Public Comments for AC 25-7B

Response to Comments for Proposed Changes Accompanying the 1 g Stall Speed Rule (Amendment 25 108)

(Note: AC 25-7B has been reformatted, which has resulted in changes to some of the paragraph numbering from the numbering that was used in the proposals. The paragraph numbers associated with and referenced in the comments are the old paragraph numbers. Any paragraph numbers referenced in the disposition are the new paragraph numbers.)

#	Commenter	Par. No.:	Comment	Disposition:
1	Gulfstream	29i	Gulfstream's principal concern…is the requirement for the manufacturer to establish the effect of wing leading edge contamination on stall speeds. It requires the manufacturer to test using artificial contaminants. Gulfstream's concerns with this new requirement are: 1. The scope and criteria for testing contaminated leading edges are poorly defined. The lack of definition of size and distribution of the contaminate material needed for testing will be confusing to both the manufacturer, and the Aircraft Certification Office (ACO) who would be attempting to implement this new regulation. Further to this point, since no clear guidelines have been provided to define the extent of contamination to be used in testing, Gulfstream foresees obvious potential for substantial inconsistencies in the level of implementation between various ACOs and manufacturers. 2. This criterion represents an additional phase for flight testing of future models that would be required to satisfy Part 25 Amendment 108 certification requirements. Therefore it will adversely impact the cost, scope and schedule for achieving certification of our products. This would create an unfair disadvantage with our foreign competition by imposing a substantial adverse effect on the cost and marketing of our products. 3. It is questionable why contamination testing is being	This revision to AC 25-7A does not institute a requirement to conduct contaminated leading edge stall testing. The paragraph to which the commenter refers only applies to airplanes equipped with a system that provides an artificial indication of stall and that is needed to comply with § 25.201(d). Such a system must comply with § 25.1309(a), which requires that it perform its intended function under any foreseeable operating condition. Wing contamination and wing leading edge damage within maintenance limits as well as atmospheric turbulence and windshear conditions are examples of foreseeable operating conditions. The paragraph has been revised to clarify its regulatory basis, its applicability, and the guidance it provides, including an acceptable means for simulating residual ice or frost contamination.

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			mandated if the FAA's proposed 6% reduction in multiplying factors produce an equivalence to operating speeds developed using traditional multiplying factors and V_{Smin} stall speeds. Since the FAA developed these reduced factors to provide an equivalence between the 1-g stall speed requirement and current safety margins, the need for contaminated leading edge testing is unclear. Based upon the above concerns, Gulfstream recommends that the revision to AC25-7A not include the requirement for contaminated leading edge stall testing.	
2	Transport Canada	17b(6)	If V_{SR0} is arbitrarily increased to meet the 110% condition, as specified, Transport Canada believes there will be no benefit in low speed safety by requiring the stall warning requirements to be met for the new declared stall speed. This is further illustrated by the statement in parentheses "An alternative to raising the landing flap stall speed, V_{SR0}, is to simply increase V_{REF}". In practice, this alternative is much more likely but technically should be considered an equivalent safety finding. No guidance is given for the increase in V_{REF} but the following is suggested: V_{SR1} (for the configuration of 25.121(d)) = 1.1 * V_{REF} / 1.23 However the increase in V_{REF} allowed by this equivalent safety should be reasonable due to the reduced level of safety from longer landing distances, higher brake energy demands and reduced margin from V_{REF} to V_{FE}. Transport Canada has previously suggested that an increase of up to 5 knots would be acceptable.	The FAA agrees and has changed the text in line with this comment.

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3	Transport Canada	19a(2)	For editorial consistency and to agree with the definitions introduced by Amendment 108, Transport Canada would suggest that "approach speed" be replaced by "landing reference speed."	The FAA agrees and has changed the text accordingly.
4	Transport Canada	20a(5)	There has been a certain amount of controversy in the past about whether operation of "alpha floor" automatic thrust increase systems constitutes a characteristic that might interfere with normal maneuvering. Since this aspect has been controversial, Transport Canada would suggest that the AC provides more guidance on the acceptability of this characteristic, particularly for the approach and landing phases. In the past, Transport Canada has accepted lower than the 40 deg bank criteria for absence of alpha floor during landing approach. This acceptance was based on, amongst other aspects, approaches in various wind and turbulence and a detailed analysis of any alpha floor events that occurred. However this judgment was somewhat dependent on individual opinion and by no means unanimous. A proposal to consider a 33 deg bank requirement is considered by some Transport Canada flight test personnel to be a suitable compromise for absence of alpha floor. However, on balance, the majority favors retaining 40 deg bank for absence of alpha floor because it reduces the probability of nuisance activation, maintains the important consistency with stall warning, reduces the need to undertake a detailed review of AOA protection system design features, and removes the explicit need to conduct	The FAA agrees that the AC should clarify whether operation of envelope protection features like "alpha floor" constitute a characteristic that might interfere with normal maneuvering. The AC text has been clarified to classify these features as interfering with normal maneuvering. The FAA considers the automatic application of thrust by an "alpha floor" feature during approach as interfering with normal maneuvering because it will result in an increase in speed, deviation from the flight path, and potentially increase crew workload due to the unexpected thrust increase. The FAA agrees with the majority view expressed in the comment, which is to retain the 40 degree bank angle maneuvering capability without triggering "alpha floor" for the reasons above as well as the reasons given in the comment.

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			approach and landings in turbulence (and the difficulties of specifying the turbulence levels).	
5	Transport Canada	20f(2)(v)	Paragraph 20f refers to the maneuvering characteristics of 25.143(f). Since the new proposed paragraph refers to power settings for the maneuver capability demonstrations of 25.143(g), Transport Canada would suggest that it should be renumbered.	The FAA agrees and has reformatted the material accordingly.
6	Transport Canada	29b(2)	Transport Canada would suggest the following to improve the intent " … clear and distinctive indication through the inherent flight characteristics or the characteristics resulting from the operation of a stall identification device …"	The FAA agrees and has changed the text accordingly.
7	Transport Canada	29b(3)	Transport Canada has presumed that the Note at the end of this paragraph will be deleted.	The commenter is correct. The note has been deleted.
8	Transport Canada	29c(1)(i)	In the last sentence, the stall speed tests require the use of properly calibrated instruments. However, Transport Canada believes that the examples might be misleading. The most commonly used system is a reference pitot pressure measurement system and a reference static pressure measurement system. The reference airspeed system can also include inertial corrections.	The FAA agrees. The examples have been removed.

