Low Airspeed Alerting Task
Appendix 2

Detailed Manufacturer Responses to Expanded Consideration List

The two tables herein provide detailed manufacturer responses to the expanded consideration list.

Table 1 covers:

- Boeing Low Speed Alert System
- Airbus FBW Aircraft Low Energy Alert System
- Bombardier CRJ-200/700/900 Low Speed Awareness Cues
- EMB Legacy 500 Low Speed Alert System
- Hawker 4000 Low Speed Awareness

Table 2 Covers

- Dassault FBW/Avionics low speed cues and protections
- Gulfstream G450/G550
- Cessna Model 750 (CX) equipped with Primus 2000
- Cessna 560XLS equipped with Honeywell Primus 1000 CDSR
- Cessna 560XLS+ equipped with Collins Pro-Line 21
- Cessna 680 Sovereign equipped with Honeywell Primus EPIC
- Cessna 560 Ultra, 560 Encore and 560 XL equipped with HWI P1000

Appendix 2, Table 1
Expanded Considerations List

Major Category	Expanded Consideration List	Questions Regarding Effect of this Consideration on LAA	Responses for Boeing Low Speed Alert System	Responses for Airbus FBW Aircraft Low Energy Alert System	Responses for Bombardier CRJ-200/700/900 Low Speed Awareness Cues	Responses for EMB Legacy 500 Low Speed Alert System	Responses for Hawker 4000 Low Speed Awareness
Operating Conditions	Altitude	Is maneuver speed, operational speed or margin to alert trip point impacted by altitude?	Margin from the operational speed to the trip point varies in different flight conditions and configurations. The margin can be very small at max cruise altitudes.	Low Energy Alert (LEA) is based on Angle-of-Attack (AoA). Margin from the operational speed to the trip point varies in different flight conditions and configurations.	Yes, based on normalized angle of attack relative to shaker or pusher alpha setting (function of flap configuration and Mach)	The alert trip point varies with fight conditions. The alert is enabled only at low altitudes.	Yes: stall warning speed is a table function of Mach number.
	Bank angle (e.g., TCAS, maneuvering on approach, unusual attitude recovery)	Can increasing the bank angle trigger the low speed alert?	Alert can be set only if already flying in the amber band. The 'g' increase is increasing the stick shaker speed. The time to stick shaker after the alert is dependent upon the 'g' onset rate. In these cases, the BANK ANGLE call out and stick shaker quickly become higher priority than the low airspeed alert.	LEA is based on AoA. When level flight, increasing the bank angle increases the AoA and LEW is more likely to occur. On Aircraft, bank angle is limited to 66° (or 45° if high angle protection is triggered))	Yes, based on normalized angle of attack. As bank angle (or "g") is increased the speeds for low speed awareness and low speed cue increase	No. The trigger point is based on a factor of the 1g stall speed (V_{SR}), which is not impacted by the bank angle. That is the trigger point is based on airspeed, rather than angle-of-attack.	Yes
	Load factor (e.g., Terrain avoidance, TCAS, dive recovery)	Is load factor considered in LAA design?	Alert can be set only if already flying in the amber band. The 'g' increase is increasing the stick shaker speed. The time to stick shaker after the alert is dependent upon the 'g' onset rate. The stick shaker quickly becomes a higher priority than the low airspeed alert.	Not directly. But because LEA is based on AoA, LEA is more likely to occur under vertical load factor.	As bank angle (or "g") is increased the speeds for low speed awareness and low speed cue increase	No. The trigger point is based on a factor of the 1g stall speed (V_{SR}), which is not impacted by the bank angle. That is the trigger point is based on airspeed, rather than angle-of-attack.	The 4000 Low Speed Awareness (LSA) increases with load factor (driven mathematically by increasing alpha). It does not correct back to nz=1.
	Accel/Decel	Is there an anticipation effect based on deceleration rate?	Deceleration rate is not factored into the alert logic. Most scenarios, thrust mismanagement, are 1kt/sec or less deceleration.	Yes	There is a trend vector but low speed awareness and cue speed values does not consider.	Yes. The anticipation factor is based on inertial deceleration and flight path angle.	The LSA does not anticipate per se, but when combined with the 10 second airspeed trend bar, provides a compelling cue.
	Proximity to stick shaker	Is the alert trigger based on proximity to stick shaker speed or AOA (delta speed or AOA, percent amberband, etc)?	Alert is based on speed and the proximity to stick shaker speed (% of penetration of the amber band)	LEA is triggered based on the proximity of an AoA threshold with a phase advance depending on current flight-path and deceleration.	Based on proximity to shaker angle of attack.	Alert trigger occurs approximately at the same moment as the angle-of-attack limiter engagement (amber band) if the airplane decelerates slowly at 1g flight. Yes. Through filtering of the airspeed and advancing based only on inertial parameters.	Yes: LSA matches current airspeed at shaker activation
	Turbulence	Are turbulence effects (primarily nuisance effects) accounted for?	Turbulence affects on the airspeed are generally not more than the margin between the operational speed and the trip point.	Yes, through filtering and rate-limitation.	Nuisance effects are minimized through turbulence filters when displaying low speed awareness, low speed cue and stick shaker visual, aural and shaker activation trigger alerts	Yes. Through filtering of the airspeed and advancing based only on inertial parameters.	See note below
	Windshear	Interaction/priority of windshear alert and low speed alert? Other impacts of windshear on LAA?	As a caution level alert, the low speed alert is lower priority than any warning, such as for windshear.	LEA algorithm is independent of windshear warning and alpha-floor. However, LEA is computed to occur before alpha-floor and it is cancelled by logic as soon as alpha-floor is triggered. Windshear warning has priority on LEA.	None. Logic and calculations are independent of windshear warning	The low speed aural algorithm is not dependent on windshear. The windshear alert has priority over the low speed aural warning.	See note below

