

DISPOSITION OF SUBSTANTIVE COMMENTS

1. **DATE FORM COMPLETED:** June 6, 2011

2. **TITLE OF DOCUMENT:** AC 20-147A, Turbojet, Turboprop, Turboshaft and Turbofan Engine Induction System Icing and Ice Ingestion

3. **COMMENT PHASE:** Internal FAA (Clearance Record): _____ **OR** Public: X

***SUBSTANTIVE COMMENTS.** Substantive comments must be resolved in the format below. Substantive comments are any comment other than those which:

- correct grammar or sentence structure
- correct spelling
- correct term use
- make simple text changes to clarify the intent, meaning or to improve readability
- change format/structure of the overall document

Name of Person or Company	Page & Par	Comment:	Comment Accepted:	Disposition:
		<i>Similar comments may be grouped together or you may list them separately.</i>	1. YES 2. NO 3. IN PART	<i>Technical specialist must dispose each comment (can group similar comments) by accepting them either in part, whole or not at all. Reasons <u>MUST</u> be provided for NOT accepting in part or whole.</i>
Honeywell & PW & PWC	9.n.2	Commenter recommends changing the level of “ <i>Sustained Power Losses</i> ” of 1.5% defined in the DRAFT AC20-147A to 3%, to be consistent with 33.78.	NO	The issue of sustained power loss was debated in the EHWG, which was the body that proposed this AC’s revisions. It was agreed that due to the higher probability of occurrence of 33.68 relative to 33.78, there needed to be a lower allowable power loss. This is consistent with FAA legacy methodology for accepting power loss.
Honeywell & PW & PWC	7.m.	Clarify that the value of the “ <i>Sustained Power Losses</i> ” is applicable to the take-off power.	YES	Revised definition of sustained power loss in section 7.m.
GE -1	Section 8 a (3)	Suggest adding the words: “and validate CPA assumptions and demonstration intent”, for clarification.	YES	Revised text as proposed by commenter.
GE -2	Section 8 b (4)	Suggest adding the words: “Events attributed to ...” for clarification.	YES	Revised text as proposed by commenter.
GE -3	Section 9 c	Recommendation for facility calibration should be given so different facilities will produce a standardized cloud. Text suggested by GE.	YES	Revised text as proposed by commenter.
GE -4	Section 9 e (1)	Correct reference from 33.68(b)(B) to 33.68(b)(2) and change wording from “ground fog” to “ground ice”.	YES	Revised text as proposed by commenter.
GE -5	Section 9 f (3)	Correct wording from “idle to takeoff” to “idle to 100% maximum continuous”.	YES	Revised text as proposed by commenter.
GE -6	Section 9 f (4) (b)	Suggest revised wording to remove allowance for in-flight shed procedures and to clarify procedure for demonstrating 45-minute hold condition.	YES	Revised text as proposed by commenter.
GE -7	Section 9 h (1) & (2)	Suggested revised wording to clarify intent. (note GE used wrong paragraph reference here.. they referenced paragraph 8 and not 9, as they had intended)	YES	Revised text as proposed by commenter.

GE -8	Section 9 o	The words “disabled by the crew” were added to the revised AC and should be removed. Some existing systems are integral with the aircraft anti-ice system and can be disabled by the crew.	YES	Revised text as proposed by commenter.
GE -9	Section 9 o (1)	Suggest revising wording from “throughout the operating envelope” to “throughout its required / intended operating envelope”.	In part	Agree that additional clarity would be helpful. Revised wording to say “the <u>approved</u> operating envelope”, for clarity.
GE -10	Section 9 p	Allow the use of auto-recovery systems in compliance tests. Although 33.68 icing conditions are considered to be a ‘probable encounter’, the requirement for extended testing in cloud lengths and equivalent time periods moves some test points well beyond the ‘Probable’ range. In these cases, ‘rare events’ could be simulated, and the use of auto-recovery systems deemed appropriate. Also, future technology advancements in controls which can detect incipient operability anomalies and take action to make such anomalies unnoticeable	NO	The issue of auto-recovery was debated in the EHWG, which was the body that proposed this AC’s revisions. It was agreed that due to the higher probability of occurrence of 33.68 there needed to be limits put on auto-recovery use. This is consistent with FAA legacy methodology for use of auto recovery. The FAA has utilized this policy on auto-recovery systems for many years with success. As new technologies emerge in the future, where highly reliable advances in control technology can detect impending events and avert unacceptable operating results, then the FAA can revisit this guidance. The current guidance on auto-recovery systems was also recommended by the EHWG.
GE -11	Section 9 s (3) (a)	The word “and” is added to allow the use of both field service and a certification report.	YES	Revised text as proposed by commenter for clarity.
GE -12	Section 9 s (4)	Remove entire paragraph describing CPA for ice crystals. Section 9 r (4) acknowledges that ice crystal CPA process is not available at the present time.	In part	Section 9 s (4) and section 9 r (4) have now been made to agree by rewording Section 9 s (4) to state: “As research advances, in the long term a CPA should be performed ...”.
Transport Canada -1	Page 2, Section 4.b.	Include 14 CFR 25.1420 in related regulations. Also add references to Appendix C, O and D.	In part	Added reference to 25.1420. Did not add reference to Appendix C and O of part 25 or Appendix D of part 33 since those appendices are referenced within the rules that impose them.
Transport Canada -2	Page 4, Section 7.d.	Underline the word “Highlight area” for consistency.	YES	Revised text as proposed by commenter.
Transport Canada -3	Page 5, Section 7.g.(2)	Define MED for consistency with MMD and MVD.	YES	Revised text as proposed by commenter.
Transport Canada -4	Page 6, Section 7.i.	Change the word “affect” to “effect”	YES	Revised text as proposed by commenter.
Transport Canada -5	Page 7, Section	Change phrase “compromise the certification basis” to “compromise <u>compliance with the</u>	YES	Revised text as proposed by commenter.