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9	Transport Canada	29c(1)(ii)	During the discussion of pilot technique, the inclusion of the word "spontaneous" may cause confusion. Transport Canada would suggest that this word be removed from the sentence.	The FAA agrees. The text has been changed accordingly.
10	Transport Canada	29c(1)(ii)	During the discussion of the operating speed margins to stall, Transport Canada would suggest that the text "; the net result of this inadequate lift margin being inconsistent operating speed margins and maneuvering margins" be removed. The previous part of the sentence explains that the operating speed margins may not be representative. The lift margin may have been inconsistent but could have been adequate.	The FAA agrees. The text has been changed accordingly.
11	Transport Canada	29c(1)(iii)	Transport Canada believes that there may not be a need for this information in the Flight Test Guide as it relates to the reasons behind the factors incorporated into the requirements by Amendment 108. In particular, the arguments with respect to costs imposed on the operator as Flight Test Guide material. If the paragraph is to be retained Transport Canada would recommend paring it down to just the first and last sentences of the proposal. That is "Since the 1-g …higher minimum operating speeds. For that (this?) reason … by approximately six percent."	The FAA agrees. The text has been changed accordingly.
12	Transport Canada	29c(1)(iv)	Similarly to the discussion above, Transport Canada would recommend that the sentence "For these airplanes … of the 1-g stall speed" be removed. For airplanes equipped with stick pusher systems designed to activate before the aerodynamic C_{Lmax}, there is very little further speed decrease beyond the speed at which the device activates. An apparent speed decrease is sometimes observed due to	The FAA agrees. The text has been changed accordingly.

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			lag effects and inaccuracy of the airspeed measurement, particularly in a pitching maneuver.	
13	Transport Canada	29c(3)(ii)	Due to Mach number effects, Transport Canada would suggest that altitude be included in the list of critical conditions. That is "… should be accomplished at each critical combination of weight, altitude, c.g. and external configuration"	The FAA agrees. The text has been changed accordingly.
14	Transport Canada	29c(5)(i)	Transport Canada believes that the establishment of V_{SR} requires the normal load factor to the flight path to be determined. At least 2 orthogonal accelerometers, normally aligned along and at right angles to the fuselage longitudinal datum as well as a means to determine the angle of attack between the flight path and the fuselage longitudinal datum are required.	The FAA agrees that it will most likely take at least two accelerometers to determine the load factor normal to the flight path. The text has been changed to include this qualification.
15	Transport Canada	29c(5)(iv)	Transport Canada would comment that in correcting C_{Lmax} from the test c.g. position, it is more appropriate to correct to a standard forward c.g. position regardless of weight. This allows the effects of weight to be clearly determined regardless of any cg effect. Of course when expanding the data, the stall speed would be that appropriate to the C_{Lmax} at the appropriate c.g. position for the weight.	The comment is noted. No changes are needed to the text.
16	Transport Canada	29c(5)(vi)(B)	From a pure technical point of view, it is unclear to Transport Canada why C_{Lmax} should be proportional to the rate of change of angle of attack. Similarly any significant trend of C_{Lmax} with entry rate should be very carefully reviewed to ensure that the effect was not in fact caused by lags or other artifacts of the airspeed instrumentation system and data analysis.	The FAA agrees and has removed the unnecessary and potentially confusing discussion of weight affects on C_{Lmax}.

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17	Transport Canada	29c(5)(vi)(C)	Transport Canada would suggest that the last sentence "An inflection …" could be removed for the same reason with respect to c.g. effect above.	The FAA agrees and has removed the unnecessary and potentially confusing discussion of weight affects on C_{Lmax}.
18	Transport Canada	29c(5)(vii)	In order to improve clarity Transport Canada would suggest that the wording be changed to "Since C_{Lmax} usually increases as the Mach number is reduced…" and "Expansion of C_{Lmax} versus Mach number data is only permitted up to the highest C_{Lmax} demonstrated within the range of W/δ's tested." An alternative to the latter is that "C_{Lmax} versus Mach number data can not be extrapolated beyond the minimum Mach number tested."	The FAA agrees. The text has been changed accordingly.
19	Transport Canada	29c(5)(viii)	Since, it is conventional to have the compressibility correction as a speed, instead of a speed squared; Transport Canada would recommend that the ΔV_C term be moved outside the square root sign.	The FAA agrees. The text has been changed accordingly.
20	Transport Canada	29d(2)(ix)	Transport Canada believes that in accordance with the last part of this sentence "or to an angle-of-attack equivalent to the AFM recommended landing approach speed divided by 1.23.", this requirement will not ensure low speed stall warning, and will not comply with 25.207(f). Transport Canada's practice in recent programs has not been to require a demonstration of stall in abnormal configuration of high lift devices that are likely to be used in flight following system failure (e.g., slats retracted, flaps extended). Adequate stall warning has been determined from a demonstration of an idle thrust, wings level, approach to stall warning plus 1 sec at a nominal 1 knot/s deceleration rate and recovery, without adverse	The FAA agrees. The text has been changed accordingly.

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			characteristics.	
21	Transport Canada	29f(2)(vi)(A)	Transport Canada would recommend to consider airplanes equipped with stick pushers depending on whether the pusher is a pre or post aerodynamic C_{Lmax} device. For aircraft with a pre C_{Lmax} device the proposed guidance is adequate for compliance with both 25.207 (c) and (d). For airplanes with a post C_{Lmax} device, compliance with 25.207(d) should still be shown with the stall warning system set to the most critical setting expected in production.	The FAA agrees and has changed the text in line with this comment.
22	Transport Canada	29f(2)(vi)(C)	Transport Canada would recommend that all factors be considered when adjusting stall warning margin and maneuver capability flight test data. It may be implicit in guidance material, but Transport Canada would suggest to modify the last sentence to "Alternatively, compliance may be shown by applying adjustments, using an agreed procedure which takes into account all the variables, to flight test data …"	The FAA agrees and has changed the text in line with this comment.
23	Transport Canada	29f(3)	In showing compliance with 25.207(e), the bank angle required to achieve the necessary conditions is frequently greater than 40 degrees. Because of that, Transport Canada would suggest that the reference to "bank angles greater than 40 degrees" be removed.	The reference to "bank angles greater than 40 degrees" refers only to demonstrations of compliance with § 25.207(c), not § 25.207(e). The text has been slightly modified for clarification.
24	Transport Canada	29f(4)	Transport Canada would suggest that some guidance should be given with respect to demonstrating compliance with the numerical stall warning requirement of 25.207(c). Although it may be inappropriate to correct to a constant load factor in all cases, load factor differences between the onsets of stall warning and stall identification could render the requirement meaningless. For example, by pulling a little extra g in a turning stall and then very slightly relaxing, it would be possible to show compliance when it	The FAA agrees. The suggested addition has been added to paragraph 29f(3).