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Configuration Aspects	Normal flaps	Is flap position considered in LAA design?	Flaps position is considered indirectly. As flap setting changes, the stick shaker speed changes, the amber band changes and the trip point changes speed.	Yes. LEA is available in configurations FULL, FULL-1 and FULL-2 with adapted gains and thresholds.	Yes, all constants used in calculations are function of slat/flap angles	Yes	Yes: alpha thresholds (which are a function of flap) are used to drive the LSA calculation
	Landing gear position	Is landing gear position considered in LAA design?	Same as flaps but much less of a change.	LEA performance is demonstrated landing gear down for conf FULL and FULL-1, which is the most critical case.	Yes, indirectly through different shaker/pusher settings for different A/C configurations, if applicable.	Yes, but the effect of landing gear change is smaller than flap.	See note below
	Gross weight	Is gross weight considered in LAA design?	Gross weight affects the actual airplane angle of attack, which in-turn determines what speed the stick shaker is set at. Operational speeds for all weights have similar relative margins to the alert trip point.	Not directly. But because LEA is based on AoA, LEA is more likely to occur under at higher weights for a given speed.	Yes indirectly, speeds based on normalized angle of attack and current A/C speed.	Yes	See note below
	Center of gravity	Is C.G. position considered in LAA design?	CG affects the actual airplane angle of attack, which in-turn determines what speed the stick shaker is set at. Consideration was given to the fact that at forward CG, the margins to stick shaker, and therefore the low speed alert, are at their lowest value.	No. LEA performance is demonstrated at forward CG, which is the most critical case.	Yes indirectly, speeds based on normalized angle of attack and current A/C speed	Yes, but the impact of the CG in the trigger point is small.	See note below
	All engine vs. eng-out	Is engine failure considered in LAA design? How?	Operational speeds do not change with an engine out, except for the takeoff condition. For the takeoff condition, V2 speeds may be closer to stickshaker than normal operational speeds so the low speed alert is inhibited because the concentration is on the V2 speed and a low speed alert is of no value.	Not directly. Engine failure is accounted for by the deceleration and flight-path feedbacks used in LEA algorithm. AoA threshold remains unchanged.	No	Not directly, only due to the engine failure effect on the flight path angle and airspeed.	See note below
	Deceleration devices	Are speedbrakes considered in LAA design?	The stick shaker speed is increased for speed brakes extended operations and the margin to the alert is reduced. The reduced margin is acceptable.	Not directly. Speedbrakes extension is accounted for by the deceleration and flight-path feedbacks used in LEA algorithm. AoA threshold remains unchanged.	Yes indirectly, speeds based on normalized angle of attack and current A/C speed.	No. Speedbrake is inhibited at low speeds or at high angle-of-attack.	See note below
	Non-normal configs.	Are non-normal configurations potentially affecting LAA considered (Example: Configs. covered in AFM)	Non-normal configurations, such as leading edge or trailing edge failures, can cause the airplane angle of attack to increase, the stick shaker speed to increase and reduce the margin from the operational speed to the low speed alert trip point. The reduced margin is acceptable.	AoA threshold is based on actual S/F position. It is therefore available in abnormal S/F configurations.	Yes, all constants used in calculations are function of slat/flap angles rather than flap lever position	Yes. Failures that potentially affect low speed aural warning are taking into account.	See note below
	Trim	Does trim operation affect the LAA?	N/A	No. Auto trimmed a/c	No	No.	See note below
	Manual flight	Does LAA operate during manual flight?	Yes	Yes.	Yes	Yes.	Yes
	Autoflight	Does LAA operate during autoflight?	Yes, same as manual flight.	Yes, the same way as it operates in manual flight.	Yes	Yes, same as manual flight.	Yes
	Relevant failed systems	Key system failures accommodated by	The redundancy and integrity of the signals used to set the alert have been	Relevant SSA has been performed on the LEA function.	Yes	Yes. The redundancy and integrity of the signals used to set the alert	See note below