	8.a.	certification basis”.		
Transport Canada -6	Page 13, Section f.2.	Add the word “power” to the phrase “50% maximum continuous”	YES	Revised text as proposed by commenter.
Transport Canada -7	Page 19, Section 1.1.	Add additional information that any scaling adjustments to account for higher ice concentrations should be conservative.	YES	Revised text as proposed by commenter.
Snecma -1	Page 26, Section 9.u and 9.v.	In consistent upper temperature boundary between these two sections. Recommend making them both 100 F, to be consistent.	In part	Concur with commenter that they should be consistent, but disagree as to what value they should be. Revised text to make both sections consistent but the value of 120 F will be used, not the suggested 100 F value. This higher value is being used since it is more conservative. Paragraph 9.u was intended as an example, while paragraph 9.v was intended as criteria.
Snecma -2	Page 26, Section 9.w. (Figure 3)	Commenter proposes replacing series of curves and symbols with just one line representing typical airfoil impingement efficiency.	NO	The Figure 3 as proposed by the FAA provides more information than what the commenter is proposing. The FAA believes the additional information proposed by the FAA could be helpful to applicants. Therefore the FAA believes that leaving the figure as proposed is preferred.
Snecma -3	Page 26, Section 9.w.	Commenter proposes modifying Figure 4 and the associated text to provide additional explanation on how the curve can be interpreted.	YES	Revised text and Figure 4 as commenter suggested. These changes provide additional information in terms of a qualitative interpretation of the curves in the figure.
AIA / GAMA -1	Whole AC	Use the term “glaciated atmospheric conditions” to define the environment and “ice crystal icing” to define accretion effects.	YES	Revised text as proposed by commenter.
AIA / GAMA -2	Whole AC	When a defined term is used anywhere within the AC the text should be capitalized/italicized/underlined so that the applicant recognizes when they are used so that the definition can be referred to.	NO	This is a formatting issue that falls under government publication standards. We used standard FAA referencing throughout AC.
AIA / GAMA -3	8.d.3, & 9.g.(2), & 9.i.(a), & 9.i.(2)	Replace the word “reference” for “paragraph” when a reference document is being referred to.	YES	Revised text as proposed by commenter.
AIA / GAMA -4 & Boeing -1	Page 1, Section 1. b.	Reinsert the prior AC version’s guidance on the part 23 installation icing AC as being the precedence for part 23 installations.	YES	Revised text to include reference to AC 23-16A.

AIA / GAMA -5 & Boeing -2	Page 1, Section 2.a.	Add reference to airframers in the applicability of the AC.	YES	Revised text as proposed by commenter.
AIA / GAMA -6 & Boeing -3	Page 2, Section 5. i.	Replace outdated Riley reference with more current Mazzawy/Strapp reference.	YES	Revised text as proposed by commenter.
AIA / GAMA -7 & Boeing -4	Page 4, Section 6.d.	Add a sentence to describe how Appendix D was derived, just as the derivation of App. C and O have been described.	YES	Revised text as proposed by commenter.
AIA / GAMA -8 & Boeing	Page 4, Section 6.e.	Grammatical correction. Add the word “for”.	YES	Revised text as proposed by commenter.
AIA / GAMA -9	Page 6, Section 7.h.	Add a sentence that states a rotating stall is generally acceptable, providing that no unacceptable operability effects or stresses result.	In part	Revised proposed text to fit in as a definition and add phrase, “upon review with the FAA”.
AIA / GAMA -10	Page 6, Section 7.k.	In definitions, substitute the word “stabilized” for “steady”.	YES	Revised text as proposed. Previous rule used the word “steady” but proposed rule uses “stabilized”.
AIA / GAMA -11	Page 6, Section 7.l.	In definitions, the definition for Stabilized Ice Accretions is unclear. Suggest substituting the word “increasing” for “forming”.	YES	Revised text as proposed by commenter.
AIA / GAMA -12	Page 6, Section 7.m. and q and s	In definitions, remove discussion of Temporary Power Loss and Momentary Power Loss from Sustained Power Loss, into their own definitions within section 7.	YES	Revised text as proposed by commenter.
AIA / GAMA -13	Page 6, Section 7.n.	Delete definition of water impingement rate since it adds no value to AC.	YES	Revised text as proposed, and deleted definition as proposed.
AIA / GAMA -14	Page 6, Section 7.p.	Delete this definition because the term Airfoil span is not used in AC.	YES	Revised text as proposed, and deleted definition as proposed.
AIA / GAMA -15 & Boeing -5	Page 7, Section 8. a.	Propose clarifying language to reduce confusion to the reader. Text has to do with changes to the build standard during the certification program that needs to be evaluated.	YES	Revised text as proposed by commenter.
AIA /	Page 7,	Utilize existing power loss definitions within	YES	Revised text as proposed by commenter.