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			was not justified. Transport Canada would suggest that text be added along the lines of "The pilot technique in stalling the airplane should be consistent between the onset of stall warning and stall identification. That is, there should be no deliberate attempt to reduce the load factor, change the deceleration or other means to increase the stall warning margin." Note that for airplanes with pre aerodynamic C_{Lmax} stick pushers, it is standard practice to correct to a constant load factor.	
25	Transport Canada	29i	All airplanes (regardless of whether they have a stall identification system or not) are subject to the adverse effects of (1) – high lift device and control surface rigging. As this item is not specific to airplanes equipped with stall identification systems, Transport Canada would recommend that it should be removed from this paragraph.	The FAA agrees. The text has been changed accordingly.
26	Transport Canada	29i	Transport Canada believes that for most airplanes, the effect of item (3) alone would be more than ±0.5 knots. However, Transport Canada does concur that the combined effects of (2) and (3) should be less than ±1 knot.	The FAA agrees. The text has been changed accordingly.
27	Transport Canada	29i	With respect to the sentence "Investigations should include…", Transport Canada is acknowledged that there are specific design considerations to reduce the possibility of unwanted stick pusher operation while in a windshear escape maneuver. However, depending on the severity of the windshear and associated turbulence levels it may well be impossible to eliminate the possibility of stick pusher operation (it may also be difficult to avoid aerodynamic	The FAA agrees and has changed the text in line with this comment.

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			stall on airplanes without a stick pusher system).	
28	Transport Canada	29i	The stall speeds of all airplanes could be adversely affected by item (4) – wing leading edge contamination. The significant safety issue for airplanes that have a stall identification system is the possibility that the system will not perform its intended function under a foreseeable operating condition. Unacceptable aerodynamic stalling characteristics, that the device is intended to prevent or alleviate, may still occur if the wing leading edge is contaminated. The direct concern is not an adverse effect on stall speeds; the concern is unacceptable stall characteristics. In the design of stall identification systems, the trigger points may have to be adjusted to account for possible leading edge conditions. This in turn will have an effect on stall speeds. The prime consideration is to ensure that the stall identification system still performs its intended function – the indirect effect may be an increase in stall speeds whether the wing leading edge is contaminated or not.	The FAA agrees and has changed the text in line with this comment.
29	Boeing	17b(6)	We are aware that some manufacturers have used an increase in V_{REF} in conjunction with showing compliance to Section 25.121(d), in the case where the approach flap stall speed exceeds that of the corresponding landing flap by more than 110%. This is permitted by the text in Paragraph 17b(6) that is enclosed in parentheses. We request that the FM verify that this alternative remains acceptable, and provide an expanded discussion regarding	The FAA agrees and has changed the text in line with this comment.

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			this option.	
30	Boeing	20a(5)	This reference to the additional 15 degrees of bank without clear definition of the "minimum bank angle" may cause confusion. The presumed genesis of the requirement was the nominal operational bank angle limit of 25 degrees with the addition of 15 degrees of bank angle for "potential crew distraction and turbulence," yielding the 14 CFR §25.143(g) requirement to demonstrate a 40 degree bank angle. This is not clearly spelled out in the proposed addition to AC 25-7 A; it could be misinterpreted to call for 15 degrees additional bank added to other maneuvers. For example, AC 25-7A, Paragraph 29d(2)(i), suggests demonstrating a 30 degree bank stall characteristic maneuver -adding 15 degrees to this would require 45 degrees of bank; on the other hand, 14 CFR part 121 Appendix E, III (h) requires flight crew to demonstrate proficiency in steep turns of 45 degree bank angle-adding 15 degrees to this suggests demonstrations of 60 degrees of bank. This would be extreme, and would add significant cost to development and testing with little, if any, appreciable improvement in safety. It is recommended that the reference to "a further 15 degrees of bank" be deleted from the proposed revision to AC 25-7 A and allow the bank angle requirements defined in 14 CFR 25.143(g) to stand on their own merit. Our suggested wording is as follows: "The maneuvering requirements specified in 25.143(g)	The FAA agrees and has changed the text of paragraph 20a(4) in line with this comment.

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			consist of the minimum bank angle capability the FAA deems adequate for the specified regimes of flight combined with additional bank angle to provide a safety margin for various operational factors."	
31	Boeing	20b(2)	We are aware that some manufacturers have used an alternate approach to demonstrating compliance with § 25.143(g). Rather than varying speed, the airplane is stabilized in a coordinated turn, holding initial power and speed, and the bank angle is increased at constant airspeed until stall warning occurs. We request that the FM verify that this alternative is acceptable, and provide a discussion regarding this option in Paragraph 20b(2) of AC 25-7 A.	The FAA agrees and has changed the text in line with this comment.
32	Boeing	29c(5)(viii)	The equation in Paragraph 29c(5)(viii) is incorrect in two respects: 1) The numerator under the radical currently reads 295.37(W); however, it should read 295.37(n_{zw})(W) (2) The term ΔV_c should be outside of the radical.	The FAA agrees. The text has been changed accordingly.
33	Boeing	29c(5)(ix)	In light of our next comment, revise Paragraph 29c(5)(ix) to read as follows "(ix) For airplanes equipped with a device that abruptly pushes the nose down at a selected angle of attack (e.g., a stick pusher), V_{SR} must not be less than the greater of 2 knots or 2 percent above the speed at which the device activates. Additional guidance on the definition of the speed at which the device activates is included in paragraph 29c(5)(x)."	The FAA does not see a need for the proposed change, which would add a sentence pointing to the immediately following paragraph for additional guidance. The FAA considers the sequencing of the paragraph, with the first paragraph identifying the requirements of § 25.103(d) and the second paragraph providing compliance guidance to be adequate as is.
34	Boeing	29c(5)(x)	Paragraph 29c(5)(x) contains ambiguous wording. The wording suggests that the activation speed of a device that abruptly pushes the nose down would be load factor corrected unless it activated after C_{Lmax} In cases where the device actually sets or defines C_{Lmax} this would result in an inappropriate increase in stringency of § 25.1 03(d). Our	The FAA agrees and has changed the text in line with this comment.

