COMMENT TABLE
AC 25-28
COMPLIANCE OF TRANSPORT CATEGORY AIRPLANES WITH CERTIFICATION REQUIREMENTS FOR FLIGHT IN ICING CONDITIONS

Comment	Requested Change	Disposition
Commenter: AIRBUS		
General Comment: Although it is anticipated that few applicants would choose to certify aircraft components of large aircraft in Appendix O conditions using a “detect and exit” certification strategy, Airbus believes that such an approach should remain an acceptable certification strategy for all types of aircraft and this should be explicitly described in the advisory circular.		We agree. We added paragraph (f) **Holding Ice considerations** to section **8.a.(4)** of the AC to clarify the various “Holding Ice” definitions in Appendix O, Part II, for airplanes not certified to § 25.1420. For airplanes not certified to § 25.1420, the applicant should choose the holding ice conditions for which certification is sought.

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AC 25-XX
COMPLIANCE OF TRANSPORT CATEGORY AIRPLANES WITH CERTIFICATION REQUIREMENTS FOR FLIGHT IN ICING CONDITIONS

Commenter: BOEING (1/11)		
Expressly including all of the Part 25 regulations being revised to include Appendix O requirements is recommended to avoid uncertainty and confusion as to the applicability of the guidance material for applicants not required to certify to §25.1420.	**Section:** 1. Purpose **Page:** i Boeing requests that the proposed text be revised as follows: **1. PURPOSE**. This advisory circular (AC) describes an acceptable means of showing compliance with the requirements of § 25.1419, Ice protection, and § 25.1420, Supercooled large drop icing conditions, <u>as well as the supercooled large drop condition (Appendix O) requirements of § 25.773, "Pilot compartment view," § 25.1323, "Airspeed indicating system," and § 25.1325, "Static pressure system,"</u> of Title 14, Code of Federal Regulations (14 CFR) part 25. Part 25 contains the certification requirements for transport category airplanes. The compliance means described in this document are intended as guidance. They are meant to supplement the engineering judgment that must form the basis of any compliance findings for §§ 25.1419 and 25.1420<u>, and the requirements of §§ 25.773, 25.1323, and 25.1325 relative to Appendix O conditions.</u>	We agree and have revised the Purpose section as suggested to accurately reflect the requirements described in the AC.

Commenter: AIA/GAMA (10/12)		
Expressly including all of the part 25 regulations being revised to include Appendix X requirements is recommended to avoid uncertainty and confusion (which have already occurred) as to the applicability of the guidance material for applicants not required to certify to § 25.1420.	**Page i** Revise to (add underscored text, delete strike thru text): **1. PURPOSE**. This advisory circular (AC) describes an acceptable means of showing compliance with the requirements of § 25.1419, Ice protection, and § 25.1420, Supercooled large drop icing conditions, as well as the supercooled large drop condition (Appendix O) requirements of § 25.773, "Pilot compartment view," § 25.1323, "Airspeed indicating system," and § 25.1325, "Static pressure system," of Title 14, Code of Federal Regulations (14 CFR) part 25. Part 25 contains the certification requirements for transport category airplanes. The compliance means described in this document are intended as guidance. They are meant to supplement the engineering judgment that must form the basis of any compliance findings for §§ 25.1419 ~~and~~, 25.1420, and the requirements of §§ 25.773, 25.1323, and 25.1325 relative to Appendix O conditions.	We agree and have revised the purpose section as suggested to accurately reflect the requirements described in the AC.

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Commenter: AIRBUS		
7 figures included in Appendix O give a lot of data concerning the SLD icing conditions but do not require any exact test conditions.	**3. b. Use of Icing Envelopes (Page 8)** The AC guidance should provide tangible recommendations or guidance on how to apply the new envelopes or how to show compliance.	We partially agree. Much like part 25, Appendix C, part 25, Appendix O, is not intended to define the test conditions used for certification. Rather, Appendix O defines environmental conditions to be considered for flight in icing. The exact test conditions used to define critical ice shapes during the various phases of flight will be dependent on several variables, such as the airfoil shape, type of ice protection system, etc…. Therefore, specific test conditions will need to be defined for each certification program, rather than defined in advisory material. Since no specific changes were proposed with this comment, no specific changes were made as a result. However, other commenters offered suggestions intended to clarify the guidance material and the AC has been revised in several areas.

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Commenter: AIRBUS		
The aircraft certification plan is normally written and agreed to at the beginning of the certification program. In cases where the aircraft certification program is running in parallel with the engine certification activities it may not be practical to include this information in the plan. The certification plan is therefore not considered the appropriate location for this information and some flexibility in which document contains this information should be allowed. It is recognized that this phrase is included in the existing AC 25.1419 but it is nevertheless recommended to modify this wording.	**4. CERTIFICATION PLAN (Page 11)** **Existing text** ***"h.*** *A list of any anomalous results from completed icing certification tests (relevant to requirements of §§ 33.68 and 33.77) that will require special operating procedures."* **Proposed revision.** **h.** A list of any anomalous results from completed icing certification tests (relevant to requirements of §§ 33.68 and 33.77) that will require special operating procedures <u>unless this information is provided in a separate certification document or other airworthiness approved documentation.</u>	We agree that anomalous results from certification tests requiring special operating procedures may be provided in documentation other than the ice protection system certification plan. As stated by Airbus, the engine and airframe certification activities are often run in parallel. We have revised the AC as suggested.

Commenter: AIRBUS		
The vast majority of part 25, Appendix C, certified aircraft have not experienced in-service issues related to super cooled large droplet icing conditions. Continued application of the Appendix C design and certification methodologies and similarity of the aircraft design to the successful ancestor aircraft can be expected to provide a similar level of safety to the previous designs that have proven to be safe in-service. The guidance currently implies that the analysis for Appendix O must be validated or must have been validated. Whilst this is of course a valid objective and something all manufacturers want to achieve the currently available tools do not provide a means to do this. Despite the great progress made by NASA, all of the available various SLD analysis tools remain unvalidated for freezing rain. In addition, there are no test means capable of producing an adequate range of freezing rain conditions. **(continued on next page)**	**5. ANALYSES (Page 12)** The wording of section 5 should be changed to allow a means of compliance with Appendix O based on in-service experience of previous successful aircraft designs that have been certified to Appendix C. In addition, the method of compliance [MoC] should require an analysis of the similarity between the new aircraft and the ancestor aircraft. This should be applicable to both derivative aircraft and new designs and type certifications. Additional guidance or an alternative means of compliance as outlined above is required because the means required to validate the Appendix O analyses do not currently exist.	We agree that similarity to existing designs with a successful service history may be appropriately used as a means of compliance for many regulations. The AC describes a general means of compliance based on similarity in section 5.g on page 16. Additional sections have been revised to clarify the use of similarity based on specific proposed changes to the AC.