		LAA?	considered.			have been considered	
Major Category	**Expanded Consideration List**	**Questions Regarding Effect of this Consideration on LAA**	**Responses for Boeing Low Speed Alert System**	**Responses for Airbus FBW Aircraft Low Energy Alert System**	**Responses for Bombardier CRJ-200/700/900 Low Speed Awareness Cues**	**Responses for EMB Legacy 500 Low Speed Alert System**	**Responses for Hawker 4000 Low Speed Awareness**
Phases of Flight	Takeoff	Is LAA inhibited during some/all of takeoff?	Inhibited until the amber band is displayed which occurs at the first flap retraction.	See general remark below	Low speed awareness and low speed cue are inhibit on ground and for 3 seconds after lift off	Not directly. The alarm is inhibited if the thrust lever is at take-off / go-around position.	I believe the LSA is suppressed until the AOA vanes are confirmed flying OK near 80 kts; might be active after nosewheel liftoff (verify?)
	Initial climbout	Are there any special considerations during initial climbout?	Inhibited until the amber band is displayed which occurs at the first flap retraction.	See general remark below	Low speed awareness and low speed cue are inhibit on ground and for 3 seconds after lift off	Not directly. The alarm is inhibited if the thrust lever is at take-off / go-around position.	See note below
	Enroute climb	Are there any special considerations during enroute climb?	Thrust and pitch mismanagement have been considered.	See general remark below	None required. Low speed awareness and low speed cue function of flap/slat angles, normalized angle of attack and current A/c speed. Shaker/pusher settings function of Mach	Not directly. The alarm is enabled only at low height (below 2000 ft radio altitude).	See note below
	Cruise	High altitude behavior of the airplane and engines (Thrust available vs. thrust required)	Dropping into the amber band at max cruise altitudes (see Operating conditions – Altitude)	See general remark below	None required. Low speed awareness and low speed cue function of flap/slat angles, normalized angle of attack and current A/c speed. Shaker/pusher settings function of Mach	Not directly. The alarm is enabled only at low height (below 2000 ft radio altitude).	See note below
	Descent	Are there any special considerations during descent?	Pitch mismanagement as well as thrust mismanagement at level off have been considered.	See general remark below	None required. Low speed awareness and low speed cue function of flap/slat angles, normalized angle of attack and current A/c speed. Shaker/pusher settings function of Mach	Not directly. The alarm is enabled only at low height (below 2000 ft radio altitude).	See note below
	Hold	Are there any special considerations during hold?	None	See general remark below	None required. Low speed awareness and low speed cue function of flap/slat angles, normalized angle of attack and current A/c speed. Shaker/pusher settings function of Mach	Deceleration at leveled flight have been considered in the design.	See note below
	Approach	Are there any special considerations during approach?	Thrust mismanagement conditions emphasized.	See general remark below	None required. Low speed awareness and low speed cue function of flap/slat angles, normalized angle of attack and current A/c speed. Shaker/pusher settings function of Mach	Yes. The approach angle (-3 or -5.5 degrees depending on normal or steep approach respectively) are considered in the computation of the low speed aural advance.	See note below
	Go-around	Is LAA inhibited during go-around?	Not inhibited so pilot awareness is maintained.	See general remark below	No	If the thrust lever position is at TOGA the alarm is inhibited. The rationale is that it does not trigger after appropriate pilot action.	See note below
	Landing	Are there any special considerations during landing?	Not inhibited so pilot awareness is maintained.	See general remark below	None required. Low speed awareness and low speed cue function of flap/slat angles, normalized angle of attack and current A/c speed. Shaker/pusher settings function of Mach	Yes. Alarm is inhibited below 100ft. The rationale is to avoid nuisance trip of the alarm if the airspeed decreases a lot during the flare.	See note below