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			suggested revision of this paragraph is as follows: "(x) In showing compliance with § 25.103(d), for aircraft equipped with a device that abruptly pushes the nose down at a selected angle of attack (e.g., a stick pusher), the activation speed of the device need not be corrected to 1 g. Requiring load factor correction of the device activation speed to 1 g would unnecessarily increase the stringency of §25.1 03(d). For example, if the device actuates at or after C_{Lmax}, it would be possible for the device activation speed to be assessed as higher than V_{SR} (or at least closer to V_{SR} than would be obtained without the correction to 1 g). Test procedures should be in accordance with paragraph 29c(3)(i) to ensure that no abnormal or unusual pilot control input is used to obtain an artificially low device activation speed."	
35	Boeing	29f(2)(vi)(B)	The revision to Paragraph 29f(2)(vi)(B) could result in a substantial increase in testing required to show compliance with §25.143(g) by mandating testing with the stall warning system set to both its nominal and its low angle-of-attack limits. Similarly, the revision to Paragraph 29h removes the note providing guidance allowing maneuvering margin testing to be demonstrated with stall warning systems set at the nominal setting if it can be shown that the angle of attack tolerance band of an artificial stall warning system results in no more than a ±1 knot variation about the stall warning speed. It is recommended that the guidance in the removed note be added to the revised Paragraph 29f(2)(vi). This will allow analytical treatment of the effect of system tolerance on stall warning where appropriate; therefore, the cost to show compliance with this requirement will be commensurate with the increase in safety. The proposed	The FAA did not intend to substantially increase the amount of testing required to show compliance with § 25.143(g). The following statement was added to paragraph 29f(2)(vi)(B) to clarify that it is not mandatory to conduct flight tests to evaluate whether the criterion of that paragraph is met: "Flight test, an acceptable analysis, or simulation can be used to make this assessment." The FAA disagrees with the suggestion to reinstate the note previously contained in paragraph 29h. The ±1.0 knot tolerance band has been replaced by the 2 degree bank angle criterion. The issue of reducing the flight test burden is addressed by paragraph 29f(2)(vi)(C), which states that compliance may be shown by

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			wording for Paragraph 29f(2)(vi)(B) is as follows: "(B) The maneuvering capabilities required by §25.143(g) should be available assuming the stall warning system is operating on its nominal setting. In addition, when the stall warning system is operating at its low angle of attack limit, the maneuver capabilities should not be reduced by more than 2 degrees of bank angle from those specified in §25.143(g). Compliance with this stall warning tolerance requirement may be demonstrated by analysis, simulation, or flight test. Note: If it can be shown that the angle-of-attack (AoA) tolerance band of an artificial stall warning system results in no more than a ±1.0 knot variation about the stall warning speed obtained at the nominal AoA setting, that nominal setting may be used for the maneuver margin testing specified in Paragraph 29f(2)(vi)(B), above."	applying appropriate analytical adjustments to flight test data if not all of the most critical tolerance settings are demonstrated by flight test.
36	Boeing	29h	Additionally, we suggest that the note removed with paragraph 29(h) be added to Paragraph 20(b), namely: NOTE: If it can be shown that the angle of attack tolerance band of an artificial stall warning system results in no more than a ±1.0 knot variation about the stall warning speed obtained at the nominal AoA setting, that nominal setting may be used for the maneuver margin testing specified in paragraph 20(b), above.	The guidance that was proposed for paragraph 29f(2)(vi)(B) (now paragraph 29f(2)(f)2) addresses the stall warning system tolerance band in a more comprehensive manner and supersedes the note that was proposed to be deleted from paragraph 29(h). The FAA considers it more appropriate to place this information in the section of the guidance covering compliance with the stall warning requirements.

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#	Commenter	Par. No.:	Comment	Disposition:
37	Boeing	29i	1. The proposed changes to Advisory Circular 25-7 A do not explain the source of the concerns that this guidance is presumed to address. If these additions to AC 25-7 A are motivated by specific incidents or operational issues, the specifics of these incidents/issues should be reviewed by an appropriate working group – such as the Flight Test Harmonization Working Group -- to ensure that the stall identification systems addressed in Paragraph 29(i) are, in fact, the root cause as opposed to some other airplane characteristic or design feature. Moreover, if there is a specific incident or event that has caused the FAA to address the question of the effect of tolerances on airplanes equipped with stick pushers, presuming that this motivating event occurred on an airplane that was equipped with a stick pusher, what is the justification for generalizing to all airplanes that are equipped with stick pushers, but not generalizing further to airplanes equipped with other forms of stall identification systems or functions? And why is a distinction drawn between airplanes with and without stick pushers when considering the effects of tolerances that are not influenced by the presence or absence of a stick pusher (e.g., high-lift system rigging tolerances and airplane build tolerances)? The implication of the proposed Paragraph 29i is that naturally stalling airplanes invariably exhibit repeatability of stall speeds and characteristics that are superior to those of airplanes that are equipped with stall identification systems. Boeing maintains that this is not necessarily the case. A review of stall data from airplanes that depend on natural stall identification versus airplanes with stall identification systems will certainly show variations in stall speed from individual stall to stall, even at similar flight conditions, for either type of design.	The text has been changed to indicate that the additional guidance is related to showing compliance with § 25.1309(a) for systems that are used to show compliance with § 25.201(d). The need for this additional guidance was not motivated by any specific incident. Section 25.1309(a) requires that such a system, when it is needed to show compliance with the stall-related requirements, must be designed to perform its intended function under any foreseeable operating condition. This issue was first raised by Transport Canada following experience gained during the certification program of an airplane equipped with a stall identification system (specifically a stick pusher). It was found that the pusher may not perform its intended function under some foreseeable operating conditions, which, as noted above, is required by § 25.1309(a). Since there was no specific guidance available for showing compliance with § 25.1309(a), the guidance we proposed to add to AC 25-7A was developed. The Joint Aviation Authorities' Flight Steering Group (a working group that includes representation from Boeing) was aware of and kept informed of this guidance as it was being developed. Earlier versions of this guidance material have been used on every recent certification program for airplanes equipped with stall identification systems. This guidance was intended to apply to any

