

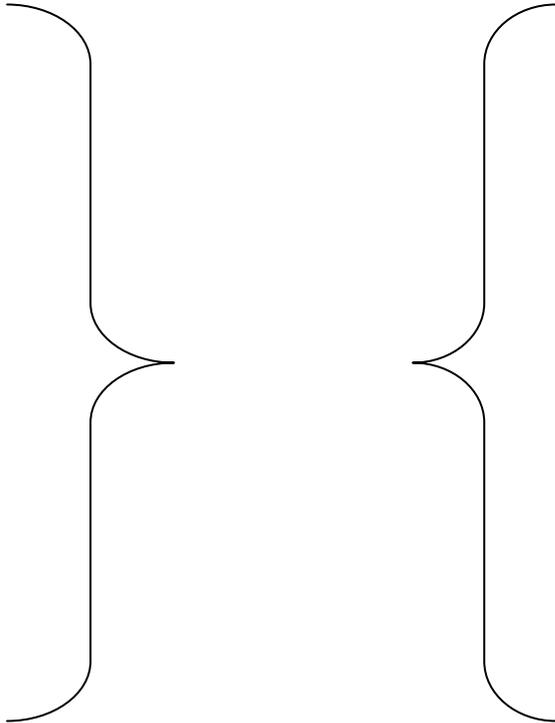
**DISPOSITION OF INTERDIRECTORATE COMMENTS**

**AC 25.629-1X, “AEROELASTIC STABILITY SUBSTANTIATION OF TRANSPORT CATEGORY AIRPLANES”**

**(Note: This AC revision was required as a result of the proposed new rule, “Airplane and Engine Certification Requirements in Supercooled Large Drop Icing, Mixed Phase, and Ice Crystal Icing Conditions”. The purpose of the AC revision is to address only those areas that the new SLD icing rule affected.)**

Comment	Comment/Requested Change	Disposition
<p><b>Commenter:</b> ANM-120S</p> <p>The AC paragraph 4f notes that additional regulations (namely, special conditions) have been issued. These govern the interaction of systems and structures for airplanes equipped with advanced electronic flight control systems.</p> <p>This is significant because the SCs have the effect of potentially increasing the required flutter margins over the stated requirement of § 25.629(b)(2).</p> <p>Also, the SCs that have been issued contain requirements dealing with the advanced electronic flight control system in both the “fully operative” and the “failed” states. The AC only makes reference to the “failed state,” and therefore could be misleading.</p> <p>Many, perhaps most, part 25 certification programs have been conducted without the FAA having imposed the SC. Perhaps it would be well to list out those programs that have the SC already, reducing the</p>	<p>A fuller discussion of the SC condition seems warranted. What exactly is the concern the SC is intended to address? What sorts of electronic flight control systems are you concerned with? Are these the same as the “automatic control systems” referred to on page 15? If so, why use different terminology?</p> <p>This should be stated explicitly.</p> <p>No change requested.</p> <p>A list of major TC and STC programs that are subject to the SC would be helpful.</p>	<p>These comments address a section of the AC not changed due to new SLD icing rule. The comments will be considered for the next revision.</p> <p>Please contact Carl J. Niedermeyer, ANM-115, 425-227-2279 for any questions regarding the application of the “Interaction of Systems and Structures” Special Condition.</p>

Comment	Comment/Requested Change	Disposition
<p>confusion of future STC applicants.</p>		
<p>Para 4(e) Ice Accumulation</p> <p>We're not sure what appendix X is, nor are we familiar with FAR 25.1420. Typos?</p> <p>The subject of icing assumptions that are to be used in flutter analysis has proved to be a source of confusion and frustration in the past, owing in part to the previous version of this AC. It is not clear that this new version confronts the issue directly.</p> <p>The FAR itself makes no reference to any icing assumption that should be used for airplanes that are approved for operation in icing. The only reference to icing in the FAR is made in the context of adverse conditions, and only for those airplanes that are not approved for flight in icing.</p> <p>The AC seems to stray from this understanding of the FAR requirement by stating, for example, that the flutter analysis should use the icing conditions from part 25 appendix C and appendix X. If FAR 25.629 does not require consideration of icing (at least for those airplanes with icing protection systems) why should the applicant make any icing</p>	<p>Self explanatory.</p>	<p>§ 25.1420 - <i>Supercooled large drop icing conditions</i>, is a proposed new rule and Appendix X is a new Appendix to 14 CFR Part 25 created by this new SLD Icing Rule.</p> <p>Agree. The potentially ambiguous phrases “any likely” and “maximum likely”, as they pertain to ice accumulations, have been removed from the draft AC. The draft AC has been changed to direct the Applicant to use ice accumulations up to and including those specified in Appendix C and the new Appendix X for flutter substantiation.</p> <p>Disagree. It has always been the intent of § 25.629 that airplanes approved for operation in icing conditions be flutter free with ice accumulations on unprotected surfaces (a “normal” condition), and ice accumulations due to failures of the de-icing system. Note that all “normal” conditions are not listed in § 25.629.</p> <p>The intent of § 25.629(d)(3) was to make it clear that airplanes <i>not approved</i> for operation in icing conditions needed to also be considered under the “adverse” condition clause.</p> <p>Hence, AC 25.629-1X, as well as the previous version, provides flutter substantiation guidance for airplanes approved for operation in icing conditions, including failures of the de-icing system, and airplanes not approved for</p>