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Phases of Flight, Cont.				1) High AOA protections are available and alphafloor available below Mach 0.5 2) LEA is available in configurations FULL, FULL-1 and FULL-2 and between 100 (or 200ft at T/O, depending on the A/C). and 2000ft (or 2500ft, depending on the A/C). It is inhibited if TO/GA thrust is applied or alpha-floor is triggered. Rationale for the altitude conditions are that low energy situations are critical near the ground (*) and that estimation of the A/C energy at high Speed/Mach based on AoA is not accurate, so that inadvertent LEA could be triggered in cruise. (*) Because Airbus aircraft are protected against stall by the high angle of attack protection, large altitude losses due to stall are not possible as on conventional aircraft. Therefore, it is only necessary to compute low energy alert near the ground.			NOTE: The other parameters requested did not require a specific system input for certification.
Icing Aspects	Clean vs ice stick shaker/pusher trips	Does stick shaker/pusher trip and/or maneuver speed change with ice protection system on, and is this considered in the LAA design?	The stick shaker speed is increased for icing and the margin to the alert is reduced. The reduced margin is acceptable. In a few model-specific cases the speed may be in the amber band and the alert may set once. It is accepted because it is an accurate gauge of speed margin to stick shaker.	AoA thresholds for all AIRBUS A/C protections (including LEA) do not depend on ice protection system status. These thresholds have a single setting based on icing considerations. They are demonstrated to be adequate with or without actual icing conditions.	Stick shaker/pusher angles do not change when flight in icing conditions.	Yes. The angle-of-attack limiter activation depends on ice condition. The low speed aural warning is also dependent on ice condition.	Yes: the shaker activation points are reduced with wing anti-ice failed in icing conditions; the LSA is calculated based on the reduced shaker activation angle
	Manual vs auto ice protection system	WAI activation method (automatic, manual following ice detector alert, manual only)?	Same	Same - LEA single setting covers icing and non icing cases.	WAI activation is manual and does not affect the speeds calculations for low speed awareness and low speed cue	Same. Low Speed aural is advanced by the same amount regardless the activation method of the anti-ice system.	Manual activation following ice detector alert