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				system that is used to show compliance with § 25.201(d), not just to stick pushers. The text has been revised accordingly. Although the FAA acknowledges there will be some variability in the stall identification speed for airplanes that do not use a stall identification system, the stall warning margin requirements and compliance with § 25.1309(a) for the stall warning system have resulted in these airplanes retaining a safe speed margin between stall warning and stall identification under all foreseeable operating conditions. The certification experience described above indicates that the same cannot be said for airplanes that use a stall identification system to comply with § 25.201(d). Also, additional standards (e.g., § 25.1309) apply whenever a system is used to show compliance with a part 25 requirement.
38	Boeing	29i	2. The new requirements of subparagraphs (1), (2) and (3) of Paragraph 29(i) are likely to result in increased costs for certification and increased stall speeds for airplanes equipped with stall identification systems. However, airplanes with such systems have been operated successfully and safely for many years. The existing speed margins above stall speed, defined by 14 CFR § 25.107 and § 25.125, mandate minimum operational speeds for takeoff and landing to account for airplane and system tolerances, piloting technique, gusts, etc. Operational experience has demonstrated that these speed ratios are adequate to ensure operational safety. The proposed	This compliance guidance does not introduce any new requirements. It represents only one means of showing compliance with § 25.1309(a) for systems that are used to show compliance with § 25.201(d). This compliance guidance will not necessarily result in increased stall speeds for airplanes that use a stall identification system to show compliance with § 25.201(d), but it will bring attention to addressing this issue in the design stage. The text has been clarified to identify the safety

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			changes to Advisory Circular 25-7A do not explain the source of the concerns that this guidance is presumed to address. If these additions to AC 25-7 A are motivated by specific incidents or operational issues, the specifics of these incidents/ issues should be reviewed by an appropriate working group – such as the Flight Test Harmonization Working Group – to ensure that the stall identification systems addressed in Paragraph 29(i) are, in fact, the root cause as opposed to some other airplane characteristic or design feature.	issue and regulatory requirements that this means of compliance is intended to address. We do not consider it necessary or appropriate to identify the specific event(s) or experience that led to each acceptable means of compliance presented in AC 25-7. The Joint Aviation Authorities' Flight Steering Group (a working group that included representation from Boeing) was aware of and kept informed of this guidance and the background behind it as it was being developed.
39	Boeing	29i	3. The new requirements of subparagraphs (1), (2), and (3) of Paragraph 29(i) are levied against airplanes with stall identification systems, but only subparagraph (3) addresses airplane tolerances that are unique to designs that incorporate such systems. Subparagraphs (1) and (2) address tolerances that are common to all aircraft without explaining why it is necessary to consider the effects of these tolerances only for airplanes that incorporate stall identification systems.	This compliance guidance does not introduce any new requirements. It represents only one means of showing compliance with § 25.1309(a) for systems that are used to show compliance with § 25.201(d). Additional standards (e.g., § 25.1309) apply whenever a system is used to show compliance with a part 25 requirement. The stall warning margin requirements and compliance with § 25.1309(a) for the stall warning system have resulted in these airplanes retaining a safe speed margin between stall warning and stall identification under all foreseeable operating conditions. The certification experience described above in response to comment 37 indicates that the same cannot be said for airplanes that use a stall identification system to comply with § 25.201(d).

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40	Boeing	29i	4. The safety issue(s) that the proposed guidance is intended to address and the additional costs that will result to manufacturers and operators must be identified and quantified to demonstrate that the proposed guidance will in fact produce a benefit that is commensurate with the associated costs.	This compliance guidance does not introduce any new requirements. It represents only one means of showing compliance with § 25.1309(a) for systems that are used to show compliance with § 25.201(d). Applicants can propose other means of showing compliance. The cost vs. benefit of the regulatory standard was addressed when the standard was introduced.
41	Boeing	29i	5. The wording of the proposed guidance that states –"*The stall identification system consists of everything from the angle of attack sensing device to the connection of the force application actuator to the longitudinal control system...*" - suggests that the new guidance is intended to apply only to airplanes that incorporate the ability to apply forces to mechanically-signaled longitudinal control systems using actuators that are specific to that purpose. However, such a configuration is only one of a number of approaches to supplemental aircraft control at high angles of attack. In particular, recent designs incorporating software-driven, electrically signaled features (i.e., fly-by-wire designs) adopt a completely different paradigm that can provide stall identification without the use of dedicated mechanical actuators. No justification is presented for applying this new guidance to only this specific mechanization of a stall identification capability.	The text has been clarified to apply to any means employed by a system to provide stall identification for showing compliance with § 25.201(d).
42	Boeing	29i	6. The draft guidance material proposes an acceptable tolerance for the combined effects of subparagraphs (1) through (3): ±1 knot; and an additional tolerance for subparagraph (3) alone: ±0.5 knots. The proposed guidance does not define the method(s) to be used to combine the individual tolerances for subparagraphs (1),	The text has been revised to identify how the individual tolerance values should be combined and what the consequences are if the overall tolerance limit is exceeded.