GAMA -16 & Boeing -6	Section 8.a.(3)	this paragraph.		
AIA / GAMA -17 & Boeing -7	Page 7, Section 8.b.	Propose clarifying language to discussion of mixed phase and glaciated icing. Us ice crystal icing as the result of a mixed phase and glaciated icing encounter.	YES	Revised text as proposed by commenter.
AIA / GAMA -18 & Boeing -8	Page 8, Section 8.b.(2)	Proposed changes in accordance with 1st AIA comment.	YES	Revised text as proposed by commenter.
AIA / GAMA -19 & Boeing -9	Page 8, Section 8.b.(3)	Clarify that TAT probe freezing is for heated probes and may not be stabilized in temperature.	YES	Revised text as proposed by commenter.
AIA / GAMA -20 & Boeing -10	Page 8, Section 8.b.(4)	Proposed changes in accordance with 1st AIA comment.	YES	Revised text as proposed by commenter.
AIA / GAMA -21 & Boeing	Page 9, Section 9.a.	Grammatical change. Add the word “and”.	YES	Revised text as proposed by commenter.
AIA / GAMA -22	Page 12, Section 9.d.(3)	Utilize existing power loss definitions within this paragraph.	YES	Revised text as proposed by commenter.
AIA / GAMA -23	Page 12, Section 9.d.(3)	Clarify wording so that it does not state that a burst from G/I to T/O is required during compliance test, but rather from F/I to T/O.	YES	Revised text as proposed by commenter.
AIA / GAMA -24 & Boeing -13	Page 12, Section 9.d.(5)	Clarifying language on inlet probe icing is offered.	YES	Revised text as proposed by commenter.
AIA / GAMA -25 & Boeing -12	Page 11, Section 9.d.(1) (b)	Propose additional description of industries current capabilities for predicting ice sheds.	In part	Revised text to include the proposed concept but utilized different words then proposed by AIA. FAA newly proposed words include a discussion of current industry capability in shed predictions.
AIA / GAMA -26 & Boeing -13	Page 13, Section 9.e.	Proposed changes in accordance with 1st AIA comment.	YES	Revised text as proposed by commenter.

AIA / GAMA -27 & Boeing - 14	Page 13, Section 9.e.(1)	Correct a paragraph reference to the new rule. Change reference from 33.68(b)(B) to 33.68(b)(2)	YES	Revised text as proposed and fixed rule reference.
AIA / GAMA -28 & Boeing -15	Page 14, Section 9.f.(3) (a)	Suggest deleting a sentence that states de-iced inlets have some unheated surfaces since that is always true and irrelevant to issue.	YES	Revised text as proposed and deleted sentence.
AIA / GAMA -29	Page 14, Section 9.f.(3) (a)	Proposed wording changes the simulated condition from top-of-descent, which is above the icing envelope, to top of Appendix C.	YES	Revised text as proposed by commenter.
AIA / GAMA -30 & Boeing -16	Page 14, Section 9.f.(4)	Clarifying language on indefinite operations is offered.	YES	Revised text as proposed by commenter.
AIA / GAMA -31	Page 14, Section 9.f.(4)	Remove references to installation requirements of part 23, 25, 27, and 29, since this section is for part 33 compliance alone. Address these issues in section 11 of AC.	YES	Revised text as proposed by commenter.
AIA / GAMA -32 & Boeing -17	Page 17, Section 9.g.(2) (a)	AIA proposes adding clarify words to definition of extreme snow fall rates. Suggested adding “over approximately 30-minutes” at the end of the first sentence of the paragraph.	YES	Revised text as proposed by commenter.
AIA / GAMA -33 & Boeing -18	Page 17, Section 9.g.(2) (b)	AIA’s proposed changes are intended to be consistent with section 11 for snow.	YES	Revised text as proposed by commenter.
AIA / GAMA -34 & Boeing -19	Page 17, Section 9.h.	Remove reference to large high bypass turbofan engines because it is not true anymore. Revise other wording for clarity.	In part	Text had already been revised (see GE comment for same section). So the paragraph on large turbofans had already been removed. Some of the other suggested AIA rewording was adopted.
AIA / GAMA -35 & Boeing -20	Page 18, Section 9.i.(a) and (b)	AIA proposes changes to update the ice crystal conditions definition and clarify the wording for how the Appendix D was developed.	YES	Revised text as proposed by commenter.
AIA / GAMA -36 & Boeing -21	Page 20, Section 9.l.(1)	Remove discussion of a CPA for ice crystals. Remove discussion that flight testing is the most accurate method of assessing ice crystal icing effects. These should be removed to reflect industries current capabilities.	YES	Revised text as proposed by commenter.
AIA /	Page 19,	Proposed changes in accordance with 1st AIA	YES	Revised text as proposed by commenter.