Appendix 2, Table 2
Expanded Considerations List

Major Category	Expanded Consideration List	Questions Regarding Effect of this Consideration on LAA	Responses for Dassault FBW/Avionics low speed cues and protections	Responses for Gulfstream G450/G550	Responses for following Model: Cessna Model 750 (CX) equipped with Primus 2000	Responses for Model: Cessna 560XLS equipped with Honeywell Primus 1000 CDSR	Responses for Model: Cessna 560XLS+ equipped with Collins Pro Line 21	Responses for Model: Cessna 680 Sovereign equipped with Honeywell Primus EPIC	Responses for following Models: Cessna 560 Ultra, 560 Encore and 560XL equipped with Honeywell P1000
Operating Conditions	Altitude	Is maneuver speed, operational speed or margin to alert trip point impacted by altitude?	Yes. Low speed cues are mainly based on normalized AOA, but are also a function of gross weight in Clean configuration at high altitude	Yes, altitude along with flap configuration both have an affect on the margin between operational speed and alert trip point.	NA	NA	NA	NA	NA
	Bank angle (e.g., TCAS, maneuvering on approach, unusual attitude recovery)	Can increasing the bank angle trigger the low speed alert?	Yes. Low speed cues are mainly based on normalized AOA : in level flight, increasing the bank angle increases AOA and low speed alerts are more likely to occur	Yes, increasing bank angle which increases AOA and 'g' can trigger the low speed alert.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor which can be driven by bank angle.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor which can be driven by bank angle.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor which can be driven by bank angle.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor which can be driven by bank angle.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor which can be driven by bank angle.
	Load factor (e.g., Terrain avoidance, TCAS, dive recovery)	Is load factor considered in LAA design?	Yes, partially. The load factor is taken into account in the amber low speed cue to avoid untimely low speed alerting during manual operational maneuvers. AP disconnect cue and Red cue do not depend on load factor.	Yes, increasing 'g' or load factor is a factor in LAA.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor.	Indirectly, low airspeed awareness is a function of normalized AOA which increases in response to load factor.
	Accel/Decel	Is there an anticipation effect based on deceleration rate?	Yes, but only when AP is engaged. Speed trend displayed on the ADI provides also the crew with anticipation (AP engaged or not)	Yes, indicated by airspeed trend vector. If either IAS or TAS are invalid, vector is removed from display. Trend vector is not displayed on the ground during takeoff or landing.	Airspeed Trend Vector	Airspeed Trend Vector per Note 2	Airspeed Trend Vector per Note 2	Airspeed Trend Vector per Note 2	Airspeed Trend Vector per Note 2
	Proximity to stick shaker	Is the alert trigger based on proximity to stick shaker speed or AOA (delta speed or AOA, percent amberband, etc)?	Low speed cues are based on the proximity from an AOA threshold. An "increase speed" aural is triggered as soon as speed drops in the amber band or AP protection modes are activated. No stick shaker/pusher on F7X.	Yes, the airspeed digital readout and AOA value will change color to amber prior to stick shaker activation.	Low airspeed awareness thermometer displays red 1 1.1Vstall, amber 1.2 Vstall, white 1.3 Vstall as determined from normalized AOA.	Low airspeed awareness thermometer displays red 1.1Vstall as determined from normalized AOA. Green Approach Que Caret is positioned on the edge of the airspeed tape at 1.3 Vstall	Low airspeed awareness thermometer displays red 1.1Vstall as determined from normalized AOA.	Low airspeed awareness thermometer displays red 1.1Vstall as determined from normalized AOA. Green Approach Que Caret is positioned on the edge of the airspeed tape at 1.3 Vstall	Low airspeed awareness thermometer displays red 1 1.1Vstall, amber 1.2 Vstall, white 1.3 Vstall as determined from normalized AOA.
	Turbulence	Are turbulence effects (primarily nuisance effects) accounted for?	Yes, through filtering	Yes, the AOA is filtered to prevent nuisance shaker activation during flight in turbulence.	NA	NA	NA	NA	NA
	Windshear	Interaction/priority of windshear alert and low speed alert? Other impacts of windshear on LAA?	No interaction with windshear alerts. Windshear alerts have priority	Windshear is highest priority for all voice alerting; tones can be played concurrently. LAA is independent of windshear.	NA	NA	NA	NA	NA

Cessna Note 1: Low Airspeed Awareness thermometer display adjacent to airspeed display. Low Airspeed Aural Alert not provided

Cessna Note 2: Airspeed Trend Vector displays the airspeed the aircraft would attain in 10 seconds if current aircraft acceleration is maintained. Based upon samples of filtered airspeed.