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			(2), and (3) in order to verify that the proposed requirement has been satisfied. How were the specific numerical values proposed in the new guidance arrived at; what are the consequences and alternatives if the proposed tolerances are not met?	
43	Boeing	29i	7. The wording of the proposed guidance in subparagraphs (1), (2) and (3) is not clear in several respects. This lack of clarity may lead to a number of problems: incorrect interpretations of the guidance material; uncertainties in applicants' design and certification activities; inequitable application of the proposed guidance material to different airplane certification programs; and unnecessary differences in costs and performance between current and new derivatives of existing airplane families. All ambiguities in the proposed guidance material should be identified and clarified before this material is incorporated into AC 25-7 A.	The wording of the guidance has been clarified as a result of all of the comments on this paragraph.
44	Boeing	29i	8. The effect of leading edge contamination is an issue that is not addressed in 14 CFR Part 25 and is therefore not appropriate to include in advisory material. If the affect of leading edge contamination on stall speeds is deemed a certification issue, it should be subject to the normal rulemaking process.	The issue of contaminated or damaged wing leading edges are foreseeable operating conditions, and hence, in accordance with § 25.1309(a), are a certification issue for affected systems.
45	Boeing	29i	9. Other sources of leading edge contamination, such as dents and scratches, dirt, etc., are not addressed in the proposed guidance. All of these issues, as well as contamination by insects, should be addressed by operators' maintenance practices, and all should be addressed by a single, consistent approach.	The guidance has been clarified to address wing contamination generically, regardless of the source.

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#	Commenter	Par. No.:	Comment	Disposition:
46	Boeing	29i	10. The wording of the proposed guidance in subparagraph (4) is not clear in several respects. There is insufficient guidance on the methods to be used to determine appropriate models for this contamination and on the methods to be used determine the effects of this contamination on stall speeds. "Significant" affects on stall speeds are not defined. The method(s) for substantiating the critical height and density of contaminants appears to have been inadvertently omitted from the text of the proposed guidance material; the lack of definition of these methods adds to the ambiguity of this proposed requirement.	The guidance has been revised to remove this paragraph as part of the clarification to consider all types/sources of wing contamination, regardless of source. Additional guidance has been provided regarding the critical height and density of residual frost or ice contamination. For other types of contamination, the applicant is requested to substantiate the critical height and density used.
47	Boeing	29i	11. The proposed guidance material would levy this requirement only on airplanes equipped with stall identification systems. However, all airplanes are subject to the affects of leading edge contamination; in fact, a number of other characteristics (wing characteristic dimensions, airfoil characteristics, high lift system design) are likely to be more important in determining the impact of leading edge contamination. In particular, airplanes without active leading edge devices are likely to be especially susceptible to the effects of leading edge contamination. The proposed guidance material does not explain why only airplanes equipped with stall identification devices should be subject to this requirement.	The text has been changed to indicate that the additional guidance is related to showing compliance with § 25.1309(a) for systems that are used to show compliance with § 25.201(d). Additional standards (e.g., § 25.1309) apply whenever a system is used to show compliance with a part 25 requirement.
48	Boeing	29i	12. If there is a need for Part 25 rulemaking pertinent to the subject of wing leading edge contamination, harmonization with the JAA and Transport Canada should be part of that process.	The FAA does not see a need at this time for additional rulemaking pertinent to the subject of wing leading edge contamination.

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#	Commenter	Par. No.:	Comment	Disposition:
49	Boeing	29i	In summary, considering the above points, Boeing considers that it is not appropriate to include subparagraphs (1), (2) and (4) of the proposed Paragraph 29i in the next revision of AC 25-7A. The proposed material should be thoroughly reviewed and revised, as appropriate, by a suitable working group such as the Flight Test Harmonization Working Group before inclusion in AC 25-7A. In addition, rulemaking activity leading to a new amendment to 14 CFR Part 25 and harmonization with other national authorities should precede the inclusion of the subject addressed by Paragraph 29(i)(4) into guidance material. Boeing agrees that the intent of subparagraph (3) of Paragraph 29i should be included in the revision to AC 25-7 A. We suggest the following revision of the text of proposed Paragraph 29i to achieve an appropriate balance between attaining a high level of safety for airplanes that incorporate such systems and additional costs to manufacturers and operators: "i. *Tolerance Considerations for Airplanes Equipped with Stall Identification Systems.* For airplanes equipped with a stall identification device or function, the applicant should consider the effects of stall identification system tolerances. The stall identification system consists of everything from the sensing devices that supply inputs to the system to the activation of the system response that provides stall identification to the flight crew and/or limits airplane state variables to avoid undesirable flight conditions. It should be verified that threshold tolerances and system design features (e.g.,	As stated in the response to comment 48, the FAA does not see a need at this time for additional rulemaking. This AC 25-7 guidance is provided as one acceptable means of showing compliance with § 25.1309(a) for airplanes using a stall identification system to show compliance with § 25.201(d). Most of the text changes suggested by the commenter have been adopted, except that the guidance is not limited to tolerance considerations for airplanes equipped with stall identification systems. The guidance applies to all foreseeable operating conditions, as required by § 25.1309(a), and includes, in addition to those identified by the commenter, accelerated stall entries, wing contamination, wing leading edge damage within prescribed maintenance limits, and airplane production tolerances.

#	Commenter	Par. No.:	Comment	Disposition:
			filtering, phase advancing) will not result in an unsafe diminishing of the margin between stall warning and stall identification, or between stall identification and some dangerous airplane characteristic. The effects of maneuver margins, dynamic stall entries, atmospheric turbulence, and operation in windshear environments where the airplane will be flown at, or very near, stall warning should be investigated. These flying conditions should not result in unwanted activation of the stall identification system or aerodynamic stall prior to, or close to, activation of the stall warning system. This verification may be provided by a combination of analysis, simulation, and flight test. Flight Testing: The stall identification system tolerances should be set to achieve the most adverse activation condition for stall characteristics during flight testing of stall characteristics. The deviation in stall speed due to stall identification system tolerances should be determined; if this deviation does not exceed ±0.5 knots a nominal system setting may be used for stall speed testing. If the stall speed deviation due to the tolerances of the stall identification system is greater than ±0.5knots the system settings for stall speed testing must be those that yield the highest stall speeds. Compliance with this requirement may be demonstrated by analysis, simulation, or flight test."	
50	Bombardier	17b(6)	Two means of compliance are described for the case where the stall speed for the approach configuration exceeds 110 % of the stall speed for the landing configuration: (1) increase of the landing flap stall speed and (2) increase of V_{REF}. For some unknown reason, the second option (increase of V_{REF}) is presented in brackets at the end of the paragraph addressing this subject. The fact that the second option is presented in brackets may lead the readers to	The text of this paragraph has been changed to address the commenter's concerns.

