13 May 2016

Docket Operations, M-30
U.S. Department of Transportation (DOT)
1200 New Jersey Ave, SE Room W12-140
West Building Ground Floor
Washington, DC 20590-0001
Docket FAA-2015-1621

Dear FAA Representative:

The FAA's complete review and evolution of 14CFR§23 is critical to assuring the safety and vitality of general aviation in the United States and around the world. The importance of this effort cannot be understated and the aviation associations representing GA manufacturers, maintainers and operators are extremely supportive of the FAA's efforts to assure a brighter future for the general aviation community. With the comments of the aviation community in mind, the FAA must work swiftly to implement the changes being proposed in as short a timeframe as possible. With proper execution and prioritization, the FAA and U.S. Government can achieve a final rule that amends part 23 in the manner described before the end of 2016. This must be an absolute priority for the FAA and with the expected timeline pressures that the Presidential election will bring, business as usual will not be sufficient to achieve the goal of a final rule by the end of 2016.

On behalf of the aviation community, we would like to extend appreciation to the staff at the FAA who have understood to the concerns of the general aviation industry, who have worked so hard to implement the critical change being proposed. The process of creating this proposal was over 9-years in the making and it is clear the work that has been put into the proposal was worthwhile. To assure this critical goal is realized, we have coordinated a technical review with key stakeholders around the world and we offer the FAA the following general and detailed comments:

General Comments:
The shift to a proportional and objective based rules within the part 23 framework will provide general aviation with the ability to more efficiently design, certify, produce, operate and maintain the airplanes of today and it will assure the future of general aviation will only be limited by human imagination. Working with key states of design to assure close harmonization of these new regulations is as important to the success of this process and we appreciate the FAA's leadership in this area. The FAA must make it a top priority to closely coordinate with aviation regulators at key states of design to assure that the general aviation industry can reach its full potential.

When one looks at the slow decline in general aviation activity, active pilots and the continual aging of the general aviation fleet, it is clear that the proposed changes are necessary to reverse these trends. While traditional rulemaking efforts have focused on specific technical regulations through myopic lenses, this proposed rule takes account of the entire general aviation ecosystem; it assures real world improvements can occur as opposed to other rulemaking activities which merely produce more documentation and administrative work. This revision of 14CFR§23 effort is a posterchild for good rulemaking and we applaud these efforts to fully understand the range of issues involved when making changes of this magnitude.

The proposals contained in NPRM 16-01 will allow for new products and retrofits to existing airplanes so that innovation which has previously been prevented by the nature of the existing rules can be made available.

The NPRM has been crafted in a manner so as to allow the safe adoption of current and future technologies in an extremely efficient manner while assuring the highest levels of safety are maintained. The proposed changes to part 21 and 43 within the proposal are a lifeline to assuring that today's GA community can begin to implement the kinds of technologies and capabilities that should be reasonable to install, but for the outdated nature of the regulations. This update is no small feat and we appreciate the work of the FAA in assuring an appropriate final rule by the end of 2016.

One of the near-term significant technological developments which absolutely must be accommodated into the new part 23 rule structure is hybrid and electric propulsion. While it may take time to create detailed means of compliance which can be broadly applied to these airplanes, the regulations must accommodate these technologies. We are working with a broad range of general aviation manufacturers towards fielding new propulsion systems based on electric motors and fans. The FAA must make changes to assure the proposed rules are sufficiently objective based so they can accommodate the features of electric aircraft. In a number of cases, the rules are not written in this manner so we provide detailed comments on these areas below.

The NPRM has proposed a new numbering system for CFR§23. The change from outdated, prescriptive rules to objective based rules has resulted in an extensive enough compression of the regulations to necessitate a purposeful change to the numbering of part 23. It would be unnecessarily confusing to have an amendment 63 part 23 rule share the numbering of an amendment 62 rule if the subject matter was significantly different due to compression or change. Because the compression of regulations is extensive throughout the regulation, the FAA should choose a part 23 numbering system that is clearly organized and partitioned but which does not repeat numbering from amendment 62.