Airbus Comment (continued) The guidance material provides no advice on how to perform the validation of the application of a code to a specific design. Although a database of validation cases produced by NASA is available for certain aerofoils for freezing drizzle (only) icing conditions it is not known if this validation would be accepted for other aerodynamic designs, devices or components exposed to the icing conditions.		

Commenter: AIRBUS		
5. c. Analysis of areas and components to be protected (Page 13) *"In evaluating the airplane's ability to operate safely in Appendix C icing conditions and relevant icing conditions of Appendix O, and in determining which components will be protected, the applicant should examine those areas listed in AC 20-73A to determine the degree of protection required. An applicant may determine that protection is not required for one or more of these areas or components. If so, the applicant's analysis should include the supporting data and rationale for allowing those areas or components to remain unprotected. The applicant should show that the lack of protection does not adversely affect handling characteristics or performance of the airplane, as required by § 25.21(g). The applicant must also show that the lack of protection does not affect the operation and functioning of affected systems and equipment (e.g., pitot probes). Accessory cooling air intakes that face the airstream could become restricted with ice accretion. Inlets (including National Advisory Committee for Aeronautics (NACA) inlets) that do not accrete ice in Appendix C conditions may accrete ice in the Appendix O conditions."* **(continued on next page)**	**5. c. Analysis of areas and components to be protected (Page 13)** Reword to explicitly allow in-service history for part 25, Appendix C, certified aircraft and design similarity to be used as a means of compliance. Reword to allow detect and exit policy for a/c with non-reversible flight controls and MTOW>60 klb.	We agree that similarity to existing designs with a successful service history may be appropriately used as a means of compliance. The AC describes a general means of compliance based on similarity in section 5.g on page 16. Additional sections of the AC have been clarified regarding the use of similarity based on specific comments to the AC.

Airbus comment (continued) There are no known events that support a safety concern due to windshield, radome, intake icing etc. in SLD conditions aloft. In particular, the ARAC EHWG evaluated all of the known icing-related events since 1988 and found no events in SLD conditions aloft. The current rigorous compliance using Appendix C conditions is credited with this result. To maintain this good service history, key aspects of prior successful practices for ice slab ingestion were made part of this rule. The safety of these systems for flight in Appendix O conditions has already been proven by service history. Continuing to certify future systems to the requirements for Appendix C icing conditions, in conjunction with consideration of excellent service history of similar designs in Appendix O conditions, should be acceptable insurance of future safety.		

Commenter: AIRBUS		
The proposed AC stated the following: *"Flutter analyses should reflect all mass accumulations of ice on protected and unprotected surfaces from exposure to Appendix C and, as appropriate, Appendix O conditions. This includes any accretions that could develop on control surfaces"*. The text should be modified to avoid any confusions or inconsistencies between AC 25.629 and AC 25-XX.	**Section 5.d. Flutter Analysis.** **(Page 13)** Revise the next to last sentence as follows: Flutter analyses should reflect all mass accumulations of ice on protected and unprotected surfaces from exposure to Appendix C and~~, as appropriate,~~ Appendix O conditions in accordance with the guidance of AC 25.629-1. This includes any accretions that could develop on control surfaces.	We agree with Airbus that this section could be clarified to avoid confusion. To avoid confusion or inconsistencies between AC 25.629-1B and this AC, the flutter analysis section on page 13 of this AC has been revised to specifically refer to AC 25.629-1B.

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Commenter: AIRBUS		
5. f. (2) Failure analysis for § 25.1420 (Page 14) As highlighted by the AIA there are no known events that support a safety concern due to windshield, radome, intake icing etc. in SLD conditions aloft. In particular, the ARAC EHWG evaluated all of the known icing-related events since 1988 and found no events in SLD conditions aloft. The current rigorous compliance using Appendix C conditions is credited with this result. To maintain this good service history, key aspects of prior successful practices for ice slab ingestion were made part of this rule. The safety of these systems for flight in Appendix O conditions has already been proven by service history. Continuing to certify future systems to the requirements for Appendix C icing conditions, in conjunction with consideration of excellent service history of similar designs in Appendix O conditions, should be acceptable insurance of future safety.	**5. f. (2) Failure analysis for § 25.1420 (Page 14)** Reword to explicitly exclude airplanes with maximum takeoff weight [MTOW] >60,000lb and irreversible flight controls.	We disagree. Airplanes with MTOW greater than 60,000 pounds are excluded from § 25.1420 by regulation. The AC provides guidance if the rule is applicable, so it is not necessary to specifically restate the regulation in the AC. In addition, the failure analysis section already includes guidance for the use of service history and similarity to previous designs. No changes to the AC were made as a direct result of this comment. However, other changes have been made to the AC to clarify the use of similarity for airplanes that have had a successful service history.

Commenter: AIA/GAMA (11/12)		
We could not find a statement in NACA TN 2738 that indicated that "Appendix C was designed to include 99 percent of icing conditions."	5. ANALYSES, section f. (2) **Page 15** Revise to (add underscored text, delete strike thru text): **(c) Probability of encountering Appendix O conditions.** Appendix C was designed to include 99 percent of icing conditions. ~~(Ref: NACA TN 2738, "A Probability Analysis of the Meteorological Factors Conducive to Aircraft Icing in the United States.")~~ Therefore, the probability of encountering icing outside of Appendix C drop conditions.	We agree that the statement was not explicitly written in the NACA document as implied. The percentage of icing conditions included in Appendix C was based on the data collected and which conditions were either inside or outside of Appendix C. The reference to the NACA document has been removed from this section of the AC.

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Commenter: BOEING (2/11)		
We could not find a statement in NACA TN 2738 that indicated "*Appendix C was designed to include 99 percent of icing conditions.*" Please verify this or delete it.	**Section:** 5. ANALYSES **Paragraph:** f.(2)(c) Probability of encountering Appendix O conditions. **Page: 15** Boeing requests that the proposed text be revised as follows: **(c) Probability of encountering Appendix O conditions.** Appendix C was designed to include 99 percent of icing conditions. ~~(Ref: NACA TN 2738, "A Probability Analysis of the Meteorological Factors Conducive to Aircraft Icing in the United States.")~~ Therefore, the probability of encountering icing outside of Appendix C drop conditions is on the order of 10-2. The applicant may assume that the average probability for encountering Appendix O icing conditions is 1 x 10-2 per flight hour. This probability should not be reduced based on phase of flight.	We agree that the statement was not explicitly written in the NACA document as implied. The percentage of icing conditions included in Appendix C was based on the data collected and which conditions were either inside or outside of Appendix C. The reference to the NACA document has been removed from this section of the AC.