GAMA -37 & Boeing -22	Section 9.1.(2) and 9.m.	comment.		
AIA / GAMA -38	Page 19, Section 9.m.(1)	Use defined terms within text for temporary and momentary power loss. Add two separate numbered paragraphs to identify the power loss criteria within this section.	YES	Revised text as proposed by commenter.
AIA / GAMA -40	Page 20, Section 9.n.(3)	Use defined terms within text for temporary and momentary power loss.	YES	Revised text as proposed by commenter.
AIA / GAMA -41 & Boeing -24	Page 20, Section 9.n.(7) (a)	AIA recommends adding the words “reflected in the”, in the sentence that requires operating procedure documentation. This change was proposed to allow for the possibility of the instructions to be tailored to the airplane procedures.	In part	The proposed AIA wording is vague and it is not clear how it meets the intent. The FAA believes that the engine manufacturer and the airframer communicate prior to establishing ground operating procedures that will work best for the airframe installation. This communication is emphasized throughout the AC. The FAA has added a sentence reflecting this recommended communication.
AIA / GAMA -42 & Boeing -23	Page 20, Section 9.n.(6)	Additional wording is proposed by AIA to allow assessing resultant high vibrations against acceptability at the airframe level. This is being proposed as an additional requirement.	In part	Revised text with the AIA intent, but more completely describing the FAA practices.
AIA / GAMA -43 & Boeing -25	Page 22, Section 9.q.	AIA has proposed additional wording to allow airframer to rewrite the ground icing operating procedures that were approved for the engine.	YES	Revised text as proposed by commenter and added words stating it should be a conservative equivalent procedure based on the actual demonstration during the cert program.
AIA / GAMA -44 & Boeing -26	Page 22, Section 9.r.	Per AIA’s first comment, text changes are proposed which would make the ice crystal language more consistent.	YES	Revised text as proposed by commenter.
AIA / GAMA -45 & Boeing -11	Page 9, Section 9.a.	(note that AIA used wrong paragraph reference in their proposal) AIA proposes to remove the reference to Appendix O for the CPA guidance paragraph and add that Appendix D is a future CPA element.	YES	Revised text as proposed by commenter.
AIA / GAMA -46 & Boeing -27	Page 24, Section 9.s.(3)	Per AIA’s first comment, text changes are proposed which would make the ice crystal language more consistent.	YES	Revised text as proposed by commenter.
AIA / GAMA -47 &	Page 25, Section 9.s.(4)	AIA has proposed wording which would reserve the term “CPA” for the more advanced environmental appendix C, and not as part of	YES	Revised text as proposed by commenter’s intent. The rewording was combined with other commenter’s proposals and modified to make a complete thought.

Boeing -28		the ice crystal comparative analysis assessment. As advances are made in other icing environments, then CPA could later be added.		
AIA / GAMA -48 & Boeing -29	Page 26, Section 9.u.(2)	AIA proposes to delete this section since they believe it is inconsistent with current knowledge base.	YES	Revised text as proposed and deleted section.
AIA / GAMA -49 & Boeing -30	Page 26, Section 9.v.	Per AIA's first comment, text changes are proposed which would make the ice crystal language more consistent.	YES	Revised text as proposed by commenter.
AIA / GAMA -50 & Boeing -31	Page 26, Section 9.v.1.	AIA proposes to delete Figures 1 and 2 which are example CPA conditions. They don't believe these examples are substantiated. They also propose word changes to the text of 9.v.1.	YES	Revised text as proposed and deleted Figures 1 and 2.
AIA / GAMA -51 & Boeing -32	Page 26, Section 9.w. & Fig. 3	AIA requests FAA to define terms Em and Ko in Figure 3 and add reference to Powerplant Icing Handbook. No specific wording was proposed by AIA for this item.	YES	Although the text already provided this information, the FAA has revised the text to add clarity. Also a new figure 3a was added that shows the calculation for Ko.
AIA / GAMA -52 & Boeing -33	Page 28, Section 9.w.(3) & Fig. 4	AIA proposes to delete figure 4 and reword paragraph 3 to be more succinct.	In part	Based on Snecma -3 comment, Figure 4 has been revised to provide clarity and additional information, therefore the FAA does not believe deleting the figure is needed now. FAA has inserted AIA's suggested wording as an addition to the current wording to provide additional clarity.
AIA / GAMA -53 & Boeing -34	Page 31, Section 10.a. (1) & (2)	AIA proposes that the ice slab density should be defined as part of the ice slab demonstration. Also the installer should be allowed a qualitative analysis of airframe ice slab sources.	In part	AIA proposed wording on density was added. Additional wording was added to paragraph 2 to instruct reader to review section 11 for installer guidance. This approach was used since the FAA believes that detailed installer guidance is inappropriate within this section, as AIA had proposed.
AIA / GAMA -54 & Boeing -35	Page 31, Section 10.e.	AIA submitted a comment only, to this paragraph with no suggested changes. AIA notes an inconsistency between part 33.77 and part 25.1093 ice slab requirements.	Comment Accepted	No changes are suggested or expected. Comment provided only. (Note changes were agreed for related comment 57)
AIA / GAMA -55	Page 36, Section 11.a.	AIA proposes eliminating the wording that requires unlimited operation in flight icing conditions.	In part	FAA agrees with AIA that a 45-minute limit may be sufficient and therefore will make changes to wording to clarify the intent.