The signed aviation associations and their members have been heavily engaged in the development of globally valid design practices through ASTM F44, General Aviation Aircraft. It is of paramount importance that the objective level rules which have been developed are clearly implemented through detailed means of compliance which remain contemporary. The model of following industry based consensus standards affords the possibility of solving what has been a very daunting problem in the past. Trying to contain high levels of detail in regulation is beneficial at a snapshot in time but practically the day those detailed rules are printed, they will no longer meet all the needs of a dynamic industry. The approach of objective based rules implemented through detained consensus standards, which are also globally harmonized, is the key to assuring the success of general aviation.

Throughout the proposal, the FAA varies the language of each rule from "the applicant must show", "the applicant must demonstrate", "the airplane must", etc. It is important that the language of part 23 does not contradict FAA part 21 which includes showing of compliance and acceptance of statement of compliance based upon a risk based determination. To assure that compliance findings and acceptance of compliance can be accomplished as efficiently as possible, we recommend the FAA defer to regulatory language throughout the code which indicates "the aircraft must" or other variants of this concept versus "the applicant must show" or other similar statements.

Detailed Comments:

§21.9 Replacement & modification articles.

We are very supportive of the changes offered in proposed §21.9(a)(7 There are countless examples of components which had historically contributed to aviation safety but which today's §21.9 prohibits. There are in fact examples of designs that can be approved by part 21.8(d) but which cannot currently be manufactured under 21.9. Added flexibility when the FAA determines that the production of parts for sale and aviation use/installation are appropriate will allow for safety enhancing equipment to be produced in cost effective ways which will allow these devices to be widely adopted.

§21.9(a)(7) will add the necessary flexibility in the regulations to correct this issue. With this provision, it is conceivable that retrofit equipment could be developed and produced in a very cost effective manner and simplified installation means could be developed in acceptable consensus standards to assure for efficient installation. To assure a level playing field, guidance should be created to illustrate how the FAA intends to facilitate the additional path to production for parts that would be produced under 21.9(a)(7).

§21.24 Issuance of type certificate: primary category aircraft.

For the sake of simplicity, it may not be necessary to include the stricken text in the revised definition of primary category aircraft. It should be sufficient to include such intent in the preamble of the rulemaking. There are many references to items such as stall speed which do not need to reference a previous amendment regulation for the steps to determine that speed.

Additionally, the FAA should permit electric propulsion in the primary category once the FAA determines acceptable standards as is the standard process for applicants in the primary category.

> *§21.24(a)(1)(i) Is unpowered; is an airplane powered by a single, naturally aspirated engine* ***or with electric propulsion systems*** *with a 61-knot or less Vso stall speed ~~as defined in § 23.49 of this chapter, at amendment 23–62, effective on Jan 31, 2012~~; or is a rotorcraft with a 6-pound per square foot main rotor disc loading limitation, under sea level standard day conditions;*

§21.35 Flight test

In the revision of part 23 the FAA has almost succeeded in replacing arbitrary weight and propulsion thresholds with more appropriate measures and it has placed increased reliance on consensus standards as means of compliance at the product level. With respect to §21.35(b)(2), it would be advantageous to select a parameter other than maximum weight as a discriminator. It would seem that the historic division at 6,000 pounds was based on a combination of aircraft complexity mixed with acceptable level of risk.

It would seem appropriate that the use of low-speed airplane and airworthiness level 2 or less would provide the same level of safety while this change would better align with the part 23 design rules. It should be noted that the low-speed parameter is a measure of complexity in its own right and airworthiness level is the newly accepted measure of risk.

We recommend the FAA replace the term "of 6,000 pound or less maximum weight" used in the draft §21.35(b)(2) with the term "meeting part 23 airworthiness level 1 or 2".