Commenter: AIA/GAMA (1/12) and Boeing (3/11)		
The successful service history of the vast majority of airplanes indicates that additional test requirements are not required for successful designs. The evaluation of similarity to an airplane with a successful service history addresses some of the concerns expressed in Appendix F of the IPHWG report relative to uncertainty of which features might yield robust designs.	5. ANALYSES. g. Similarity Analyses. **Page 17** Revise to (add underscored text): (4) On derivative or new airplane designs, the applicant can use similarity to previous type designs shown to comply with § 25.1420, or airplanes that have shown compliance to § 25.1419 that have a successful service history, if the effects of differences are substantiated. Natural ice flight testing may not be necessary for a design shown to be similar. At a minimum, the following differences should be addressed: …	We agree that a successful service history in icing conditions indicates that additional test requirements may not be necessary for a successful design. The use of similarity has been clarified as proposed.

Commenter: AIRBUS		
5. g. Similarity Analyses There are no known events that support a safety concern due to windshield, radome, intake icing etc. in SLD conditions aloft. In particular, the ARAC EHWG evaluated all of the known icing-related events since 1988 and found no events in SLD conditions aloft. The current rigorous compliance using Appendix C conditions is credited with this result. To maintain this good service history, key aspects of prior successful practices for ice slab ingestion were made part of this rule. The safety of these systems for flight in Appendix O conditions has already been proven by service history. Continuing to certify future systems to the requirements for Appendix C icing conditions, in conjunction with consideration of excellent service history of similar designs in Appendix O conditions, should be acceptable insurance of future safety.	**5. g. Similarity Analyses** **(Page 16)** Reword to explicitly allow in-service history for part 25, Appendix C, certified aircraft and design similarity to be used as a means of compliance.	We agree that a successful service history in icing conditions indicates that additional test requirements may not be necessary for a successful design. The use of similarity has been clarified as proposed.

Commenter: AIA/GAMA (2/12)		
The ability to calculate intercycle ice accretions, potential runback and resulting propeller efficiency losses is not within the current state of the art. Some research has been accomplished in this area, but availability of tools/methods is limited. Recommend modification of the advisory material to reflect current state of the art.	Section 5 Analysis (j) Propeller Deicing **Page 18** **j. Propeller Deicing Analysis.** The applicant should perform a propeller deicing analysis that— **(1)** Substantiates ice protection coverage in relation to chord length and span. ~~wingspan.~~ **(2)** Substantiates the ice protection system power density. **(3)** ~~Calculates intercycle ice accretions and resulting propeller efficiency losses.~~ The effect of intercycle ice accretions and potential for propeller efficiency degradation should be considered. Qualitative analysis of the design supported by similarity to prior designs with successful service histories in icing may be used to show compliance with this aspect.	We agree and have clarified the AC as proposed.

Commenter: AIA/GAMA (3/12) and BOEING (4/11)		
Computer codes have been used successfully for runback ice mass determination, and assumptions have been applied in the past to determine extent and thickness. There is no specific reason to not allow the continued use of these methods, and the comments about computer codes are equally applicable to large droplet icing or other icing conditions.	Revise to (add underscored text): 5. ANALYSES Revise to (add underscored text): **Page 20** **m. Runback Ice.** Water not evaporated by thermal ice protection systems and unfrozen water in near-freezing conditions (or in conditions when the freezing fraction is less than one) may run aft and form runback ice. This runback ice can then accumulate additional mass from direct impingement. Computer codes may be unable to estimate the characteristics of the runback water or resultant ice shapes (rivulets or thin layers), but some codes may be able to estimate the mass of the runback ice. Thus runback ice should be determined experimentally<u>, or the mass determined by computer codes with assumptions about runback extent and thickness similar to those used successfully with prior models.</u> It should be considered when determining critical ice shapes. Simulated runback ice shapes may be used when evaluating effects of critical ice shapes. The applicant should consider potential hazards resulting from the shedding of runback ice.	Runback ice is described in further detail in AC 20-73A. As such, this section has been clarified to refer to AC 20-73A as follows: … *This runback ice can then accumulate additional mass from direct impingement. The determination of runback ice is described in further detail in AC 20-73. Runback ice should be considered when determining critical ice shapes.*

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Commenter: AIRBUS		
The proposed AC stated the following: *".....include asymmetric ice shapes, to demonstrate acceptable operational safety."* The proposed words are redundant and should be deleted.	**Section 7. d. (3) Dry air flight tests with predicted simulated ice shapes and roughness** **Page 24** Delete this sentence: ~~".....include asymmetric ice shapes, to demonstrate acceptable operational safety. ...."~~	We agree and have deleted the sentence. Dry air flight testing is adequately described in the proceeding paragraph, so the last sentence in section (3) on page 24 is unnecessary.

Commenter: AIA/GAMA (4/12)		
The successful service history of vast majority of airplanes indicates that additional test requirements are not required for successful designs. The evaluation of similarity to an airplane with a successful service history addresses some of the concerns expressed in Appendix F of the IPHWG report about uncertainty of which features might yield robust designs. The low probability of encountering adequate Appendix O icing conditions is another justification. It is noted elsewhere in the draft AC 25-XX [11.(e)]: **(2)** The low probability of finding conditions conducive to Appendix O ice accumulation may make natural icing flight tests a difficult way to demonstrate that the system functions in conditions exceeding Appendix C. The applicant may use flight tests of the airplane under simulated icing conditions (icing tanker). The applicant may also use icing wind tunnel tests of a representative airfoil section and an ice detector to demonstrate proper functioning of the system and to correlate signals provided by the detectors with the actual ice accretion on the surface. **(continued on next page)**	7. COMPLIANCE TESTS (Flight/Simulation) Revise to (add underscored text): **Page 28** … **2** Flight testing in natural Appendix O icing conditions should not be necessary <u>if similarity is shown to an airplane that has shown compliance to § 25.1419 and has a successful service history, or</u> if— **(aa)** The design analyses show…	We agree and have revised this section as suggested. The low probability of finding conditions conducive to Appendix O ice accumulation may make natural icing flight tests a difficult way to demonstrate that the airplane functions in conditions exceeding Appendix C.