AIA / GAMA -56	Page 38, Section 11.c.	AIA has proposed a new paragraph be inserted to provide guidance on running-wet systems.	YES	Revised text as proposed by commenter.
AIA / GAMA -57 & Boeing -36	Page 39, Section 11.f.(1)	AIA proposes changing the 25.1093 ice slab ingestion guidance to be the same as the part 33 guidance, in 10.e of AC. (see comment AIA - 54)	YES	Revised text as proposed by commenter. See proposed wording in section 11.f.1 – This would result in a quarter of the radome ice entering the engine, which is what was agreed to in the EHWG.
AIA / GAMA -58	Page 40, Section 11.f.(3)	AIA has proposed a new paragraph be inserted to provide guidance on 25.1093 ice slab ingestions. This proposal would allow tanker test ice ingestions as adequate demonstration of 25.1093.	In part	Revised text is partially as proposed by commenter. Discusses additional conservatism. See proposed wording in section 11.f.3. The wording proposed by AIA was revised to clarify and add additional pertinent criteria. Will revise AC to make damage criteria consistent with 33.77 requirements.
AIA / GAMA -59 & Boeing -37	Page 40, Section 11.g.	AIA proposes some clarifying language, on clear wing ice which forms on the ground and therefore s a takeoff rotation threat.	YES	Revised text as proposed by commenter.
AIA / GAMA -60 & Boeing -38	Page 40, Section 11.g(1)	AIA proposes some clarifying language, on clear wing ice which forms on the ground and therefore s a takeoff rotation threat.	YES	Revised text as proposed by commenter.
AIA / GAMA -61 & Boeing -39	Page 40, Section 11.h.	AIA proposes clarification to include other anti-ice and wing designs as well as qualitative analysis.	In part	Revised text as proposed by commenter. AIA’s wording was revised slightly.
AIA / GAMA -62 & Boeing -40	Page 40, Section 11.i.	Per AIA’s first comment, text changes are proposed which would make the ice crystal language more consistent.	YES	Revised text as proposed by commenter.
AIA / GAMA -63 & Boeing -41	Page 42, Section 11.j. (1) & (2)	AIA proposes changes that allow qualitative analysis. AIA also proposes to drop the 3000 micron reference in paragraph 11.j.(2).	YES	Revised text intent as proposed by commenter. Dropped the size reference. As written it includes all of Appendix O.
AIA / GAMA -64	Page 43, Section 11.n(1)	AIA proposes to add the words “or anti-ice idle”	YES	Revised text as proposed by commenter.
AIA / GAMA -65	Page 43, Section 11.n(3)	New paragraph is proposed by AIA which would limit the icing certification demonstration for installations where flight into known icing is not requested.	NO	The FAA policy on engine icing has consistently asserted that engines must continue operating, even if inadvertent icing is incurred. As the AC state, it doesn’t matter what the approved operations of the airplane is, section xx.1093 would still apply.

AIA / GAMA -66 & Boeing -42	Page 43, Section 11.o(1)	AIA proposes changes to wording that recognizes pitot style inlets as not having a history of snow issues. Also, revised wording is said to be more consistent with AC 23-16A.	YES	Revised text as proposed by commenter.
AIA / GAMA -67 & Boeing -43	Page 44, Section 11.o(2)	AIA proposes that the falling and blowing snow criteria be aligned with the AC wording in the engine criteria, section 9, and to highlight that the test is intended to target LPC snow accretions.	YES	Revised text as proposed by commenter.
AIA / GAMA -68 & Boeing -44	Page 44, Section 11.q.	A new paragraph is proposed to provide guidance on APU icing. They would like to exempt shadowed APU inlets from the compliance test requirements of SLD and ice crystal.	NO	This proposed paragraph since APUs are not directly included in this AC. APU's are addressed under TSO C77. The inlets to APU's are covered under 25.1093, and therefore must meet the criteria of 25.1093.
AIA / GAMA -69 & Boeing -45	New Attachm ent A	AIA has proposed to add back into this AC the Attachment A from the last version of the AC. That attachment provided the FAA's perspective on guidance relative to test time durations for certain in-flight icing conditions. AIA believes these are important assumptions about descent in icing and is helpful to applicant.	YES	Revised text as proposed by commenter. Added Attachment A from original AC.
Airbus -1	Page 13, Section 9.e.	Commenter references AIA -26 comment. Airbus states that CPA for SLD was never intended by EHWG proposal, for those applications where service experience has shown that it is not an issue.	NO	No text changes proposed. FAA disagrees with Airbus on the EHWG intent. The revised rule and AC reflect the criteria that were proposed by EHWG. The FAA did not change the intent of the EHWG proposal on this issue. EHWG agreed that analysis can be used for SLD.
Airbus -2	Page 20, Section 9.n.(7) (a)	Commenter references AIA -41 comment. Airbus recommends that engine applicant must get approval for run-up shedding procedures from installer to assure procedures are practical.	YES	The FAA revised the paragraph to add a statement that the run-up shed procedures should be coordinated with the airplane manufacturer.
Airbus -3	Page 31, Section 10.e.	Commenter references AIA -54 comment. Airbus states that they believe an airframe ice shed will result in multiple break-ups of the slab prior to impacting the engine.	In part	The FAA has modified the wording to better reflect the EHWG perspective of allowing an additional break-up after release, prior to impacting the engine. See related comment and response at comment AIA -57.
Airbus -4	Page 36, Section	Commenter references AIA -55 comment. Airbus states that EHWG had no identified in-	In part	See response to AIA -55 comment.