> *§ 21.35(b)(2) For aircraft to be certificated under this subchapter, except gliders, and except for low-speed airplanes, as defined in part 23 of this chapter, ~~of 6,000 pounds or less maximum weight~~* ***meeting airworthiness level 1 or 2*** *that are to be certificated under part 23 of this chapter, to determine whether there is reasonable assurance that the aircraft, its components, and its equipment are reliable and function properly.*

§21.101(c) Designation of applicable regulations.

We do not believe the use of the term "simple airplane" should be included in the regulations. Further discussion of this concern is illustrated in comments to §23.5 which follow. It would be appropriate to remove the term "simple" from the proposed §21.101(c) regardless of the later utilization of the term as these aircraft are completely encompassed by low-speed level 1 airplanes anyway.

> *§21.101(c) An applicant for a change to an aircraft (other than a rotorcraft) of 6,000 pounds or less maximum weight, to a non-turbine rotorcraft of 3,000 pounds or less maximum weight, ~~to a simple,~~ to a level 1 low speed~~,~~ or to a level 2 low speed airplane may show that the change and areas affected by the change comply with the regulations incorporated by reference in the type certificate. However, if the FAA finds that the change is significant in an area, the FAA may designate compliance with an amendment to the regulation incorporated by reference in the type certificate that applies to the change and any regulation that the FAA finds is directly related, unless the FAA also finds that compliance with that amendment or regulation would not contribute materially to the level of safety of the product or would be impractical.*

§23.1 Applicability and definitions.
We agree with the applicability statement included in proposed §23.1(a). These statements are important to assure the clear readability and use of the future part 23. The removal of the utility and commuter category from the part 23 design regulations is appropriate based upon how these categories have evolved over time in both the design and operational sense.

The definition of "Designated fire zone" should be modified slightly to allow for solutions other than pure containment. While containment of fire may be optimal with traditional flammable fluids used in aviation, as the potential for electric propulsion is now being realized, there may be better ways to address fire safety in these technologies. We recommend the FAA assure fire safety while also allowing for appropriate solutions by modifying the definition of "designated fire zone" as follows:

> *§23.1(b)(2) Designated fire zone means a zone where catastrophic consequences from fire in that zone must be mitigated by ~~containing~~ **preventing the spread of** the fire ~~in that zone~~**to other parts of the airplane**.*

A change of this type would still assure the highest levels of fire safety while permitting solutions, such as safe external venting of flammable fumes, which may be more efficient and effective.

The definition of "Empty weight" could be improved in the following manner:

> *§23.1(b)(3) Empty weight means the weight of the airplane with fixed ballast, unusable fuel, ~~full operating fluids,~~ and ~~other~~ **full** fluids required for normal operation of airplane systems.*

It may be confusing to specify full operating fluids and a separate category of other fluids required for normal operation. Removing this redundancy adds to simplicity and understanding.

§23.5 Certification of normal category airplanes.
A cornerstone to the success of the change to part 23 includes the principle of reducing arbitrary lines. Generally §23.5 has done a very good job of eliminating a number of these and cleaning up the utility, aerobatic and commuter category issues is certainly key to this effort. We are also supportive of the creation of certification levels based upon scale or seating capacity. Lower performing, low risk simple designs should have associated means of compliance which are based upon those criteria, however, it would be detrimental to the overall concept to use the rule to delineate one grouping of these characteristics. The concept of using the means of compliance to differentiate the wide range of issues in each design area is a more appropriate way to accommodate these concepts. It appears the FAA has tried to capture some of the characteristics that define a European Aviation Safety Agency (EASA) Very Light

Aeroplane (VLA). Certainly these vehicles need to be properly accommodated into part 23 but by splitting them out, this appears to be contrary to the goal of the overall effort.

With respect to the creation of the "simple" airplane division, this is counter to the goal of the re-write and we suggest §23.5(d) be removed and all reference to a strictly defined simple airplane be removed as show in the following:

§23.5 Certification of normal category airplanes.