Appendix 2, Table 2
Expanded Considerations List

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Configuration Aspects	Normal flaps	Is flap position considered in LAA design?	Yes. Low speed cues and low speed protection take into account the various slats/flaps positions	Yes, flap position is considered in the design.	Yes, normalized AOA and stall warning settings are a function of flap position. Flap/slat deployment speeds are indicated by three full time bugs outside of the airspeed tape. The bugs are displayed as a red horizontal T with corresponding label to the right of the T. When flap deployment speed is exceeded a White down Arrow and F(slow for flap speed) displayed at bottom of airspeed tape	Yes, normalized AOA and stall warning settings are a function of flap position.	Yes, normalized AOA and stall warning settings are a function of flap position.	Yes, normalized AOA and stall warning settings are a function of flap position. Flap deployment speeds are indicated by three full time bugs outside of the airspeed tape. The bugs are displayed as a red horizontal T with corresponding label to the right of the T. When flap deployment speed is exceeded a White down Arrow and F(slow for flap speed) displayed at bottom of airspeed tape	Yes, normalized AOA and stall warning settings are a function of flap position.
	Landing gear position	Is landing gear position considered in LAA design?	No. Settings provide good performance in all landing configurations	No, gear position has no effect.	Low Airspeed Awareness display removed with WOW	Low Airspeed Awareness display removed with WOW Indirectly, low airspeed awareness is a function of normalized AOA which accounts for stall speed variation with gross weight.	Low Airspeed Awareness display removed with WOW	Low Airspeed Awareness display removed with WOW	Low Airspeed Awareness display removed with WOW on ground.
	Gross weight	Is gross weight considered in LAA design?	Yes. Gross weight is taken into account when in Clean configuration at high altitude	Yes, indirectly, since gross weight affects AOA which is the key parameter in the design.	Indirectly, low airspeed awareness is a function of normalized AOA which accounts for stall speed variation with gross weight.	Indirectly, low airspeed awareness is a function of normalized AOA which accounts for stall speed variation with gross weight.	Indirectly, low airspeed awareness is a function of normalized AOA which accounts for stall speed variation with gross weight.	Indirectly, low airspeed awareness is a function of normalized AOA which accounts for stall speed variation with gross weight.	Indirectly, low airspeed awareness is a function of normalized AOA which accounts for stall speed variation with gross weight.
	Center of gravity	Is C.G. position considered in LAA design?	No. Settings are demonstrated to provide good performance with the full range of CG positions	Yes, CG is considered but it has a small effect on the alert trigger point.	Indirectly, low airspeed awareness is a function of normalized AOA which is designed to yield conservative values for the entire CG envelope.	Indirectly, low airspeed awareness is a function of normalized AOA which is designed to yield conservative values for the entire CG envelope.	Indirectly, low airspeed awareness is a function of normalized AOA which is designed to yield conservative values for the entire CG envelope.	Indirectly, low airspeed awareness is a function of normalized AOA which is designed to yield conservative values for the entire CG envelope.	Indirectly, low airspeed awareness is a function of normalized AOA which is designed to yield conservative values for the entire CG envelope.
	All engine vs. eng-out	Is engine failure considered in LAA design? How?	No. AOA thresholds are unchanged, but AP protection modes adapt the commands to aircraft response, exactly as the pilot would do when flying manually.	Only a consideration during takeoff since V2 is factored based on Vsr and V2 is slightly closer to shaker with OEI.	NA	NA	NA	NA	NA
	Deceleration devices	Are speedbrakes considered in LAA design?	Yes. Speedbrakes deflection is taken into account in the settings in landing configuration (Slats/Flaps fully extended)	Yes, speedbrakes change AOA which in turn changes margin to the alert.	NA	NA	NA	NA	NA
	Non-normal configs.	Are non-normal configurations potentially affecting LAA considered (Example: Configs. covered in AFM)	Yes. Some non normal Slats/Flaps configurations are taken into account.	Non-normal configurations covered in the AFM are flown at speeds that provide acceptable margins to the alert trigger point.	NA	NA	NA	NA	NA