Comment	Comment/Requested Change	Disposition
<p>assumptions in its analysis?</p> <p>(Again, FAR 25 contains no appendix X. Is this a typo or perhaps is this some kind of draft appendix that has yet to be routed for comment? Confusing.)</p> <p>However this may be, and assuming that some icing assumptions are required to be made for flutter analysis, it is not at all clear that Appendix C, Appendix X(?), or the FAR 25.1420 (sic) are really appropriate. After all, is the critical icing accumulation that is appropriate for takeoff and low speed flight really the best assumption for an airplane whose 1.15 Vd speed is in excess of 450 KEAS? Would it not be more reasonable to assume that ice shedding takes place at speeds exceeding, say, 375 KEAS, and therefore the icing assumptions embedded within the logic § 25.1419 are no longer appropriate?</p> <p>It may be that the critical icing accumulation for an aeroelastic stability analysis is some intermediate level between no ice and max ice accumulation. Using § 25.1419 may not be appropriate in these cases.</p> <p>Also, pages 5 and 6 make mention of “likely” and “maximum likely” ice accumulations for nominal and adverse conditions, respectively. The meaning of these terms has proved problematic in the</p>		<p>operation in icing conditions.</p> <p>§ 25.1420 - <i>Supercooled large drop icing conditions</i>, is a proposed new rule and Appendix X is a new Appendix to 14 CFR Part 25 created by this new SLD Icing Rule.</p> <p>Partially agree. However, at this time there is not enough data available to quantify the amount of ice, or its location on the surface that may be shed due to the effects of dynamic pressure and aerodynamic heating, for flutter modes that are critical at high speed. Note that certain flutter modes may be critical from a damping margin perspective well within the operating envelope and would not be subject to these effects.</p> <p>Agree. The draft AC has been changed to direct the Applicant to use ice accumulations up to and including those specified in Appendix C and the new Appendix X for flutter substantiation.</p> <p>Agree. The potentially ambiguous phrases “any likely” and “maximum likely”, as they pertain to ice accumulations, have been removed from the AC. The draft AC has been changed to direct the Applicant to use ice accumulations up to and including those</p>

Comment	Comment/Requested Change	Disposition
<p>past, and may well do so again unless they are more fully discussed in the AC.</p> <p>The TAD recently issued policy memo ANM-05-115-019, (November 2007) which broadly treats of the entire subject of flutter prevention and control surface freeplay. This AC does not refer to the policy memo or any of its primary concerns (e.g., freeplay limit assumptions, acceptability of LCO, the need for nonlinear aeroelastic analysis, etc.) Are we to assume that this version of the AC supersedes the earlier policy memo, or do we assume that the policy memo supplements this AC? Unclear.</p> <p>Page 7. The AC makes the statement that certain failures (e.g., dual hydraulic system failures) “are not normally considered to be extremely improbable regardless of probability calculations.” This is a puzzling statement coming as it does in a paragraph which states that extreme improbability is defined as less than <math>10^{-9}</math>.</p> <p>Terminology</p> <p>The AC occasionally refers to the term “dynamic similitude.” One assumes that this is merely a variation of the more commonly used term “dynamic similarity”;</p>		<p>specified in Appendix C and the new Appendix X for flutter substantiation. Policy Memo ANM-05-115-019, November 2007, is currently being revised. Interdirector comments have been received and are being dispositioned at this time. The Policy Memo guidance will be incorporated in the next revision to the AC.</p> <p>Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.</p> <p>Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.</p>

Comment	Comment/Requested Change	Disposition
if not, it should be defined.		
<b>Commenter:</b> ACE 115W		
AC 25.629-1X, Aeroelastic stability substantiation of Transport Category Airplanes Paragraph 4.d line 4 reads as “CFR, which was recodified from part 04b of the CAR”.	It should be part 4b not 04b.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
Paragraph 6.a.(4) (e) on page 14, refers to part 25 Appendices C and X.	There is no Appendix X to part 25. We do not know whether the “X” refers to an appendix to be introduced later. This should be clarified.	§ 25.1420 - <i>Supercooled large drop icing conditions</i> , is a proposed new rule and Appendix X is a new Appendix to 14 CFR Part 25 created by this new SLD Icing Rule.
<b>Commenter:</b> ACE-115C		
<p>Page 6, Paragraph (h) 2</p> <p>Maximum extent of damage (or critical flaw length) is based upon fracture at limit loading. The assumption of a Damage Tolerance Analysis (DTA) is that a component will completely fracture at limit loading when critical flaw length is reached. This will immediately affect the stiffness of the structure and its flight characteristics. You should not exclude a possible radical change in stiffness when the airframe is already fully loaded. This could trigger a flutter event in a flight condition when the aircraft has little</p>	Remove paragraph (h) 2.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.