(a) Certification in the normal category applies to airplanes with a passenger-seating configuration of 19 or less and a maximum certificated takeoff weight of 19,000 pounds or less.

(b) Airplane certification levels are:

(1) Level 1 - for airplanes with a maximum seating configuration of 0 to 1 passengers.

(2) Level 2 - for airplanes with a maximum seating configuration of 2 to 6 passengers.

(3) Level 3 - for airplanes with a maximum seating configuration of 7 to 9 passengers.

(4) Level 4 - for airplanes with a maximum seating configuration of 10 to 19 passengers.

(c) Airplane performance levels are:

(1) Low speed.for airplanes with a V_C *or* $V_{MO} \leq 250$ *Knots Calibrated Airspeed (KCAS) (and* $M_{MO} \leq 0.6$*).*

(2) High speed.for airplanes with a V_C *or* $V_{MO} > 250$ *KCAS (or* $M_{MO} > 0.6$*).*

~~*(d) Simple.Simpl is defined as a level 1 airplane with a* V_C *or* $V_{MO} \leq 250$ *KCAS (and* $M_{MO} \leq 0.6$*), a* $V_{SO} \leq 45$ *KCAS and approved only for VFR operations.*~~

*(~~e~~**d**) Airplanes not certified for aerobatics may be used to perform ~~any~~ maneuver**s** incident to normal flying, including—*

(1) Stalls (except whip stalls); and

(2) Lazy eights, chandelles, and steep turns, in which the angle of bank is not more than 60 degrees.

*(f) Airplanes certified for aerobatics may be used to perform **all** maneuvers ~~without limitations~~, other than those limitations necessary to avoid damage or injury.*

We request that the FAA remove the simple airplane delineation from the proposal in favour of a code that properly addresses the full range of aircraft from simplest to most complex with varying obligations which are captured in accepted means of compliance. With the removal of the simple aircraft category, the FAA can use specific features in place of "simple".

§23.10 Accepted means of compliance.

It is important to codify the use of standards to assure the aviation community will be able to rely upon these methods of compliance. The basis for keeping the regulations contemporary and for embracing new solutions is footed in the concept of acceptable consensus standards and we appreciate the regulatory tie to this process.

Today part 21 does not require showing of compliance in all cases. Today and potentially more so in the future the FAA may accept compliance through demonstration or even statement of compliance. To assure that the designs meeting part 23 can continue to fully utilize 14CFR§21 the following wording should be used in §21.10:

§ 23.10 Accepted means of compliance.

*(a) An applicant must ~~show the FAA how it will demonstrate compliance~~**comply** with this part using a means of compliance, which may include consensus standards, accepted by the Administrator.*

*(b) ~~A person requesting acceptance of a means of compliance must provide the~~**Acceptable** means of compliance **must be** ~~to the FAA~~ in a form and manner specified by the Administrator.*

The above changes to 23.10 also assure there is no confusion with respect to how the certification process will apply to the amended part 23 rules. Without these changes one might believe the FAA expects each applicant to come to agreement with respect to acceptable means of compliance during each certification project, when it appears the FAA intends to issue acceptance of methods of compliance through standards that are found to be acceptable, for example.

§ 23.100 Weight and center of gravity.

For the sake of readability and to assure that an applicant can comply with the requirements through the methods specified in 14CFR§23 we offer the following comments to improve the proposed rule for assuring proper weight and balance limits.

It is appropriate for compliance to be demonstrated at critical combinations of weight and center of gravity but compliance showing at each combination would present an infinite matrix of test points. We suggest the FAA include the term, "critical" in place of "each" for the combinations of weight and C.G. that will be demonstrated.

Finally, the determination of empty weight and C.G. is somewhat confusing and potentially unnecessary. We recommend making the language more clear.

§ 23.100 Weight and center of gravity.