AIA/GAMA Comment (continued) While the section noted is specifically on ice detection, the observation about the "low probability of finding conditions conducive to Appendix O ice accumulation may make natural icing flight tests a difficult way to demonstrate that the system functions in conditions exceeding Appendix C" is applicable to all areas of demonstrating compliance, not just ice detection. For technical and economic feasibility, methods of demonstrating compliance must have maximum flexibility, allowing the use of alternative test methods as well as similarity to prior, successful designs.		

Commenter: BOEING (5/11)		
The successful service history of vast majority of airplanes indicates that additional test requirements are not required for successful designs. The evaluation of similarity to an airplane with a successful service history addresses some of the concerns expressed in Appendix F of the IPHWG report about uncertainty of which features might yield robust designs. The low probability of encountering adequate Appendix O icing conditions is another justification. Elsewhere in this proposed AC 25-XX [see paragraph 11.e.(2) at page 40] it is noted: *"(2) The low probability of finding conditions conducive to Appendix O ice accumulation may make natural icing flight tests a difficult way to demonstrate that the system functions in conditions exceeding Appendix C. The applicant may use flight tests of the airplane under simulated icing conditions (icing tanker). The applicant may also use icing wind tunnel tests of a representative airfoil section and an ice detector to demonstrate proper functioning of the system and to correlate signals provided by the detectors with the actual ice accretion on the surface."* **(continued on next page)**	**Section:** 7. COMPLIANCE TESTS (Flight/Simulation) **Paragraph:** d.(4)(d) Appendix O natural icing flight testing **Page: 28** Boeing requests that paragraph 7.d.(4)(d)2 be revised as follows: **(d) Appendix O natural icing flight testing.** . . . **2** Flight testing in natural Appendix O icing conditions should not be necessary <u>if similarity is shown to an airplane that has shown compliance to § 25.1419 and has a successful service history, or </u>if— (aa) …	We agree and have revised this section suggested. The low probability of finding conditions conducive to Appendix O ice accumulation may make natural icing flight tests a difficult way to demonstrate that the airplane functions in conditions exceeding Appendix C.

Boeing Comment (continued) While the section noted is specifically on ice detection, the observation about the *"low probability of finding conditions conducive to Appendix O ice accumulation may make natural icing flight tests a difficult way to demonstrate that the system functions in conditions exceeding Appendix C"* is applicable to all areas of demonstrating compliance, not just ice detection. For technical and economic feasibility, methods of demonstrating compliance must have maximum flexibility, allowing the use of alternative test methods as well as similarity to prior, successful designs.		

Commenter: Dassault		
Proposed text: Flight testing in natural Appendix O icing conditions should be accomplished for airplane derivatives whose ancestor airplanes have a service record that includes a pattern of accidents or incidents due to inflight encounters with Appendix O conditions. Comment: This paragraph allows taking into account in-service experience; so, for a derivative airplane whose ancestor airplane is free of accidents or incidents recorded in icing conditions, flight testing in natural Appendix O icing conditions should not be necessary.	§7.d.(4): Compliance tests (Flight / simulation) - Appendix O natural icing flight testing **Page 29** It is proposed to add the following sentence at the end of the paragraph: "For a derivative airplane whose ancestor airplane is free of accidents or incidents recorded in icing conditions, flight testing in natural Appendix O icing conditions should not be necessary."	We agree and have clarified when flight testing in natural Appendix O icing conditions should and should not be necessary.

Commenter: AIA/GAMA (9/12) and Boeing (6/11)		
A detailed review of in-service data found no instances of engine damage due to large drop icing or ice crystal icing in flight. From this it is evident that the radome is not a source of ice ingestion larger than that for which engines are certified. An analysis presented in a letter from the AIA to the FAA (dated 10 May 2010) documents that radome ice accretions in Appendix O icing conditions are calculated to be much greater than those in Table 1. If conservative assumptions about radome ice breakup (breaking into only 2 pieces) are used, the resulting ice mass is much larger than the Table 1 requirements. This could drive airframe manufacturers to incorporate radome ice protection systems that have weight and cost beyond that accounted for the cost benefit analysis. The proposed wording change would harmonize the part 25 compliance with the part 33 requirement and not incur additional, burdensome costs that would not result in an improvement to safety, as is evident by the excellent service record of the propulsion systems.	**8. CERTIFICATION TO § 25.1420** **b. Certification to §§ 25.1420(a)(1) and 25.1420(a)(2).(4)** **Page 34** Revise to (add underscored text, delete strike thru text): **(e) Engine considerations.** Ice accumulation on the airframe and on air induction system components resulting from Appendix O icing conditions should be analyzed for potential ingestion of ice by the engine (relative to requirements of § 25.1093) and potential blockage effects. <u>Ice shed from areas such as the forward aircraft radome may be considered to have broken up so that no individual piece is larger than that in [draft rule] 33.77.(e)(1) Table 1, for the appropriate engine inlet area, before the ice shed reaches the inlet.</u>	We agree that there have not been reports of engine damage due to large radome ice accretions in SLD conditions. While there may be evidence that radome ice accretions break up for existing designs, it may not hold true for future designs. The AC has been revised to allow for consideration of similar designs with positive in-service history. For § 25.1093 compliance, analysis may be used for the radome as a potential airframe ice source. Applicants may use qualitative analysis of the design supported by similarity to a previous design that has shown successful service history to have confidence that the historical methodology for certification represented by "Table 33.77, Minimum Ice Slab Requirements Based on Engine Inlet Size" is appropriate. Service history for designs similar to the ones under consideration should be part of the icing certification plan. In order to demonstrate compliance using similarity, the applicant should show successful service history of the previous design and establish confidence that the historical certification methodology is appropriate for the current certification.

Commenter: AIRBUS		
The proposed AC stated the following: *“......If the ice detector cannot detect ice at low freezing fractions and ice accretes on the airplane in such icing conditions, installation of an icing conditions detector, i.e. one that detects both moisture and temperature, may be required....”* The guidance implies that for a manual advisory system it may be necessary to install 2 different types of ice detector and certify the system as if it were a primary automatic system. There have been no serious incidents or accidents of Airbus aircraft (or other aircraft of similar design) due to late or lack of activation of the airframe ice protection systems. The new guidance material could be interpreted as requiring certification demonstrations similar to those required for a primary ice detector. The AC text should allow compliance to be demonstrated by impingement analysis and allow in-service experience to be used as an element of the means of compliance on a case-by-case basis. Such flexibility in the showing of compliance is required because the design of each aircraft is different, the effect of ice on **(continued on next page)**	**11 a. (1) (b) Advisory ice detector (page 36)** 1/ Delete this sentence: ~~“......If the ice detector cannot detect ice at low freezing fractions and ice accretes on the airplane in such icing conditions, installation of an icing conditions detector, i.e. one that detects both moisture *and* temperature, may be required....”~~ 2/ The AC text should allow compliance to be demonstrated by impingement analysis and allow in-service experience to be used as an element of the means of compliance on a case-by-case basis.	We partially agree. The sentence described by Airbus has been clarified, but not deleted. The intent is to emphasize that if certain icing conditions result in ice accretions on the airplane that may go undetected by both the advisory ice detector and the flight crew, additional detection means may be necessary, or the airplane should be demonstrated to be safe with those ice accretions. The sentence was clarified to state the following: *If the advisory ice detector cannot detect ice at low freezing fractions and ice accretes on the airplane in such icing conditions that may go undetected by the flight crew, installation of an icing conditions detector (i.e. one that detects both moisture and temperature), or additional substantiation with the resulting undetected ice accretions may be required.* With regard to the use of impingement analysis and in-service experience, the AC has been clarified in several locations as a result of this comment and other similar comments.