	11.a.	flight SLD events and so should not require compliance beyond the engine compliance test.		
Turbomeca -general	general	Turbomeca states that the AC does not appropriately address turboshaft installations and does not provide adequate help.	In part	This comment has no suggested changes. Although guidance exists within the AC, the FAA agrees that additional efforts can be given to enhance the turboshaft guidance material. The EPD has requested that Rotorcraft Directorate assist in an industry working group to develop additional icing guidance applicable to turboshaft engines and their installations. (Note that the new SLD and ice crystal requirements have been determined by FAA legal to not be required for Part 27 & 29 & therefore excluded from the rule and AC).
Turbomeca -A1	Section 1.a.	Turbomeca states that the discussion throughout the CA on turboshaft engines is inconsistent	YES	Concur with commenter's observation, and will welcome the additional comments provided by this commenter. Commenter proposed no specific word changes for this paragraph.
Turbomeca -A2	Section 2.b.	Turbomeca disagrees that this AC was derived from extensive FAA and industry experience in determining regulations.	In part	The guidance for turboshaft engines has been used extensively for Appendix C icing conditions for many years. No specific wording changes were proposed by the commenter. The AC also includes extensive experience with both turbofan and turboshaft compliance experience.
Turbomeca -A3	Section 6.a.	Turbomeca states they agree with the statement in AC paragraph 6.a., although they believe changes proposed later in the AC will be required to support this statement.	YES	No specific wording changes were proposed by the commenter. Commenter concurs with the AC statement.
Turbomeca -A4	Various Sections	Turbomeca states that in various paragraphs throughout AC, part 25 is referenced, but not part 29. Also, Turbomeca points out that wherever appendix C is referenced, we should state of either part 25 or part 29.	YES	The various sections that the commenter has referenced have been reviewed and adjusted to account for their comments. Reference to part 29, appendix C, has been added throughout the AC.
Turbomeca -A5	Section 7.d. and 7.i.	Commenter suggests clarifying definition of highlight area and scoop factor to include the rotorcraft inlet systems.	In part	The FAA concurs with the commenter that turboshaft installations are more complex and thus require a different definition for highlight area and scoop factor. But the commenter has not made any proposed remedies nor is there a standard industry wide definition that has been agreed for turboshaft installations, so this issue will be raised within these paragraphs of the AC.
Turbomeca -A6	Section 7.o.	Commenter points out that the current definition for flight idle descent idle engine speed is not applicable to rotorcraft, but no revised wording is proposed by commenter.	In part	The FAA concurs with the commenter that low engine speed conditions in flight are not well defined within the turboshaft engine community. But the commenter has not made any proposed remedies nor is there a standard industry wide definition that has been agreed for turboshaft installations, so this issue will be raised within these paragraphs of the AC. The following was added to this paragraph: "Since this is different

				for turboshaft installations, the applicant can propose appropriate criteria.”
Turbomeca –A7	Section 8(a)(1) and 8(a)(2)	The commenter points out that where the phrase “throttle manipulation” is used, a different phraseology should be used for turboshaft applications.	YES	Will change the phrase to the following: “...throttle manipulation or <u>power change</u> ...”
Turbomeca –A8	Section 8(a)(2)	The commenter points out that although 25.1093 is being revised by the NPRM, parts 27 and 29.1093 are not. So the commenter believes that ground operating procedures demonstrated during compliance testing for 33.68 should not be mandatory.	NO	The FAA maintains that if certain ground operation simulation procedures are utilized during the conduct of the compliance demonstration, and they are required for successful ground operation in icing conditions, then those procedures must not be violated when the engine is installed and operated in the aircraft, including rotorcraft.
Turbomeca –A9	Section 8.b.	The commenter questions how many service events of ice crystal power loss have occurred on turboshaft engines.	YES	Although commenter does not propose any alternative wording, the commenter does pose a rhetorical question. This issue is a mute issue since turboshaft engines have been removed from the NPRM requirements of compliance to either SLD or ice crystals. Words have been added to the AC which overtly state that appendices O and D do not currently apply to turboshaft engines.
Turbomeca –A10	Section 8.b(2) and (3)	Commenter suggests that ice crystal icing description should be clarified to state that the experience is on fixed wing applications. Also they request a definition of roll-back.	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter. A new definition for power rollback is introduced. Service experience in ice crystals has been clarified to indicate fixed-wing applications.
Turbomeca –A11	Section 8.b(4)	Add appendix C of part 29 reference.	YES	Revised text as proposed by commenter.
Turbomeca –A12	Section 8.b(5)	Commenter discusses their concern with appendix D applicability to turboshaft engines.	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter. Appendix D is no longer applicable to turboshaft engines. (Both rule and AC have been revised)
Turbomeca –A13	Section 8.c.	Commenter states that this paragraph does not reference part 27 or 29 applications.	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter.
Turbomeca –A14	Section 9(a)(2)	Commenter discusses current short falls in turboshaft engine installation CPA’s. They would like more guidance to be added to the AC but they do not make any suggestions for improvement.	In part	The commenter makes no recommendations for improving guidance for CPA on turboshaft inlet systems. The AC provides guidance for CPAs, but as the commenter suggests, additional guidance should be developed to standardize this process. The FAA agrees that an ARAC should be assembled to address turboshaft engines and their installations only.
Turbomeca –A15	Section 9(a)(2)	Same comment as Turbomeca –A14.	In part	See prior comment and response. (commenter wants more guidance to be added to AC for CPA process). FAA agrees that