*(a) The applicant must determine **limits for** weight~~s~~ and center~~s~~ of gravity that provide ~~limits~~ for the safe operation of the airplane.*

*(b) The applicant must ~~show compliance~~**comply** with each requirement of this subpart at each combination of weight and center of gravity within the airplane's range of loading conditions using tolerances acceptable to the Administrator.*

(c) The condition of the airplane at the time of determining its ~~empty~~ weight and center of gravity must be ~~well~~ defined ~~and easily repeatable~~.

§ 23.105 Performance data.

With respect to §23.105(b)(2) there may be some cases where the performance of equipment other than the propulsion system (such as avionics or utility systems) may drive cooling requirements for hot conditions. Further, it is possible that some designs may have performance limitations at low temperatures in place of high temperatures (batteries in electric propulsion uses for example). We offer the following change to address this concern:

§ 23.105 Performance data

(a) Unless otherwise prescribed, an airplane must meet the performance requirements of this subpart in—

(1) Still air and standard atmospheric conditions at sea level for all airplanes; and

(2) Ambient atmospheric conditions within the operating envelope for—

(i) Level 1 high-speed and level 2 high-speed airplanes; and

(ii) Levels 3 and 4 airplanes.

(b) Unless otherwise prescribed, the applicant must develop the performance data required by this subpart for the following conditions:

(1) Airport altitudes from sea level to 10,000 feet (3,048 meters); and

*(2) Temperatures from standard to 30° Celsius above standard or the maximum ambient atmospheric temperature at which compliance with ~~propulsion~~ cooling requirements ~~in climb~~ is shown, if lower****; and***

(3) Low temperatures below standard within expected operation, when low temperature has detrimental effects on performance.

(c) The procedures used for determining takeoff and landing distances must be executable consistently by pilots of average skill in atmospheric conditions expected to be encountered in service.

(d) Performance data determined in accordance with paragraph (b) of this section must account for losses due to atmospheric conditions, cooling needs, and other demands on power sources.

§ 23.110 Stall speed.

There are a number of new technologies that can introduce monumental utility and safety to general aviation through the changes being conceived by the FAA. Distributed propulsion with reliable electric power has the potential to allow us to realize some of these benefits. As the concept of distributed lift along a wing can be used to facilitate low-speed handling and with reliable systems of this type dictate operational stall speeds, the FAA needs to allow for this kind of technology in the rules. To assure this kind of distributed lift system can come into play, the following changes need to be included:

§ 23.110 Stall speed.

The applicant must determine the airplane stall speed or the minimum steady flight speed for each flight configuration used in normal operations, including takeoff, climb, cruise, descent, approach, and landing. ~~Each determination must account for the most adverse conditions for each flight configuration with power set at idle or zero thrust.~~ Stall speed or minimum steady flight speed is determined under the most adverse conditions associated with each flight configuration used in normal operations.

The included change would assure that distributed propulsion that has an appropriate reliability level could be used in a landing condition with credit given for a lower stall speed based upon the effects of this equipment.

§ 23.115 Takeoff performance.

The language of the takeoff performance section is far too detailed and prescriptive. For example, requirement that a certain performance be obtained in a conditional configuration was appropriate on traditional aircraft which may have required pilot action to change flight configuration; tomorrow we may have aircraft which may include designs that allow for optimized flight configuration without pilot input, in this case, rules related to conditions that won't exist would be inappropriate. The power of standards to address these issues must be realized by crafting this section at a higher objective based level.

As the FAA has worked so hard to eliminate weight breaks based upon arbitrary boundaries, we suggest the FAA remove the multiengine 12,500 pounds delineation as level 4 multiengine airplanes or level 3 high-speed airplanes addresses the concerns of take-off performance being discussed here.

We also offer other corrections that simplify the language.

§23.115 Takeoff performance.

(a) The applicant must determine airplane takeoff performance accounting for—

(1) Stall speed safety margins;

(2) Minimum control speeds; and

(3) Climb gradients.