Comment	Comment/Requested Change	Disposition
residual structural strength.		
<p>Page 10, Paragraph (2)(c)</p> <p>1. Divergence should also consider the effect of control surface deflection. For example a downward deflected aileron increases Coefficient of Lift (CL) near the wingtip where stiffness is lowest. Also, for non symmetric airfoils, this increase in CL moves the center of lift forward exacerbating the tendency to diverge.</p> <p>2. Divergence can also be excited by for non-rigid modes, such as a mode one torsional event which quickly changes the local alpha. These are especially important to consider because of the rapid change in alpha is in the dynamic CL regime, greatly increasing the destabilizing force</p>	<p>1. Add consideration of deflected control surface.</p> <p>2 Add considerations of non-rigid modes.</p>	<p>Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.</p> <p>Divergence analyses, by definition, include flexible modes of the airplane (structural vibration modes), such as torsion modes. The intent of paragraph (2)(c) was to ensure that important rigid body modes were not left out of the analysis.</p>
<p>Page 13, Paragraph (b) 1</p> <p>1. The term “adequate separation between modes” needs to be quantified. What is adequate? 2 HZ? 20 HZ?</p> <p>2. This paragraph should be removed. Static balances introduce additional torsional flutter modes that should be accounted for.</p>	<p>Either define “adequate separation” or preferably remove paragraph.</p>	<p>Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.</p>

Comment	Comment/Requested Change	Disposition
<p>Page 13, Paragraph (b) 2</p> <p>In a reversible control system, accumulations of snow ice or any other item of mass near the trailing edge of a control surface should be accounted for unless shown to be extremely improbable.</p>	<p>Remove the word “avoided” and substitute “In a reversible control system, accumulations of snow ice or any other item of mass near the trailing edge of a control surface should be accounted for unless shown to be extremely improbable.”</p>	<p>Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.</p>
<p>Page 18, Paragraph (4) (c)</p> <p>Discussion of flight test should include discussion of appropriate methods of exciting the suspected modes of flutter. For example, stick raps are generally accepted to excite below 10hz, shakers or other devices may be required for modes above this value.</p>	<p>General Comment: Suggest adding more detailed discussion of acceptable flight test techniques.</p>	<p>Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.</p>

**Commenter:** AIR-500

#	Page and Paragraph No.:	Comment:	Reason:	Recommendation:	AIR-115 Disposition:
1.	General Comment	This does not follow an approved format for ACs.	Examples: <ul style="list-style-type: none"> <li>○ Section headings should be bolded, not underlined.</li> <li>○ The order of the paragraphs on the first page should be 1. Purpose 2. Audience 3. Cancellation</li> </ul>	Please refer to FAA Order 1320.46C for the correct templates to use for drafting ACs.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
2.	Paragraph 1	Edit the first and second sentences.	<ul style="list-style-type: none"> <li>○ Incorrect reference to 14 CFR.</li> <li>○ Verb is singular when it should be plural.</li> </ul>	Rewrite to read:  .....of demonstrating compliance with the provisions of Title 14 of the Code of Federal Regulations (14 CFR), part 25.....  The precise details for analytical procedures and testing techniques are beyond.....	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
3.	Paragraph 4.a., fourth sentence and last sentence	Incorrect punctuation.  Sentence is unclear.	Insert missing comma.  Should be rewritten as two sentences.	In 1934, Bulletin No. 7-A  Rewrite to read: All airplane designs were required to have interconnected elevators, statically-balances ailerons, and irreversible or balanced tabs. In some cases, a ground vibration test was required to be conducted.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
4.	Paragraph 4.b., second sentence	The word “part” and “04” are on separate lines.	Incorrect formatting.	Move the word “part” to the next line.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.