				this guidance should be further developed for turboshaft engines.
Turbomeca -A16	Section 9.d.	Commenter states that AC guidance on fan module is not applicable to turboshaft engines.	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter. The paragraph referring to the fan module has been re-titled as the first stage of compressor, to be more generic.
Turbomeca -A17	Section 9.d.2.	Commenter suggests that wording should be revised to address turboshaft applications too.	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter.
Turbomeca -A18	Section 9.d.5.	Commenter suggests that wording should be revised to address turboshaft applications.	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter. Turboshaft engines are overtly exempted from appendices O and D evaluation.
Turbomeca -A19	Section 9.f.	Commenter asks rhetorical questions on Table 1 reference. They state that it is not specified if altitude is to be simulated.	NO	Altitude is not to be included in table points. The FAA believes the issue is adequately addressed within the AC. It states in section 9.f(1), "Table 1 of § 33.68 represents ambient icing conditions for an open inlet ground test facility or equivalent, within the inlet duct of a direct connect test facility." As this quoted statement indicates, altitude is not simulated for these table points.
Turbomeca -A20	Section 9.f.3.(a)	The commenter suggests that the guidance in this paragraph is directed to transport fixed wing aircraft and not rotorcraft	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter. The following sentence was added to the paragraph: "Applicants for rotorcraft applications should propose an appropriate flight profile to address this low power test period duration."
Turbomeca -A21	Section 9.f.4.	The commenter notes that this paragraph refers to a fixed wing issue (holding phase).	YES	Although commenter does not propose any alternative wording, the text has been revised as suggested by commenter. References to part 27 and 29 have been removed.
Turbomeca -A22	Section 9.f.4.(a)	The commenter suggests that a discussion of rotorcraft applications within the context of holding phase conditions is not appropriate and should be transferred to section 9(e) of the AC.	YES	The text has been revised as suggested by commenter. Paragraph has been moved to 9(e).
Turbomeca -A23	Section 9.f.4.(a)	Commenter states that paragraph is unclear. No propose wording changes are made.	YES	Although commenter does not propose any alternative wording, the text has been moved and revised as suggested by commenter, to improve clarity.
Turbomeca -A24	Section 9.f.6.(a)	Commenter states again that they object to a requirement of appendices O and D compliance.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -A25	Section 9.g.	Commenter states that the wording is not appropriate for turboshaft engines.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised

				as suggested by commenter. As the rule states, SLD and ice crystal conditions are not intended to be applicable to turboshaft engines.
Turbomeca –A26	Section 9.i.(a)	Commenter states that the criteria of this paragraph are not helpful to turboshaft installations since the conditions are outside their operating envelope.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. As the rule states, SLD and ice crystal conditions are not intended to be applicable to turboshaft engines.
Turbomeca –A27	Section 9.i.(b)	Same comment as Turbomeca –A26.	YES	See prior comment and response. Text revised to address comments concerns.
Turbomeca –A28	Section 9.j.	Commenter states that turboshaft installations have different criteria, but the commenter provides no suggestions as to how best to word this paragraph to address this issue.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca –A29	Section 9.l.	Commenter states that the paragraph is not appropriate for turboshaft engines.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. Turboshaft engines do not need to address ice crystals.
Turbomeca –A30	Section 9.o.	Commenter states that turboshaft installations have different criteria, but the commenter provides no suggestions as to how best to word this paragraph to address this issue.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca –A31	Section 9.r.	Similar comments as Turbomeca -9, -10, and -26. The commenter questions how many service events of ice crystal power loss have occurred on turboshaft engines.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. Clarified section by stating: “Turbofan and Turboprop, only”.
Turbomeca –A32	Section 9.s.3.(a)	Commenter states that this section is not clear and should not be applicable to turboshaft engines. This section applies to ice crystal compliance.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. Clarified section by stating: “Turbofan and Turboprop, only”.
Turbomeca –A33	Section 9.v.(1)	Commenter states that the paragraph is not appropriate for turboshaft engines.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. Turboshaft engines do not need to address ice crystals.
Turbomeca –A34	Section 9.w.(3)	Commenter states that the paragraph is not appropriate for turboshaft engines.	YES	Figure 4 is intended to depict the effects of SLD. Both the revised rule and AC state that turboshaft engines do not need to address SLD compliance. The comment has been addressed with revised text.
Turbomeca –A35	Section 10.a.	Commenter states that ice shedding from nacelle inlets is not applicable to turboshaft	In part	The FAA disagrees that the rotorcraft inlet can not accrete ice which could subsequently be ingested into the engine. Although

		installations. Commenter also states that clarity for turboshaft engines should be added.		commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -A36	Section 10.b.(1) and (2)	Commenter states that this section is not clear and may not be applicable to turboshaft engines as written.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -A37	Section 10.d.	Commenter states that this section is not clear and may not be applicable to turboshaft engines as written. They also state they don't think Figures 5 and 6 are applicable.	In part	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. The FAA disagrees with the commenter that Figures 5 and 6 are not applicable to turboshaft engines.
Turbomeca -A38	Section 10.f.(1)	Commenter states that the paragraph is not appropriate for turboshaft engines.	YES	The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -A39	Section 10.f.(1). b.	Commenter states that the paragraph is not appropriate for turboshaft engines.	YES	The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -A40	Section 11.	Commenter states that this section is not clear and may not be written appropriately to be applicable to turboshaft engines.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -A41	Section 11. – Table C	The commenter states that Table C is not appropriate for rotorcraft applications.	YES	The comment has been addressed and the Table title has been revised to clearly state that is intended for turbofan and turboprop engine installations only. Added, "(Turbofan and Turboprop Engines only)".
Turbomeca -A42	Section 11.m.	Commenter states that this paragraph should not be applicable to rotorcraft since it references appendix O (SLD).	In part	The comment has been addressed and the text has been revised to address the commenter's concern. Added, "as applicable."
Turbomeca -A43	Section 12.	Commenter states that the conclusion only references airplanes and not rotorcraft.	YES	Although commenter does not propose any alternative wording, the comment has been addressed and the text has been revised as suggested by commenter. "Airplane" changed to "aircraft".
Turbomeca -A44	AC 20- 73A	Commenter makes comparisons to various ACs, including 20-147, 20-73, 20-73A, 33-2B, 27-1A, and 29-2C. Then makes statement that appendix O and D should not be applied to turboshaft engines or rotorcraft.	YES	Concur with commenter. Both appendix O and D have been removed as requirements for turboshaft engines or rotorcraft, both in the proposed revised rule and the subject AC.
Turbomeca -B1	Table of Contents	Commenter recommends that a table of contents be added to the AC for quick references purposes. They say because of the current numbering system the AC is very difficult to use.	YES	Concur with commenter. The comment has been addressed and the table of contents has been added as suggested by commenter.
Turbomeca	Section	This paragraph states that AC is targeting	YES	Concur with commenter. The comment has been addressed and