Airbus Comment (continued) different aircraft types differs, and the use by the aircraft systems of the ice detection or ice protection system activation signals differs and so on. Such design differences make different aircraft more or less sensitive to any ice that can form prior to activation of the ice protection system. An aircraft that incorporates de-icing or anti-icing across the whole span of the wing and HTP is likely to be more sensitive to pre-activation ice than a large transport aircraft which has only partial anti-icing or de-icing of the wing. In addition, an aircraft that requires ice to be detected or the ice protection systems to be activated to set the correct stall warning or stall protection settings will be more at risk to a failure to detect ice and activate the ice detection systems than other aircraft especially if it incorporates full span ice protection. A primary ice detection system relies solely on the primary ice detectors. An advisory system has the additional safety benefit of having two independent means of ice detection with the **(continued on next page)**		

Airbus Comment (continued) visual cues and advisory ice detectors complementing each other whilst ensuring that the pilot remains in the loop and takes the decision to activate the airframe ice protection system. Such detection methodologies have provided exemplary safety on Airbus aircraft. The in-service experience on Airbus aircraft supports the view that no appreciable improvement in safety would result. It is recognized that ice detection has been implicated as a contributory factor in at least one non fatal accident of a regional aircraft. However, the design of the aircraft was different to Airbus aircraft and the application of a potentially highly penalizing and inflexible means of compliance to all types of aircraft is not appropriate. Implying that an icing conditions detector may be required is inappropriate for guidance on the certification of an advisory ice detection system. In addition, there are few of such devices operating in-service and the available in-service experience is, therefore, limited. There is little reason to suspect that these new devices will not function correctly in-service but it is premature to imply that such devices would provide improved safety compared to the existing systems and procedures currently employed.		

Commenter: AIRBUS		
The proposed AC stated the following: *"... Therefore, an undetected failure of the advisory ice detector should be considered as at least a major hazard unless substantiated as meriting a lower failure condition classification ..."* It is common to install more than one ice detector. The loss of only one ice detector, unannunciated or otherwise, has almost no effect on the safety of the aircraft for a manual advisory system. As described by EASA Acceptable means of Compliance (AMC) 25.1309 a classification of major would lead to a failure probability objective of remote or in qualitative terms a failure that would not occur within the life of an aircraft. For a system that is not critical to the safe operation of the aircraft a major classification for loss of a single ice detector is inappropriate. In addition, as the manual advisory ice detection system is a back-up to the crew it is reasonable to classify the unannunciated loss of the ice detection system as minor or major.	**Section 11. a. (1) (e): Ice detector system safety considerations** **(Page 37)** Change the following sentence as marked up below: "... Therefore, an undetected failure of the advisory ice ~~detector~~ detection system should be considered as at least a major hazard unless substantiated as meriting a lower failure condition classification ..."	We agree and revised the AC as suggested.

Commenter: AIRBUS		
The proposed AC stated the following: *"... If accretions on protected surfaces cannot be observed, a reference system would be necessary if compliance with § 25.1419(e)(2) is desired …"* *"... As the freezing fraction drops below 1, although some reference surfaces may not build up ice, ice may begin to accumulate on protected surfaces of the airplane. The applicant should substantiate, for all the icing conditions defined in Appendix C to part 25 and the applicable portions of Appendix O, that the reference surface accumulates ice at the same time as or prior to ice accumulating on the protected surfaces."* The new guidance material could be interpreted as requiring certification demonstrations similar to those required for a primary ice detector. The AC text should allow compliance to be demonstrated by impingement analysis and allow in-service experience to be used as an element of the means of compliance on a case-by-case basis. Such flexibility in the showing of compliance is required because the design of **(continued on next page)**	**Section 11. a. (2): Visual cues (Page 37-38)** The AC text should allow compliance to be demonstrated by impingement analysis and allow in-service experience to be used as an element of the means of compliance on a case-by-case basis.	We agree that the proposed AC could be interpreted as requiring certification demonstrations similar to those required for a primary ice detector and that there should be flexibility in the showing of compliance. If a reference surface is used to detect ice accretions, then the possibility of accumulating ice on the protected surface before detecting ice on the reference surface should be a consideration. The information in this section was taken from AC 25.1419-2, *Compliance with the Ice Protection Requirements of §§ 25.1419(e), (f), (g), and (h,)* which has been cancelled. Appendix K of AC 20-73A, *Aircraft Ice Protection*, provides additional guidance on the certification of ice detector systems. The appendix provides guidance regarding ice detection response times as the freezing fraction drops below 1. That guidance is equally applicable to advisory and primary ice detection systems. The AC text was clarified to indicate that applicants should show, rather than substantiate, that ice accumulates on the reference surface at the same time or prior to ice accumulating on the protected surface. The AC describes various analysis methods that may be used to show compliance, including impingement analysis and similarity.

Airbus Comment (continued) each aircraft is different, the effect of ice on different aircraft types differs, and the use by the aircraft systems of the ice detection or ice protection system activation signals differs and so on. Such design differences make different aircraft more or less sensitive to any ice that can form prior to activation of the ice protection system. An aircraft that incorporates de-icing or anti-icing across the whole span of the wing and HTP is likely to be more sensitive to pre-activation ice than a large transport aircraft which has only partial anti-icing or de-icing of the wing. In addition, an aircraft that requires ice to be detected or the ice protection systems to be activated to set the correct stall warning or stall protection settings will be more at risk to a failure to detect ice and activate the ice detection systems than other aircraft, especially if it incorporates full span ice protection. A primary ice detection system relies solely on the primary ice detectors. An advisory system has the additional safety benefit of having two independent means of ice detection with the visual cues and advisory ice detectors **(continued on next page)**		

Airbus Comment (continued) complementing each other whilst ensuring that the pilot remains in the loop and takes the decision to activate the airframe ice protection system. Such detection methodologies have provided exemplary safety on Airbus aircraft. The in-service experience on Airbus aircraft supports the view that no appreciable improvement in safety would result. It is recognized that ice detection has been implicated as a contributory factor in at least one non fatal accident of a regional aircraft. However, the design of the aircraft was different to Airbus aircraft and the application of a potentially highly penalizing and inflexible means of compliance to all types of aircraft is not appropriate.		