#	Page and Paragraph No.:	Comment:	Reason:	Recommendation:	AIR-115 Disposition:
5.	Paragraph 4.d., last sentence	The last sentence does not specifically reference which CFR part.	This sentence needs to call out 14 CFR.	Rewrite to read:  .....part 25 of 14 CFR. Which was recodified.....	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
6.	Paragraph 4.e., Second sentence	The sentence uses the preposition “at” instead of “by” in front of “Amendment 77”	Grammatically incorrect.	Rewrite to read:  Part 25 as amended by Amendment 77 incorporated this minimum.....	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
7.	Paragraph 5	Sentence contains incorrect punctuation, redundant words and does specifically reference a section of the CFR.	The number 14 needs to be inserted before CFR, the comma before the word “after” is not necessary and the word “certain” is redundant when used in front of the word “specific.”	Rewrite to read:  .....By the sections of 14 CFR listed in paragraph 3 above to be contained in this AC pertain only to specific amendments of 14 CFR.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
8.	Paragraph 5.a.(3)(b) on page 4	These two paragraphs at the top of this page are not correctly formatted and figures 1A and 1B are located at the end of paragraph 5a instead of after the subsection where each is referenced.	Incorrect formatting.	Relocate figure 1A to immediately after sub-paragraph 5.a.(1) where it is referenced.  Reformat the two paragraphs on page 4 as sub-paragraphs (c) and (d) under paragraph 5.a.(3).	Partially agree. Since the format spacing of these figures was impacted by the addition of SLD rule change language, extra spaces between figures will be taken out and figure placement will be adjusted.
9.	Paragraph 5.b.(2), and 5.b.(2)(h), page 6	The sentences end with a semicolon instead of colon.	Incorrect punctuation. Replace period with colon.	.....within the fail-safe envelope defined in paragraph 5a(3) above:  .....above need not be considered in showing compliance with this paragraph if:	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
10.	Paragraph 5.b.(2)(h)2(i), page 6	This sentence is split between two pages and includes an unnecessary comma.	Incorrect formatting and grammar.	Move (i) to page 7 and delete the comma after the word “malfunction”	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.

#	Page and Paragraph No.:	Comment:	Reason:	Recommendation:	AIR-115 Disposition:
11.	Paragraph 5.c.(3)(a)	Incorrect punctuation.	Replace the comma with a semi-colon.	Rewrite as follows:  More than one engine stopped or windmilling;	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
12.	Paragraph 5.c.(3)(b)	Changes needed for grammatical clarity and correct punctuation.	Use e.g. in place of “for example” and change the comma to a semicolon.	Rewrite as follows:  (e.g.- a disconnect or failure of a mechanical element, such as a hydraulic line, an actuator, a spool housing or a valve);	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
13.	Paragraph 5.c.(3)(c)	Incorrect format.	This paragraph does not include a letter or number to identify it.	Make that paragraph (d).	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
14.	Paragraph 6, page 8	There is an extra space between “flutter” and “analyses”.	Incorrect formatting.	Delete extra space between “flutter” and “analyses”	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
15.	Paragraph 6.a(3)(a), page 10	(a) There is no intent in this AC to define a flight test level of acceptable minimum damping.	Grammatical clarity.	(a) It is not the intent of this AC to define a flight test level of acceptable minimum damping.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
16.	Figures 2, 3 and 4 on pages 11 & 12	Formatting of figures 2, 3 and 4.	<ul style="list-style-type: none"> <li>○ These figures should be shown immediately after paragraph 6.a.(3)(b) where they are first referenced.</li> <li>○ There are extra spaces between figures 2, 3 &amp; 4.</li> </ul>	Delete the extra spaces between the figures and move to immediately after paragraph 6.a.(3)(b).	Partially agree. Since the format spacing of these figures was impacted by the addition of SLD rule change language, extra spaces between figures will be taken out and figure placement will be adjusted.

#	Page and Paragraph No.:	Comment:	Reason:	Recommendation:	AIR-115 Disposition:
17.	Text under Paragraph 3 Page 14	Text beginning with 100g normal to the plane.... Needs to be place in a chart or listing of analysis indicated with letters.	Formatting Purposes.	Text beginning with 100g normal to the plane.... Needs to be place in a chart or listing of analysis indicated with letters.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
18.	Paragraph 6.a.(4)(e), page 15	Word "Appendix" is incorrectly used.	Should be plural.	Replace "Appendix" with "Appendices."	Agree. "Appendix" will be changed to "Appendices".
19.	Paragraph 6.b.(2), page 16	Comma is missing in the last sentence.	Grammatically incorrect.	Insert a comma between "airplane" and "the" in the last sentence.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
20.	Paragraph 6.b.(3) (c), page 17	Comma is missing in the last sentence.	Grammatically incorrect.	Insert a comma between "surfaces" and "the" in the last sentence.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
21.	Paragraph 6.b.(4)(B), Page 17	Sentence structure is confusing.	Grammatical clarity.	Such a test may be used to augment an analysis and show a configuration free of flutter throughout the expanded design envelope.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.
22.	Paragraph 6.b.(5) (a), page 18	There is an extra space in the last sentence between "data" and "with."	Incorrect formatting.	Delete the extra space.	Comment addresses a section of the AC not changed due to new SLD icing rule. The comment will be considered for the next revision.