#	Commenter	Par. No.:	Comment	Disposition:
			believe that it does not represent an option that is as valid as the first option. Bombardier has used the second option during two recent certification programs. It is recommended that the brackets be removed to avoid any ambiguity and it is also recommended to add some wording to make it very clear that there are two alternatives.	
51	Bombardier	20b(2)	Another suitable test technique has been used by Bombardier. The aircraft is stabilized in a coordinated turn, holding speed and power set prior to the turn. Bank angle is increased at constant airspeed until stall warning is reached. This technique provides a clear bank angle / 'g' margin to stall warning. It is recommended to include this technique (as a suitable alternative technique) in the paragraph that addresses compliance with 25.143 (g).	The FAA agrees and has changed the text in line with this comment.
52	Bombardier	29i	The new paragraph is unclear in some areas; the lack of clarity will likely lead to incorrect interpretations and will raise some fundamental questions. There are various types of stall identification systems in use today; the paragraph should include a clear description of the stall identification systems for which the paragraph is applicable. How is the critical configuration for stall testing determined? How are the effects of the variables combined in order to verify if a tolerance is met ? What are the consequences and alternatives if a tolerance cannot be met? Should all stall tests (performance stalls, handling stalls and dynamic stalls) be carried out with the critical level of contamination? What is a significant increase in stall speeds?	The text has been revised to address the issues raised by the commenter. The guidance applies to any stall identification system that is used to show compliance with § 25.201(d).

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#	Commenter	Par. No.:	Comment	Disposition:
53	Bombardier	29i	More background information needs to be added to explain why the proposed means of compliance are specifically applicable to airplanes equipped with stall identification systems. The proposed paragraph may unfairly penalize the performance of aircraft equipped with stall identification systems. Clear justifications must be added in the paragraph.	This issue was first raised by Transport Canada following experience gained during the certification program of an airplane equipped with a stall identification system (specifically a stick pusher). It was found that the pusher may not perform its intended function under some foreseeable operating conditions, which, as noted above, is required by § 25.1309(a). Since there was no specific guidance available for showing compliance with § 25.1309(a), the guidance we proposed to add to AC 25-7A was developed. The Joint Aviation Authorities' Flight Steering Group (a working group that includes representation from airplane manufacturers) was aware of and kept informed of this guidance as it was being developed. The text has been clarified to identify the safety issue and regulatory requirements that this means of compliance is intended to address. We do not consider it necessary or appropriate to identify the specific event(s) or experience that led to each acceptable means of compliance presented in AC 25-7.
54	Bombardier	29i	The effect of wing leading edge contamination on stall speeds is a concept that is not addressed in the standards of FAR Part 25 and it is therefore inappropriate to include this aspect in AC 25-7A. Consideration of wing leading edge contamination on stall speeds, if deemed to be a real certification issue, should be subjected to the normal rulemaking process.	Section 25.1309(a), which applies to any system whose functioning is required to be able to show compliance with part 25, requires the system to perform its intended function in all foreseeable operating conditions. The issue of contaminated or damaged wing leading edges are foreseeable operating conditions, and hence, in accordance with

#	Commenter	Par. No.:	Comment	Disposition:
				§ 25.1309(a), are a certification issue for affected systems.
55	Bombardier	29i	The content of the proposed paragraph has not yet been discussed and harmonized with the JAA and Transport Canada. Given the importance of the points mentioned above, the proposed paragraph should be discussed and harmonized prior to inclusion in AC 25-7A.	Not all of the material in AC 25-7 has been harmonized with Transport Canada and the European Aviation Safety Agency. Harmonization is ongoing, but does not prevent the FAA from including appropriate means of compliance guidance material.
56	Bombardier	29i	Based on the above comments, it is recommended not to include the proposed paragraph in the next revision of AC25-7A. Instead, the proposed paragraph should be thoroughly reviewed and modified as required by a suitable working group such as the Flight Test Harmonization Working Group before inclusion in AC 25-7A. In addition, the normal rulemaking process will have to be followed if it is deemed appropriate to include the effect of wing leading edge contamination on stall speeds in FAR Part 25.	The FAA does not see a need at this time for additional rulemaking pertinent to the subject of wing leading edge contamination. The proposed guidance went through a notice and comment process, and has been revised in response to the many comments received.
57	ALPA	General	ALPA supports the subject document.	Noted.
58	UK CAA	29c(4)	Thrust Effects on Stall Speed – The sentence beginning "With the adoption of 25-108…" apparently states the converse of the rule. It would read better if it stated: "it is allowable to use idle thrust except…."	The FAA agrees and has changed the wording to match the rule language.

Public Comments for AC 25-7B

#	Commenter	Par. No.:	Comment	Disposition:
59	UK CAA	29c(5)(viii)	n_{ZW} should be defined for consistency.	The FAA agrees and has added a definition for n_{zw}.
60	UK CAA	29f(4)	The restriction of load factor correction in the last sentence to 25.207(d) is agreed. Rather than ignoring 25.207(c) entirely, the JAA Flight Steering Group would welcome the opportunity to work with the FAA to develop a more rational approach (based on time delays, perhaps) to address the intent of the operationally-orientated stall warning margin required by 25.207(c).	Since the JAA Flight Steering Group no longer exists, it will not be possible to work with this group to develop a "more rational approach" to addressing the intent of the § 25.207(c) stall warning requirement. The FAA is unaware of difficulties in complying with this requirement in the many certification programs in which this requirement was applied.
61	UK CAA	29i(4)	Replace "Generic" by "the applicant."	The FAA agrees and has changed the text in line with this comment.