Appendix 2, Table 2
Expanded Considerations List

	Trim	Does trim operation affect the LAA?	No. Aircraft is auto-trimmed	No	N/A	N/A	NA	NA	NA
	Manual flight	Does LAA operate during manual flight?	Yes	Yes	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.
	Autoflight	Does LAA operate during autoflight?	Yes, with automatic protection modes taking over	Yes	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.	Low airspeed awareness is available regardless of manual or autoflight.
	Relevant failed systems	Key system failures accommodated by LAA?	Yes	Yes. The redundancy and integrity of the signals used to set the alert have been considered	Loss of AOA valid	Loss of AOA valid	Loss of AOA valid	Loss of AOA valid	Loss of AOA valid

Major Category	**Expanded Consideration List**	**Questions Regarding Effect of this Consideration on LAA**	**Responses for Dassault FBW/Avionics low speed cues and protections**	**Responses for Gulfstream G450/G550**	**Responses for following Model: Cessna Model 750 (CX) equipped with Primus 2000**	**Responses for Model: Cessna 560XLS equipped with Honeywell Primus 1000 CDSR**	**Responses for Model: Cessna 560XLS+ equipped with Collins Pro Line 21**	**Responses for Model: Cessna 680 Sovereign equipped with Honeywell Primus EPIC**	**Responses for following Models: Cessna 560 Ultra, 560 Encore and 560XL equipped with Honeywell P1000**
Phases of Flight	Takeoff	Is LAA inhibited during some/all of takeoff?	Yes	The threshold for the alert trigger point is increased for the first 6 seconds after liftoff.	NA	NA	NA	NA	NA
	Initial climbout	Are there any special considerations during initial climbout?	No	No	NA	NA	NA	NA	560 Ultra/Encore LAA inhibited for a short duration after takeoff by WOW transition
	Enroute climb	Are there any special considerations during enroute climb?	No	No	NA	NA	NA	NA	NA
	Cruise	High altitude behavior of the airplane and engines (Thrust available vs. thrust required)	Yes. Low speed cues are adapted depending on gross weight and altitude	If the thrust required exceeds the thrust available, the pilot becomes aware quickly based on the airspeed trend vector and alert trigger point.	NA	NA	NA	NA	NA
	Descent	Are there any special considerations during descent?	No	No	NA	NA	NA	NA	NA
	Hold	Are there any special considerations during hold?	No, except below 20000ft with AP engaged : Pitch speed protection is inhibited	Holding speeds provide sufficient margin to the alert trigger point.	NA	NA	NA	NA	NA
	Approach	Are there any special considerations during approach?	No	Nothing special. The alert trigger point is based on the flap setting used during the approach.	NA	NA	NA	NA	NA
	Go-around	Is LAA inhibited during go-around?	No	No	NA	NA	NA	NA	NA
	Landing	Are there any special considerations during landing?	No	No	NA	NA	NA	NA	NA

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Major Category	Expanded Consideration List	Questions Regarding Effect of this Consideration on LAA	Responses for Dassault FBW/Avionics low speed cues and protections	Responses for Gulfstream G450/G550	Responses for following Model: Cessna Model 750 (CX) equipped with Primus 2000	Responses for Model: Cessna 560XLS equipped with Honeywell Primus 1000 CDSR	Responses for Model: Cessna 560XLS+ equipped with Collins Pro Line 21	Responses for Model: Cessna 680 Sovereign equipped with Honeywell Primus EPIC	Responses for following Models: Cessna 560 Ultra, 560 Encore and 560XL equipped with Honeywell P1000
Icing Aspects	Clean vs ice stick shaker/pusher trips	Does stick shaker/pusher trip and/or maneuver speed change with ice protection system on, and is this considered in the LAA design?	No. No change in the Low speed cues and protection if anti-ice system is On. The settings cover icing and non icing conditions. If anti-ice system is detected failed, specific Low speed cues settings are used. No stick shaker/pusher on F7X.	No, the alert trigger point is not advanced with the wing anti-ice selected on.					560 Ultra has dual schedule for clean vs. ice which effects shaker and LAA. 560 Encore has single schedule.
	Manual vs auto ice protection system	WAI activation method (automatic, manual following ice detector alert, manual only)?	See above.	Both automatic and manual modes with dual ice detector alert and ice detector used to trigger the automatic mode.	N/A	N/A	NA	NA	Manual ice protection system