COMMENT TABLE
AC 25-XX
COMPLIANCE OF TRANSPORT CATEGORY AIRPLANES WITH CERTIFICATION REQUIREMENTS FOR FLIGHT IN ICING CONDITIONS

Commenter: AIRBUS		
11. a. (2) Visual cues (Page 38) **The proposed AC stated the following:** *"... even when additional ice is not accumulating ..."* Considering that ice will not accrete in clear blue sky it seems reasonable to allow the pilot to switch off the ice protection systems under such conditions. As soon as the aircraft re-enters the ice accretion or icing conditions then the ice protection systems can be reactivated in accordance with the procedures.	**11. a. (2) Visual cues (Page 37-38)** Delete this sentence: ~~"... even when additional ice is not accumulating ..."~~	We agree that ice would not generally accrete in clear blue sky. However, no changes to the AC were made as a result of this comment. This section describes an ice protection system that is activated manually by the flight crew when ice is visible on a reference surface. If the ice protection system is turned off with ice still on the reference surface, the flight crew would no longer have sufficient use of the reference surface to identify if they re-enter icing conditions. Depending on the reference surface, it may be much more difficult to detect additional ice accretions compared to the ice accretion that remained. Therefore, the flight crew may not know that they need to turn back on the ice protection system. As a result, the ice protection systems should stay on as long as the reference surface has visible ice.

Commenter: AIA/GAMA (12/12)		
It is unclear what is being referenced by "this provision" indicated in the proposed text, and it could be incorrectly interpreted as only allowing static air temperatures to be used as icing cues. We recommend either clarifying its intent or deleting it. In addition, we recommend use of “Celsius” (ICAO-recognized term) rather than “Centigrade.”	Section 11(b)(2) Compliance with § 25.1419(e)(3), **Page 39** (2) Either total or static temperatures are acceptable as cues. If static temperature ~~If this provision~~ is used, a display of static air temperature should be provided to allow the flight crew to easily determine when to activate the systems. ~~The flightcrew should be able to easily determine the static air temperature. A display of static air temperature should be provided.~~ As an alternative, a placard showing corrections for the available temperature, to the nearest degree Celsius ~~Centigrade,~~ can be used, so the flightcrew can determine the static air temperature in the region of interest (that is, around 0ºC).	We agree and have revised the AC to indicate that either total air temperature or static air temperature can be used as a temperature cue. If static temperature is used, a display of static air temperature should be provided to allow the flight crew to easily determine when to activate the ice protection systems. In addition, the AC was revised to use the term Celsius in lieu of Centigrade.

Commenter: AIRBUS		
The proposed AC stated the following: *"... The applicant should substantiate that formation of ice on this device precedes formation of ice on the wings or occurs simultaneously with it ..."* This guidance suggests that the advisory ice detector should be certified in exactly the same way as a primary ice detection system. In reality the system augments the decision of the crew to activate the ice protection systems. The guidance makes no allowance for the involvement of the crew nor the fact that there are two independent means for determining the need to activate the ice protection systems.	**Section 13. a. ICE INSPECTION LIGHT(S) (Page 42)** Delete this sentence: ~~".....The applicant should substantiate that formation of ice on this device precedes formation of ice on the wings or occurs simultaneously with it....."~~	We agree that an advisory ice detection system includes two independent means for determining the need to activate the ice protection system. This section is describing the scenario when an evidence probe is used because critical portions of the wings are not visible to the flight crew. Therefore, the evidence probe is used for the flight crew to recognize they need to activate the ice protection system. If the critical portions of the wing are not visible and an evidence probe is used instead, the evidence probe should accumulate ice either before or simultaneously with ice formation on the parts of the wing that are critical from the standpoint of ice accumulation. AC 20-73A contains similar information. The sentence referred to by Airbus has not been deleted, but clarified as follows. *The applicant should substantiate that formation of ice on this device precedes formation of ice on parts of the wings critical from the standpoint of ice accumulation, or occurs simultaneously with it.*

Commenter: AIRBUS		
"... Use of a hand-held flashlight has not been considered acceptable because of the associated workload ..." Considering that the monitored surface (wing leading edge etc.) is not normally in the pilots' normal field of view illuminating the monitored surface with a flashlight may be impractical especially as the surface is often a significant distance from the flight deck. However, it is reasonable to expect the crew to illuminate a reference surface such as an ice evidence probe or wipers located within the pilots' normal field of view, with a flashlight especially considering the low probability of the installed lights not functioning.	**Section: 13. b. ICE INSPECTION LIGHT(S)** **(Page 42)** Change this sentence by: "....Use of a hand-held flashlight to illuminate the monitored surface (e.g. wing leading edge) has not been considered acceptable because of the associated workload. The use of a flashlight to illuminate the reference surface in the event of a failure of the aircraft mounted illumination is considered acceptable. The ability of the crew to illuminate the monitored surface with a flashlight must be considered." OR "....Use of a hand-held flashlight to illuminate the monitored surface (e.g. wing leading edge) has not been considered acceptable because of the associated workload. The use of a flashlight to illuminate the reference surface in the event of a failure of the aircraft mounted illumination is considered acceptable if an electronic ice detection system is installed. The ability of the crew to illuminate the monitored surface with a flashlight must be considered."	The statement in the AC is not intended to address whether a flashlight would be effective or not, but rather the impact that using a hand held flashlight has on the workload of the crew. If a flashlight is being considered, then the impact to crew workload should also be considered. Previously, the increase in crew workload has not been considered acceptable. To clarify the intent, this section of the AC has been revised to include the following: *If a hand held flashlight is being considered for inspection illumination, the impact that use of a flashlight has on the associated flight crew workload should be considered. Previously, use of a hand-held flashlight has not been considered acceptable because of the associated increase in flightcrew workload.*

Commenter: Cessna		
The document is an Aerospace Information Report (AIR) not an Aerospace Recommended Practice (ARP).	Appendix 1 - Related Regulations and Documents sub-paragraph - Industry Documents **page A1-4** **SAE ~~ARP~~ AIR 1168/4 Ice, Rain, Fog and Frost Protection, dated 7/30/1990**	We agree. The AC has been revised to correct the reference.
Commenter: Cessna		
Table was distributed for comments in gray scale, but described as green, yellow, or orange.	Appendix 5, Table 1 **page A5-2** Table would be more clear and readable if published in color.	We agree. Table 1 was scanned into an electronic file that could be printed in color; however, if printed in gray scale, the chart was difficult to read. We clarified Table 1 in Appendix 5 by adding a “G”, “Y” or “R” in the green, yellow, red boxes respectively. The legend was revised accordingly.