Public Comments for AC 25-7B

Response to Comments for Proposed Changes to AC 25-7A, "Flight Test Guide for Certification of Transport Category Airplanes" Associated with Extrapolation of Takeoff Performance Data to Higher Altitudes/Temperatures

#	Commenter	Comment	Disposition
1	General Aviation Manufacturers Association & the Aerospace Industries Association	The advances in thermodynamic modeling of the propulsion system have more than justified the dropping of the current 2%/1000 feet penalty applied for altitude expansion. It appears that the FAA did in fact recognize those improvements by eliminating the penalty, but did they? At first blush, it appears the answer is no, because there now exists a requirement that the takeoff must be validated to at least within 3,000 feet of the maximum certified altitude to be used for takeoff. Clearly, there has been no gain for the applicants' methods in this area.	The FAA disagrees that the need for takeoff thrust lapse rate testing at or near the maximum approved takeoff altitude is a new requirement. The requirement is given in § 25.101(c), which states that airplane "performance must correspond to the propulsive thrust available under the particular atmospheric conditions, the particular flight condition…" As stated in existing Advisory Circular 25-7A, "This aspect of the rule may be accomplished by actual flight test, with approved takeoff ratings, at the maximum desired takeoff altitude, or with acceptable parameter variation analysis associated with tests conducted at less than the maximum objective takeoff altitude." This guidance summarizing an acceptable means of showing compliance with § 25.101(c) was FAA policy even before AC 25-7A was issued. The change introduced by this revised advisory material allows applicants a means of validating airplane takeoff performance without conducting full airplane takeoff performance demonstrations at the highest altitude for which certification approval is sought. The applicant need only conduct takeoff demonstrations at that altitude for certain engine performance parameters. Also, with an acceptable mean of simulating the conditions that would occur at the highest altitude, these takeoff demonstrations may be conducted at altitudes up to 3,000 feet lower than the maximum altitude.
2	General Aviation Manufacturers	It is a safety benefit to both the engine and airframe manufacturer and in turn to the FAA to ensure the accuracy of	The FAA agrees that ensuring the accuracy of the mathematical models for the thrust and drag levels used

#	Commenter	Comment	Disposition
	Association & the Aerospace Industries Association	thrust and drag models used in the performance calculations. The accuracy of those models and the methods to substantiate them so as to obtain approval is the base issue that must be resolved. What is the level of accuracy that is needed to "approve" the model? Adequacy and precision of thrust or power should be evaluated by the regulatory authorities, but rather by the engine manufacturer. AIA and GAMA propose to eliminate all penalties associated with thrust expansion and go back to AFM performance verification solely by use of check climbs at the mid and maximum altitudes that are approved for the airplane. This would then remove any requirement for the airplane manufacturer to accomplish any field performance testing to within 3,000 feet of the maximum takeoff altitude and to provide any direct thrust measurement substantiation.	in airplane performance calculations is necessary for safety. The FAA disagrees, however, with the commenters' statement that the FAA should only be responsible for oversight of the Airplane Flight Manual (AFM) performance data, and not the underlying thrust and drag models. Since the only way to practically verify the AFM performance data is through verification of the thrust and drag models, FAA oversight of these models is necessary. It would be much more costly to require direct verification (i.e., flight test demonstrations) of the AFM takeoff performance charts throughout the operating envelope than to only verify the accuracy of the thrust and drag models used to expand flight test data to cover the operating envelope. The advisory material eliminates all penalties associated with expansion of the takeoff and landing performance data to higher altitudes than the altitude at which the airplane takeoff and performance tests were conducted. Applicants need only adequately define and substantiate the accuracy of the airplane thrust and drag models. To do this, applicants may either perform full takeoff performance demonstrations throughout the operating envelope of the airplane, or they may perform sufficient testing to validate the airplane/engine thrust and drag models throughout the operating envelope. In either case, engine thrust lapse takeoff demonstrations are generally needed at or near the maximum takeoff altitude in order to validate engine performance and operating characteristics. If the applicant uses an acceptable mean of simulating the conditions that would occur at the highest altitude, these takeoff demonstrations may be conducted at altitudes up to 3,000 feet lower than the

#	Commenter	Comment	Disposition
			maximum takeoff altitude.
3	General Aviation Manufacturers Association & the Aerospace Industries Association	The issue of engine operating characteristics is considered to be a totally separate subject and in itself is due for review by both the FAA and industry.	For this issue, only the engine operating characteristics that may effect the engine performance model, or substantiation of that model, are relevant. Otherwise, the FAA agrees with this comment.

Public Comments for AC 25-7B

Response to Comments for Proposed Revisions to AC 25-7A Associated With Fast Track Harmonization Changes to §§ 25.111, 25.147, 25.161, and 25.175

#	Commenter	Par. No.:	Comment	Disposition:
1	SAAB Aircraft	22a(2)	The paragraph sub chapter in the AC does not correspond with the requirement in § 25.147. For example, in paragraph 22a(2) the proposed AC says "25.147(c) and (e) require an airplane to be easily controllable with the critical engine(s) inoperative." However, the title of FAR 25.147(e) is "Lateral control, all engines operating." We assume that FAR 25.147 will be changed also with regards to sub-paragraphs (d), (e), and (f).	The commenter's assumption is correct. By separate action, the airworthiness standards of § 25.147 are being revised to include a new paragraph (d), and to redesignate existing paragraphs (d) and (e) as (e) and (f), respectively. As stated in the Notice in which the AC 25-7A revisions are proposed, "the proposed revisions to the AC complement proposed revision to the airworthiness standards for transport category airplanes, published by separate document in the **Federal Register** on January 14, 2002." The regulatory references in the AC reflect the proposed revision to § 25.147.
2	SAAB Aircraft	22a(2)	In revised paragraph 22a(2) is a sentence that says, "Roll response, § 25.147(e) should be satisfactory for takeoff, approach, landing, and high speed configurations." If the reference is changed to 25.147(f) it will be in harmony with the proposed JAA Flight Test Guide.	The commenter is correct. This particular reference in AC 25-7A was not changed in the proposal as it should have been to reflect the proposed changes to § 25.147. To correct this mistake, the subject sentence in AC 25-7A paragraph 22a(2) will be changed from: "Roll response, § 25.147(e) should be satisfactory for takeoff, approach, landing, and high speed configurations." to: "Roll response with all engines operating, § 25.147(f) should be satisfactory for takeoff, approach, landing, and high speed configurations."

Public Comments for AC 25-7B

Response to Comments for Proposed Revisions to AC 25-7A Associated With Fast Track Harmonization Change to § 25.1323

#	Commenter	Par. No.:	Comment	Disposition:
1	American Airlines		American Airlines believes the changes are acceptable and would like to recognize the coordination of the FAR and AC proposals.	No response needed.
2	Northwest Airlines		Northwest Airlines has no objection to the proposed revision to the AC.	No response needed.