DISPOSITION OF PUBLIC COMMENTS

AC NO. 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.)

No.	Comment	Requested Change	Disposition
1	**Commenter:** Airbus		
	§ 6. a. (4) (e) Ice Accumulation Title 14, Code of Federal Regulations (14 CFR) 25.253(c) and CS 25.253(c) limit the maximum speed for stability characteristics VFC/MFC of sub-section (b) to 300 knots in icing conditions. This is because ice accretion cannot remain attached to the airfoils above this speed and will break off.	Airbus proposed that § 25.253(c) be taken into account in AC 25.629-1X § 6.a.(4)(e) and that it would be clarified that flutter in icing conditions would be limited to the dive speed VDWI (with ice) established from 300 knots (i.e., VCWI) with the following understanding: Using the 300 knots also called VCWI (Vc with ice, 300 knots being the speed above which ice accretion cannot remain attached to the airfoil), CS 25.335(b) is followed to define a VDWI (Vd with ice). - The 15% margin on VDWI is then used to define the envelope for flutter analysis in icing conditions for normal cases. - For failure cases, the VCWI is used with 15% margin, or VDWI, whichever is greater.	The FAA disagrees that the reason for limiting the § 25.253 demonstration to 300 knots calibrated airspeed (KCAS) is because ice accretion cannot remain attached to the airfoils above this speed and will break off. The reason for limiting the demonstration to 300 KCAS is provided in Notice of Proposed Rulemaking (NPRM) 05-10, titled *Airplane Performance and Handling Qualities In Icing Conditions,* which was codified as Amendment 25-121 when the final rule was issued. The NPRM's preamble states: "The FTHWG's review of historical certification data showed that none of the flight tests for airplane handling qualities performed with ice accretions were conducted above 300 knots CAS. The air loads associated with such high speeds tend to make it difficult to keep either artificial or natural ice attached to the airframe to accomplish the testing. It also minimizes the possibility of encountering this condition in operational service." The philosophy applied to this section of the amendment was to adopt best certification practices since there were no safety data indicating a concern with handling qualities at high speeds in icing conditions. It was not because data was available that showed ice would detach at speeds above 300 KCAS; it was that manufacturers were not conducting any § 25.253 testing with ice shapes above 300 KCAS. Also, manufacturers claimed that the costs and difficulty of fabricating and attaching ice shapes that would stay on the airplane at higher speeds were not justified.

No.	Comment	Requested Change	Disposition
			However, for flutter, there is a safety consideration since the effect of airframe icing can degrade the flutter characteristics of the airplane. In addition, the FAA is concerned with upsets that begin at lower speeds, where airframe icing is possible, that could quickly cause the airplane to exceed the commenter's proposed speed boundary before there is time for ice accretions to break off, or dissipate due to sublimation or aerodynamic heating. No changes were made to the AC as a result of this comment.
2	**Commenter:** Airbus		
	§ 6. a. (4) (e) Ice Accumulation Airbus proposed to delete the sentence: "This includes any accretions that could develop on control surfaces." Airbus has never considered ice accretion on control surfaces. Based on extensive in-service and flight testing experience, combined with engineering judgement, the icing of control surfaces in appendix C icing conditions does not affect Airbus aircraft. The cloud shadow area in the region of these control surfaces is significant with a consequent effect on the local icing conditions.	Delete the sentence: "This includes any accretions that could develop on control surfaces."	The FAA disagrees with the suggestion to delete the referenced sentence. The sentence requires the consideration of ice accretions that *could* develop on control surfaces. With its compliance data an applicant can demonstrate that its design is such that ice accretions do not occur on the control surfaces, as suggested by the commenter. No changes were made to the AC as a result of this comment.