-B2	2(a)	engine manufacturers, while it also addresses installation compliance.		the text has been revised as suggested by commenter.
Turbomeca -B3	Section 5.	Words should be added instructing the reader how to get copies of the reference material.	NO	FAA has provided a list of reference documents that may be helpful, but are not required. Most of the documents are not FAA documents and are copy righted and therefore must be obtained directly from the publishing organization.
Turbomeca -B4	Section 6.f.	The three sections of the AC should be clearly delineated within the reference paragraph.	YES	Concur with commenter. The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B5	Section 6.f.	Commenter states that AC appears to be for engine manufacturers but also addresses installers.	YES	The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B6	Section 7.f.	Suggest adding "pressure probes" to paragraph.	YES	The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B7	Section 7.p.	Commenter suggests deleting the definition for "airfoil span".	YES	Concur with commenter. The comment has been addressed and the text has been revised as suggested by commenter. The term has been deleted from the definitions section.
Turbomeca -B8	Section 8.b.(3)	Commenter again states concern that AC appears to be engine centric and yet also addresses installation compliance. Therefore the commenter suggests removing all installation related discussions including ice detectors.	NO	AC 20-147A is written for both engine and installations as compliance guidance. Therefore providing guidance on ice detection is appropriate. The guidance was fully coordinated with all of the Directorates within Aircraft Certification Service.
Turbomeca -B9	Section 9.(a)	The commenter states that turboshaft engines should not have to comply to appendix O or D.	YES	The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B10	Section 9.(e)	The commenter states that there is a contradiction between the guidance in section 9.e and section 9.r.(1).	YES	The comment has been addressed and the text has been revised as suggested by commenter. Section 9.r.(1) has been changed to address the comment.
Turbomeca -B11	Section 9.(b)	Commenter is confused by the term standard table test points.	YES	The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B12	Section 9.(e)(1)	Commenter questions the reference to the rule paragraph, 33.68(b)(B)	YES	Concur with commenter. Correct reference is 33.68(b)(2)(ii)(B).
Turbomeca -B13	Section 9.(f)(4)b	The commenter interprets this paragraph as requiring a minimum of 45 minutes and not a maximum of 45 minutes as stated in the rule.	In part	The FAA agrees with the commenter that the requirement is a maximum duration and not a minimum, but disagrees with the commenter's interpretation. The paragraph as written in the AC does not suggest a minimum time period, but it does state that if stabilized operation is not demonstrated at the end of the period, then ice shed procedures may be required. No changes are made to the AC as a result of this comment.
Turbomeca	Section	The commenter suggest reordering the list of	YES	Concur. The comment has been addressed and the text has been

-B14	9.(g)	icing conditions within the AC paragraph to better align with the rules order of conditions within Table 2 of 33.68.		revised as suggested by commenter.
Turbomeca -B15	Section 9.(n)(6) (a)	The commenter questions why the AC references the ALS of the ICA while the rule requires an engine Operating Manual reference. Commenter proposes changing AC to remove ALS reference to ICA and make it like 33.68 requirement of engine Ops Manual.	YES	Concur. The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B16	Section 9.(r)(3)	The commenter questions the applicability of the reference to section 8.a.1 thru 3, within this paragraph.	In part	Although the reference within the AC is correct and appropriate, the reference will be revised to only include section 8.a., for simplicity. It is understood that the subparagraphs 1 thru 3 are included in the reference to paragraph 8.a.
Turbomeca -B17	Section 10.	Commenter states that title is incorrect and it should be changed to "Ice slab ingestion".	YES	Concur. The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B18	Section 10.a.(1)	Commenter states that this paragraph is confusing in that it suggests that the 33.77 ice slab may not be carried out by the engine manufacturer.	YES	Concur. The comment has been addressed and the text has been revised as suggested by commenter.
Turbomeca -B19	Section 11.	The commenter again states concern that AC appears to be engine centric and yet also addresses installation compliance.	In part	The commenter believes that this AC should only address engine icing and not the installation effects. That is not the intention of the AC. Section 2.a. and other sections have been revised to clarify this issue.
Pratt & Whitney	General	"Sustained Power Losses": For consistency with the rain and hail advisory circular document AC33.78-1 (Paragraph 19 f (2)), which allows sustained power or thrust loss up to 3%, P&WC recommends changing the level of "Sustained Power Losses" of 1.5% defined in the DRAFT AC20-147A to 3%.	NO	The AC allowance of 1.5% power loss was the ARAC agreed value after an extensive industry discussion. Additionally, the probability basis for the 33.78 rain and hail rule is 10-8 vs. approximately 10-2 for 33.68 Appendix C icing. Therefore the ARAC agreed that more stringent compliance criteria needed to be applied to the more probable icing environment.