(b) For all airplanes, takeoff performance includes ~~the determination of ground roll and initial climb distance to 50 feet (15 meters) above the takeoff surface~~

(1) the ground roll distance required to takeoff

(2) the initial climb distance to 50 feet (15 meters) above takeoff surface

(c) For levels 1, 2, and 3 high-speed multiengine airplanes~~, multiengine airplanes with a maximum takeoff weight greater than 12,500 pounds~~ and level 4 multiengine airplanes, takeoff performance includes a determination the following distances after a sudden critical loss of thrust:

(1) ~~Accelerate-stop~~ ***an aborted take-off at critical speed****;*

(2) Ground roll and initial climb to 50 feet (15 meters) above the takeoff surface; and

(3) Net takeoff flight path.

§ 23.120 Climb requirements.

The climb requirements specified will assure that smaller slower airplanes which may operate from shorter fields can climb out of closer terrain while those that are faster and require more runway have sufficient runway distance and climb performance to account for systems failures. This intent can be more clearly captured in standards which are acceptable to the Administrator while capturing the higher level intent into the rule as proposed below.

The FAA has not included an initial climb performance for level 4 airplanes, it should be the same as high-speed level 1/2 and level 3 airplanes.

The FAA should make the calculation of performance more general to facilitate the use of standard means of compliance which may exist in consensus based standards.

§ 23.120 Climb requirements.

(a) *The applicant* ***design*** *must ~~demonstrate~~***comply with** *the following minimum climb performance out of ground effect:*

*(~~a~~**1**) With all engines operating and in the initial climb configuration—*

*(~~1~~**i**) For levels 1 and 2 low speed airplanes, a climb gradient at sea level of 8.3 percent for landplanes and 6.7 percent for seaplanes and amphibians; and*

*(~~2~~**ii**) For levels 1 and 2 high-speed airplanes and all level 3* ***and 4*** *airplanes, a climb gradient at takeoff of 4 percent.*

*(~~b~~**2**) After a critical loss of thrust on multiengine airplanes—*

*(~~1~~**i**) For levels 1 and 2 low-speed airplanes that do not meet single engine crashworthiness requirements, a 1.5 percent climb gradient at a pressure altitude of 5,000 feet (1,524 meters) in the cruise configuration;*

*(~~2~~**ii**) For levels 1 and 2 high-speed airplanes, and level 3 low-speed airplanes, a 1 percent climb gradient at 400 feet (122 meters) above the takeoff surface with the landing gear retracted and flaps in the takeoff configuration;*

*(~~3~~**iii**) For level 3 high-speed airplanes and all level 4 airplanes, a 2 percent climb gradient at 400 feet (122 meters) above the takeoff surface with the landing gear retracted and flaps in the approach configuration;*

~~(4) At sea level for level 1 and level 2 low-speed airplanes; and~~

~~(5) At the landing surface for all other airplanes.~~

*(~~c~~**3**) ~~For a balked landing, a~~* ***A*** *climb gradient of 3 percent* ***during balked landing,*** *with***out creating undue pilot workload.***

(b) The applicant must determine, as applicable, climb and descent performance—

*(1) ~~Takeoff power on each engine~~**for all engines operating;***

*(2) ~~Landing gear extended; and~~**following a critical loss of thrust on take-off; and***

*(3) ~~Flaps in the landing configuration.~~**after a critical loss of thrust, during the en-route phase of flight.***

§ 23.130 Landing.

For the sake of clarity, we offer the following recommended changes to the proposed 23.130. While we agree that the term "stop" on water would differ from those on land, this description isn't as simple as stating 3 knots (current, wind, etc.) so the appropriate method of compliance for determining a stop for amphibious/seaplanes should be contained in accepted standards.

§ 23.130 Landing.

*The applicant must determine ~~the following~~, for standard temperatures at ~~each~~ weight**s** and altitude**s** within the operational limits ~~for landing~~:*

(a) The distance, starting from a height of 50 feet (15 meters) above the landing surface, required to land and come to a stop~~, or for water operations, reach a speed of 3 knots~~.