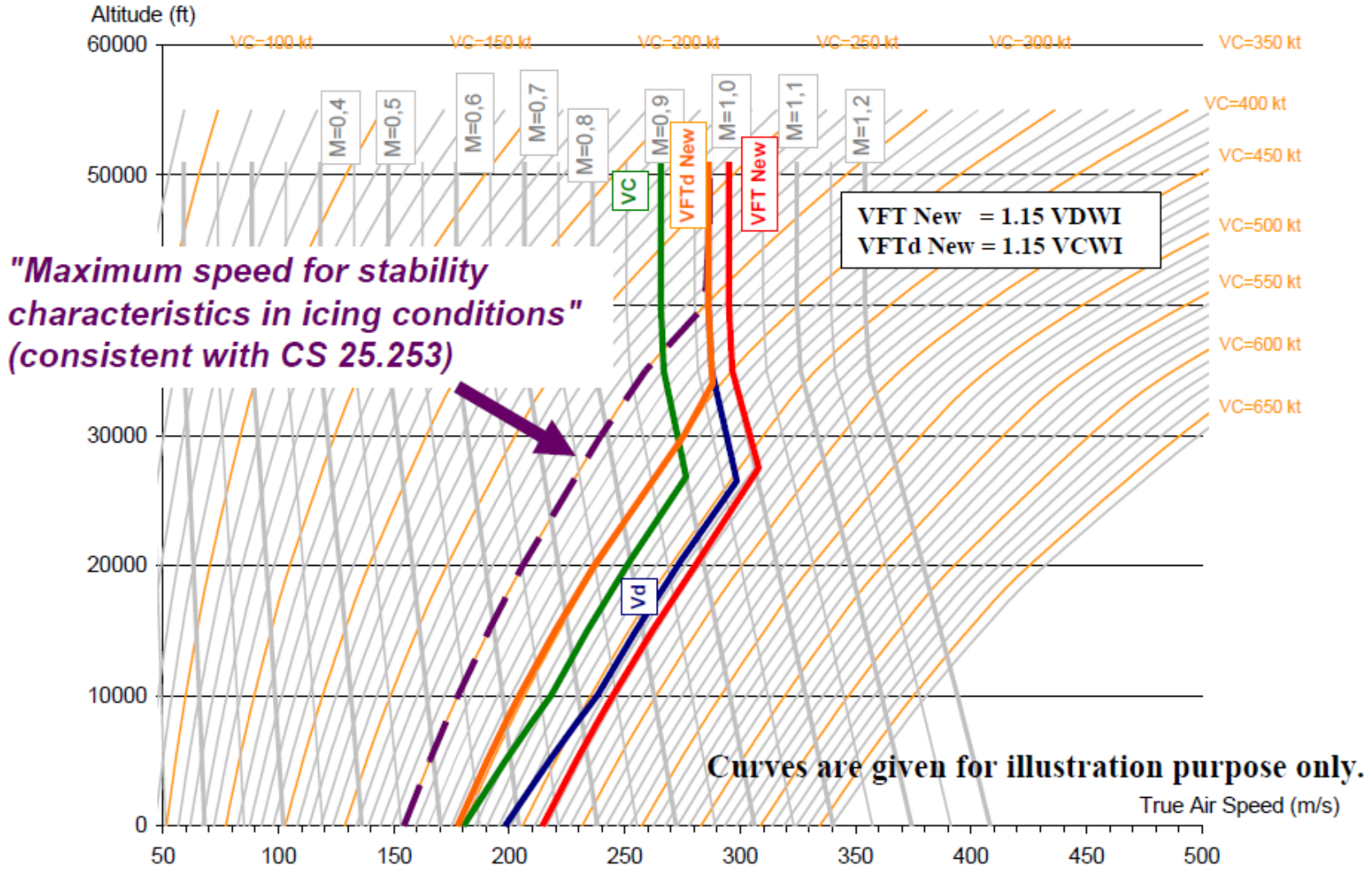
3	**Commenter:** Dassault Aviation		
	General The guidelines of ANM-05-115-019, *Policy for Certification and Continued Airworthiness of Unbalanced and Mass-Balanced Control Surface,* that said in its conclusion: "*This memorandum supplements AC 25.629-1A by including guidelines pertaining to the certification and continued airworthiness of unbalanced control surfaces with freeplay and other nonlinear features, as well as mass-balanced control surfaces. This guidance has been coordinated informally with members of the Aviation Rulemaking Advisory Committee Loads and Dynamics Harmonization Working Group, and U.S. and European aviation industry specialists. The FAA may include these guidelines in a future revision to AC 25.629-1A.*" are not included in this draft AC. Furthermore, § 5.c.(4): *Consideration of free play may be incorporated as a variation in stiffness to assure adequate limits are established for wear of components such as control surface actuators, hinge bearings, and engine mounts in order to maintain aeroelastic stability* permits to use stiffness variations to take into account free plays.	To indicate in the introductory text that the guidelines of ANM-05-115-019, *Policy for Certification and Continued Airworthiness of Unbalanced and Mass-Balanced Control Surfaces* are superseded by the recommendations of § 5.c.(4).	The FAA disagrees that the guidance in policy memo ANM-05-115-019 is superseded by the guidance in this revision to AC 25.629-1X. The only revisions to this AC were the sections affected by the new rule *"Airplane and Engine Certification Requirements in Supercooled Large Drop Icing, Mixed Phase, and Ice Crystal Icing Conditions."* Until AC 25.629-1X undergoes a more substantial revision, the guidance in policy memo ANM-05-115-019 takes precedence over the guidance in paragraph 5.c.(4) of this AC. However, that policy memo is being revised and the FAA will consider incorporating the commenter's suggestions. No changes were made to the AC as a result of this comment.