Commenter: Cessna		
Correct typographical error and include reference to the technical reference.	Appendix 5, Icing Tunnel Appendix O Simulations **Pages A5-3 & A5-4** … If there are concerns about the bi-modal distribution affecting performance of ice protection systems, sequencing should be considered. Sequencing of freezing drizzle conditions f has been demonstrated in the IRT for unprotected surfaces. The sequencing technique approximates drop distributions found in natural conditions (AIAA 2005-76 "Simulation of a Bimodal Large Droplet Icing Cloud in the NASA Icing Research Tunnel"). It results in rougher textures than Appendix C ice shapes.	We agree and have revised Appendix 5 to correct the typographical error and include the technical reference that was inadvertently left out of the proposed AC.

Commenter: AIA/GAMA (5/12) and Boeing (8/11)		
The text in the proposed AC does not provide guidance on the use of similarity. Our suggested added wording explicitly allows the use of similarity to prior successful designs. As additional analyses or tests would not necessarily improve safety, use of similarity to current designs to show compliance for Appendix O conditions should be explicitly allowed.	**Appendix 5: CAPABILITIES OF ENGINEERING TOOLS FOR COMPLIANCE WITH APPENDIX O REQUIREMENTS OF PART 25** **3. Component Evaluations** **page A5-7** Revise to (add underscored text): **Radomes** Most radomes are too large to fit into existing icing wind tunnels. Additionally, computational analysis of radomes typically would require 3-D codes. Many 3-D codes do not have large drop effects and if they do not, freezing drizzle ice shapes cannot be simulated. (All 3-D codes have capabilities for testing impingement limits, however.) Radome ice shapes have been developed in the past for Appendix C icing conditions using analysis and observed ice shapes from Appendix C flight tests (typically holding ice shapes). For analysis of the radome as a potential airframe ice source, the applicant may use qualitative analysis of the design and supported by similarity to previous designs that have shown successful service history to have confidence that the historical methodology for certification represented by "Table 33.77 Minimum Ice Slab Requirements Based on Engine Inlet Size" is appropriate.	We do not agree with the proposed change to Appendix 5. Appendix 5 is the result of a 2009 evaluation of engineering tool capabilities for predicting Appendix O ice accretions and icing effects. As such, it is inappropriate to revise Appendix 5 in response to this comment. However, the proposed use of analysis and similarity for radome ice accretions has been added to the main body of the AC. Specifically, section **5.i.(2) Ice Shedding Analysis** and section **8.a.(4)(e) Engine Considerations**.

Commenter: BOEING (9/11)		
Current design and compliance methods have resulted in ice detection designs that have had no known safety events due to supercooled large droplet icing. As additional analyses or tests would not necessarily improve safety, use of similarity to current designs to show compliance for Appendix O conditions should be explicitly allowed.	**Section:** Appendix 5, CAPABILITIES OF ENGINEERING TOOLS FOR COMPLIANCE WITH APPENDIX O REQUIREMENTS OF PART 25 **Paragraph:** 3. Component Evaluations; Ice Detection Methods **Page: A5-7** Boeing requests that the proposed text be revised as follows: **Ice Detection Methods** . . . While CFD can determine whether the large drops impact the ice detection surface, available CFD codes cannot accurately predict aerodynamic forces that cause drop shedding, or freezing fraction effects which may delay freezing. Therefore, use of CFD alone is not acceptable for showing that ice detectors function in large drop conditions. When possible, effects of installation position should be evaluated with a combination of codes and icing tunnels. Devices mounted on smaller surfaces could be assessed in an icing tunnel. **(continued on next page)**	We do not agree with the proposed change to Appendix 5. Appendix 5 is the result of a 2009 evaluation of engineering tool capabilities for predicting Appendix O ice accretions and icing effects. As such, it is inappropriate to revise Appendix 5 in response to this comment. However, the proposed use of analysis and similarity for ice detection systems has been added to section **11.a.(1)(a) Primary ice detector**. Section **11.a.(1)(b) Advisory ice detector** states that analyses and tests similar to those performed for a primary ice detector should be performed for an advisory ice detector to understand its characteristics, limitations, and installation. As such, specific reference to similarity analysis for advisory ice detectors is unnecessary.

	Boeing Comment (continued) However, if the device is mounted on the fuselage, and tunnel blockage effects would preclude a meaningful icing tunnel test, then CFD codes that adequately predict the shadowing and concentration effects may be used to verify that the equipment is properly located. Compliance for Appendix O conditions may be shown through qualitative analysis of the design, and supported by similarity to previous design that have shown successful service history. If similarity is not shown, then, bBecause of the lack of engineering tools for FZRA, primary and advisory ice detectors used for compliance with § 25.1420(c) will require validation in natural large drop conditions to substantiate that the detectors function in all Appendix O conditions, …	

Commenter: AIA/GAMA (6/12)		
Current design and compliance methods have resulted in ice detection designs that have had no known safety events due to supercooled large droplet icing. As additional analyses or tests would not improve safety, it should be explicitly allowed to use similarity to current designs to show compliance for Appendix O conditions.	**Appendix 5** **CAPABILITIES OF ENGINEERING TOOLS FOR COMPLIANCE WITH APPENDIX** **O REQUIREMENTS OF PART 25** **3. Component Evaluations** **Page A5-8** Revise to (add underscored text, delete strike thru text): … However, if the device is mounted on the fuselage, and tunnel blockage effects would preclude a meaningful icing tunnel test, then CFD codes that adequately predict the shadowing and concentration effects may be used to verify that the equipment is properly located. <u>Compliance for Appendix O conditions may be shown through qualitative analysis of the design and supported by similarity to previous designs that have shown successful service history.</u> **(continued on next page)**	We do not agree with the proposed change to Appendix 5. Appendix 5 is the result of a 2009 evaluation of engineering tool capabilities for predicting Appendix O ice accretions and icing effects. As such, it is inappropriate to revise Appendix 5 in response to this comment. However, the proposed use of analysis and similarity for ice detection systems has been added to section **11.a.(1)(a) Primary ice detector**. Section **11.a.(1)(b) Advisory ice detector** states that analyses and tests similar to those performed for a primary ice detector should be performed for an advisory ice detector to understand its characteristics, limitations, and installation. As such, specific reference to similarity analysis for advisory ice detectors is unnecessary.

