in the continuous maximum icing conditions defined in Appendix C of this part.

(5) *Pre-detection ice* is the ice accretion before detection of flight conditions in this Appendix that require exiting per §25.1420(a)(1) and (2). It is the pre-existing ice accretion that may exist from operating in icing conditions in which the airplane is approved to operate prior to encountering the icing conditions requiring an exit, plus the ice accumulated during the time needed to detect the icing conditions, followed by two minutes of further ice accumulation to take into account the time for the flightcrew to take action to exit the icing conditions, including coordination with air traffic control.

(i) For an airplane certified in accordance with §25.1420(a)(1), the pre-existing ice accretion must be based on the icing conditions defined in Appendix C of this part.

(ii) For an airplane certified in accordance with §25.1420(a)(2), the pre-existing ice accretion must be based on the more critical of the icing conditions defined in Appendix C of this part, or the icing conditions defined in part I of this Appendix in which the airplane is capable of safely operating.

(c) *Ice accretions for airplanes certified in accordance with §§25.1420(a)(2) or (3).* For an airplane certified in accordance with §25.1420(a)(2), only the portion of the icing conditions of part I of this Appendix in which the airplane is capable of operating safely must be considered.

(1) *Takeoff ice* is the most critical ice accretion on unprotected surfaces, and any ice accretion on the protected surfaces, occurring between the end of the takeoff distance and 400 feet above the takeoff surface, assuming accretion starts at the end of the takeoff distance in the icing conditions defined in part I of this Appendix.

(2) *Final takeoff 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 400 feet and either 1,500 feet above the takeoff surface, or the height at which the transition from the takeoff 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 takeoff distance in the icing conditions defined in part I of this Appendix.

(3) *En route ice* is the most 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 flight phase in the icing conditions defined in part I of this Appendix.

(4) *Holding ice* is the most critical ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, resulting from 45 minutes of flight within a cloud with a 17.4 nautical miles horizontal extent in the icing conditions defined in part I of this Appendix, during the holding phase of flight.

(5) *Approach ice* is the ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, resulting from the more critical of the:

(i) Ice accumulated in the icing conditions defined in part I of this Appendix during a descent from the maximum vertical extent of the icing conditions defined in part I of this Appendix, to 2,000 feet above the landing surface in the cruise configuration, plus transition to the approach configuration and flying for 15 minutes at 2,000 feet above the landing surface; or

(ii) Holding ice as defined by part II, paragraph (c)(4), of this Appendix.

(6) *Landing ice* is the ice accretion on the unprotected surfaces, and any ice accretion on the protected surfaces appropriate to normal ice protection system operation, resulting from the more critical of the:

(i) Ice accretion defined by part II, paragraph (c)(5)(i), of this Appendix, plus ice accumulated in the icing conditions defined in part I of this Appendix during a descent from 2,000 feet above the landing surface to a height of 200 feet above the landing surface with a transition to the landing configuration, followed by a go-around at the minimum climb gradient required by §25.119, from a height of 200 feet above the landing surface to 2,000 feet above the landing surface, flying for 15 minutes at 2,000 feet above the landing surface in the approach configuration, and a descent to the landing surface (touchdown) in the landing configuration; or

(ii) Holding ice as defined by part II, paragraph (c)(4), of this Appendix.

(7) For both unprotected and protected parts, the ice accretion for the takeoff phase must be determined for the icing conditions defined in part I of this Appendix, using the following assumptions:

(i) The airfoils, control surfaces, and, if applicable, propellers are free from frost, snow, or ice at the start of takeoff;

(ii) The ice accretion starts at the end of the takeoff distance;

(iii) The critical ratio of thrust/power-to-weight;

(iv) Failure of the critical engine occurs at V_{EF}; and

(v) Crew activation of the ice protection system is in accordance with a normal operating procedure provided in the airplane 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 400 feet above the takeoff surface.

(d) 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 the icing conditions defined in part I of this Appendix. This ice accretion only applies in showing compliance to §§25.143(j) and 25.207(h).

(e) In order to reduce the number of ice accretions to be considered when demonstrating compliance with the requirements of §25.21(g), any of the ice accretions defined in this Appendix may be used for any other flight phase if it is shown to be at least as critical as the specific ice accretion defined for that flight phase. Configuration differences and their effects on ice accretions must be taken into account.

(f) The ice accretion that has the most adverse effect on handling qualities may be used for airplane performance tests provided any difference in performance is conservatively taken into account.

[Amdt. 25–140, 79 FR 65528, Nov. 4, 2014]

PART 26—CONTINUED AIRWORTHINESS AND SAFETY IMPROVEMENTS FOR TRANSPORT CATEGORY AIRPLANES

Subpart A—General

Sec.

Subpart B—Enhanced Airworthiness Program for Airplane Systems

Subpart C—Aging Airplane Safety—Widespread Fatigue Damage

Subpart D—Fuel Tank Flammability

Subpart E—Aging Airplane Safety—Damage Tolerance Data for Repairs and Alterations

AUTHORITY: 49 U.S.C. 106(g), 40113, 44701, 44702 and 44704.

SOURCE: Docket No. FAA–2004–18379, 72 FR 63409, Nov. 8, 2007, unless otherwise noted.

Subpart A—General

§26.1 Purpose and scope.

(a) This part establishes requirements for support of the continued airworthiness of and safety improvements for transport category airplanes. These requirements may include performing assessments, developing design changes, developing revisions to Instructions for Continued Airworthiness (ICA), and making necessary documentation available to affected persons. Requirements of this part that establish standards for design changes and revisions to the ICA are considered airworthiness requirements.

(b) Except as provided in paragraph (c) of this section, this part applies to the following persons, as specified in each subpart of this part:

(1) Holders of type certificates and supplemental type certificates.

(2) Applicants for type certificates and supplemental type certificates and changes to those certificates (including service bulletins describing design changes).

(3) Persons seeking design approval for airplane repairs, alterations, or modifications that may affect airworthiness.

(4) Holders of type certificates and their licensees producing new airplanes.

(c) An applicant for approval of a design change is not required to comply with any applicable airworthiness requirement of this part if the applicant elects or is required to comply with a corresponding amendment to part 25 of this chapter that is adopted concurrently or after that airworthiness requirement.

(d) For the purposes of this part, the word ‘‘type certificate’’ does not include supplemental type certificates.

§26.3 Definitions.

For the purposes of this part:

FAA Oversight Office is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate, supplemental type certificate, or manufacturer, as determined by the Administrator.