4	**Commenter:** Dassault Aviation		
	§ 6. a. (4) (e) appendix O cited here is not documented.	To indicate in the introductory text that appendix O is the one listed in NPRM 10-10 Super cooled Large Drop.	The FAA agrees that this may have been confusing, but this point has been clarified in § 25.1420 of the final SLD icing rule. No changes were made to the AC as a result of this comment.

5	**Commenter:** Dassault Aviation		
	§ 6. a. (4) (e) The §§ CS and FAR 25.253 (e) are identical and were established through NPA 25B, E, F-332 Performance and Handling Characteristics in icing Conditions in the framework of the Harmonisation Work Programme. It permits in sub-section (c) to limit the maximum speed for stability characteristics VFC/MFC of sub-section (b) (referring to § 25.181 *Dynamic stability*) to 300 Knots in icing conditions. The reason is that the ice accretion cannot remain attached to the airfoils above this speed. The NPRM 10-10 extends § 25.253 (c) to appendix O icing conditions.	To reference § 25.253 (e) in AC 25.629-1X § 3 and § 6.a.(4)(e) and to indicate that flutter in icing conditions be limited even conservatively to the dive speed VDWI (with ice) established from 300 Kts (i.e. VCWI), with associated margins 1.15 VDWI in normal condition and 1.15 VCWI in failure conditions. (see attached figure).	The FAA disagrees that the reason for limiting the § 25.253 demonstration to 300 knots calibrated airspeed (KCAS) is because ice accretion cannot remain attached to the airfoils above this speed and will break off. The reason for limiting the demonstration to 300 KCAS is provided in Notice of Proposed Rulemaking (NPRM) 05-10, titled *Airplane Performance and Handling Qualities In Icing Conditions*, which was codified as Amendment 25-121 when the final rule was issued. The NPRM's preamble states: "The FTHWG's review of historical certification data showed that none of the flight tests for airplane handling qualities performed with ice accretions were conducted above 300 knots CAS. The air loads associated with such high speeds tend to make it difficult to keep either artificial or natural ice attached to the airframe to accomplish the testing. It also minimizes the possibility of encountering this condition in operational service." The philosophy applied to this section of the amendment was to adopt best certification practices since there were no safety data indicating a concern with handling qualities at high speeds in icing conditions. It was not because data was available that showed ice would detach at speeds above 300 KCAS; it was that manufacturers were not conducting any § 25.253 testing with ice shapes above 300 KCAS. Also, manufacturers claimed that the costs and difficulty of fabricating and attaching ice shapes that would stay on the airplane at higher speeds were not justified. However, for flutter, there is a safety consideration since the effect of airframe icing can degrade the flutter characteristics of the airplane. In addition, the FAA is concerned with upsets that begin at lower speeds, where airframe icing is possible, that could quickly cause the

			airplane to exceed the commenter's proposed speed boundary before there is time for ice accretions to break off, or dissipate due to sublimation or aerodynamic heating. No changes were made to the AC as a result of this comment.

Figure from Dassault Aviation – Reference Comment No. 5



6	**Commenter:** Dassault Aviation		
	§ 6. a. (4) (e) *Ice Accumulation. Aeroelastic stability analyses should use the mass distributions derived from ice accumulation… This includes any accretions that could develop on control surfaces. The analyses need not consider…* Dassault Aviation based on extensive in-flight testing and service experiences has never encountered critical icing on control surfaces. Furthermore no significant ice accretion has been encountered on primary trailing edge control surfaces.	To change the wording of § 6. a. (4) (e) in the form : *Ice Accumulation. Aeroelastic stability analyses should use the mass distributions derived from ice accumulation… This includes any accretions that could develop on* **primary** *control surfaces* **(comparison with previous A/C design flight testing and service experiences can be used to demonstrate the non criticality of this type of accretion)**. *The analyses need not consider….*	The FAA disagrees with the proposed changes to this sentence. The sentence requires the consideration of ice accretions that *could* develop on control surfaces. An Applicant can demonstrate with their compliance data that their design is such that ice accretions do not occur on the control surfaces, such as suggested by the Commenter. No changes were made to the AC as a result of this comment.
7	**Commenter:** Mitsubishi Aircraft Corporation		
	Paragraph 5.b.(1)(b), Paragraph 5.b.(2)(c), and Paragraph 6.a.(4)(e): The words "any likely" and "maximum likely" are intentionally deleted from current AC to the draft AC. However, the background of the changes is unclear.	It is requested to add background information, especially the reason why the words "any likely" and "maximum likely" are intentionally deleted.	As noted by the commenter, the potentially ambiguous phrases "any likely" and "maximum likely" were replaced with unambiguous guidance to use ice accumulations up to and including those specified in part 25, appendix C, and the new part 25, appendix O, for flutter substantiation. The purpose of this change is to bring the AC in line with the new requirements of the SLD icing rule. This is the same purpose as all the changes made in this AC. No changes were made to the AC as a result of this comment.