	AIA/GAMA Comment (continued) If similarity is not shown, then, b~~B~~ecause of the lack of engineering tools for FZRA, primary and advisory ice detectors used for compliance with § 25.1420(c) will require validation in natural large drop conditions to substantiate that the detectors function in all Appendix O conditions, …	

Commenter: AIA/GAMA (8/12)		
The definitions of Holding Ice contained in the proposed Appendix X, Part II apply only to airplanes required to certify to 25.1420. For other airplanes guidance concerning consideration of Holding Ice should be provided. Current design and compliance methods have resulted in air data probe heating designs that have had no known safety events due to supercooled large droplet icing. As additional analyses or tests would not improve safety, it should be explicitly allowed to use similarity to current designs to show compliance for Appendix X conditions.	Appendix 5 CAPABILITIES OF ENGINEERING TOOLS FOR COMPLIANCE WITH APPENDIX O REQUIREMENTS OF PART 25 7. Compliance with §§ 25.1323, 15.1324, 25.1325 and 25.773 for Appendix C and Appendix O Conditions **Page A5-11** Revise to (add underscored text, delete strike thru text): Analysis of exposures to Appendix C and Appendix O conditions should consider holding operations consistent with the applicable "Holding Ice" definition contained in Part II of those appendices. <u>For airplanes that are not required to comply with 25.1420, the applicant should consider holding operations consistent with the Holding Ice definition of Appendix O, Part II.b.(1)(d). Compliance to 25.1323 and 25.1325 for Appendix O conditions may be shown through qualitative analysis of the design and supported by similarity to a previous design that has shown successful service history.</u> …	We do not agree with the proposed change to Appendix 5. Appendix 5 is the result of a 2009 evaluation of engineering tool capabilities for predicting Appendix O ice accretions and icing effects. As such, it is inappropriate to revise Appendix 5 in response to this comment. However, we do agree that the guidance for compliance with §§ 25.773, 25.1323, 25.1324 and 25.1325 in consideration of "Holding Ice" could be clarified for airplanes not certified to § 25.1420. With regard to the text proposed by the commenter, there is no "Holding Ice" definition in Appendix O, Part II.b(1)(d). To clarify the compliance methods, we added a new subsection (f) **Holding Ice considerations**. This new subsection is under section **8.a.(4) Some areas of interest for Appendix O.** Appendix O, Part II contains different holding ice conditions depending on the level of certification requested. For airplanes not certified to § 25.1420, the applicant should choose the holding ice conditions most appropriate for the intended airplane operations. If the component will be certified for unrestricted operations in Appendix O, or a portion of Appendix O, then holding ice is defined in Appendix O, Part II, paragraph (c)(4). If the component will be certified for "detect and exit" operations, then the holding ice is defined in Appendix O, Part II, paragraph (b)(2).

Commenter: BOEING (11/11)		
The definitions of "Holding Ice" contained in the proposed Part 25, Appendix X, Part II, apply only to airplanes required to certify to §25.1420. For other airplanes, guidance concerning consideration of holding ice should be provided. Current design and compliance methods have resulted in air data probe heating designs that have had no known safety events due to supercooled large droplet icing. As additional analyses or tests would not necessarily improve safety, use of similarity to current designs to show compliance for Appendix X conditions should be explicitly allowed.	**Section:** Appendix 5, CAPABILITIES OF ENGINEERING TOOLS FOR COMPLIANCE WITH APPENDIX O REQUIREMENTS OF PART 25 **Paragraph:** 7. Compliance with §§ 25.1323, 25.1324, 25.1325, and 25.773 **Page: A5-11** Boeing requests that the proposed text be revised as follows: **Compliance with §§ 25.1323, 25.1324, 25.1325, and 25.773 for Appendix C and Appendix O Conditions** Analysis of exposures to Appendix C and Appendix O conditions should consider holding operations consistent with the applicable "Holding Ice" definition contained in Part II of those appendices. <u>For airplanes that are not required to comply with §25.1420, the applicant should consider holding operations consistent with the Holding Ice definition of Appendix O, Part II.b.(1)(d). Compliance with §§ 25.1323 and 25.1325 for Appendix O conditions may be shown through qualitative analysis of the design and supported by similarity to a previous design that has shown successful service history.</u>	We do not agree with the proposed change to Appendix 5. Appendix 5 is the result of a 2009 evaluation of engineering tool capabilities for predicting Appendix O ice accretions and icing effects. As such, it is inappropriate to revise Appendix 5 in response to this comment. However, we do agree that the guidance for compliance with §§ 25.773, 25.1323, 25.1324 and 25.1325 in consideration of "Holding Ice" could be clarified for airplanes not certified to § 25.1420. With regard to the text proposed by the commenter, there is no "Holding Ice" definition in Appendix O, Part II.b(1)(d). To clarify the compliance methods, we added a new subsection (f) **Holding Ice considerations**. This new subsection is under section **8.a.(4) Some areas of interest for Appendix O.** Appendix O, Part II contains different holding ice conditions depending on the level of certification requested. For airplanes not certified to § 25.1420, the applicant should choose the holding ice conditions most appropriate for the intended airplane operations. If the component will be certified for unrestricted operations in Appendix O, or a portion of Appendix O, then holding ice is defined in Appendix O, Part II, paragraph (c)(4). If the component will be certified for "detect and exit" operations, then the holding ice is defined in Appendix O, Part II, paragraph (b)(2).

COMMENT TABLE
AC 25-XX
COMPLIANCE OF TRANSPORT CATEGORY AIRPLANES WITH CERTIFICATION REQUIREMENTS FOR FLIGHT IN ICING CONDITIONS

Commenter: Cessna		
Section 25.903(a)(iv) states: Be shown to have an ice accumulation service history in similar installation locations which has not resulted in any unsafe conditions. The proposed wording of “be shown to have an ice accumulation service history in similar installation locations” will require development of guidance to clearly define what constitutes sufficient service history (size of fleet, operating time, etc) and some guidance on “similar installation locations.”		We partially agree. The use of similarity and in-service history is described in section **5.g.** of the AC. However, details of what may constitute a successful service history, such as fleet size and operating time, are not included because we recognize that there are many variables which may substantiate a successful service history. We intentionally leave it up to the applicant to show a successful service history in consideration of the variables which may be applicable.