(b) The approach and landing speeds, configurations, and procedures, which allow a pilot of average skill to meet the landing distance consistently and without causing damage or injury.

§ 23.200 Controllability.

The current proposal does not take account for preferred technologies, such as angle of attack, for executing safe approach and landing procedures.

The FAA has indicated that a typical accident scenario involves loss of control in multiengine aircraft which are unable to climb on a single engine. The current proposed rule contained in 23.200(c) does represent at potential solution to the condition the FAA has illustrated however there are other solutions which may be better depending on the design of the aircraft. In place of assuring minimum control speed is below that of stall speed, solutions might include envelope protection, increased awareness of the loss of control condition, automatic power response, etc. There are solutions which may result in better solutions than allowing the aircraft to stall in the single engine case being highlighted, but with the current proposed rule, this would not be possible. We recommend this safety provision be included in the loss of control rule section which follows.

To assure that the best solution for a particular design can be fielded, we believe §23.200(c) should be revised as follows:

§ 23.200 Controllability.

(a) The airplane must be controllable and maneuverable, without requiring exceptional piloting skill, alertness, or strength, within the operating envelope—

(1) At all loading conditions for which certification is requested;

(2) During low-speed operations, including stalls;

(3) With ~~any~~ probable flight control or propulsion system failure; and

(4) During configuration changes.

*(b) The airplane must be able to complete a **safe** landing ~~without causing damage or serious injury, in the landing configuration at a speed of VREF minus 5 knots using the approach gradient equal to the steepest used in the landing distance determination.~~**, when following the landing procedures, providing a safe margin below V_{REF} or above approach angle of attack.***

~~(c) For levels 1 and 2 multiengine airplanes that cannot climb after a critical loss of thrust, VMC must not exceed VS1 or VS0 for all practical weights and configurations within the operating envelope of the airplane.~~

(d) If the applicant requests certification of an airplane for aerobatics, the applicant must demonstrate those aerobatic maneuvers for which certification is requested and determine entry speeds.

This change is critical to assuring the best solutions to safety can be realized through the regulatory changes being proposed.

§ 23.205 Trim.
We recommend the FAA make the below suggested changes to simplify the readability of the trim requirement.

§ 23.205 Trim.

*(a) The airplane must maintain longitudinal, lateral, and directional trim under the following conditions**, without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system:***

(1) For levels 1, 2, and 3 airplanes, in cruise, ~~without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system.~~

(2) For level 4 airplanes in normal operations~~, without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system~~.

(b) The airplane must maintain longitudinal trim under the following conditions:

(1) Climb.

(2) Level flight.

(3) Descent.

(4) Approach.

(c) Residual forces must not fatigue or distract the pilot during likely emergency operations, including a critical loss of thrust on multiengine airplanes.

§ 23.215 Stall characteristics, stall warning, and spins.
We believe loss of control accidents predominantly involve single-engine airplanes or multi-engine airplanes during a critical loss of thrust event. The language of 23.215 should be modified as described below to assure the loss of control requirements are applied in a manner that will maximize safety while being applied in an efficient manner.

§ 23.215 Stall characteristics, stall warning, and spins.

(a) The airplane must have controllable stall characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive stall warning that provides sufficient margin to prevent inadvertent stalling.

(b) ~~Levels 1 and 2 airplanes and level 3~~ single-engine airplanes, not certified for aerobatics, must not have a tendency to inadvertently depart controlled flight.

(c) multi-engine airplanes, not certified for aerobatics, must not have a tendency to suffer a loss of control after a likely critical loss of thrust.

(c) Airplanes certified for aerobatics must have controllable stall characteristics and the ability to recover within one and one-half additional turns after initiation of the first control action from any point in a spin, not exceeding six turns or any greater number of turns for which certification is requested, while remaining within the operating limitations of the airplane.

(d) Spin characteristics in airplanes certified for aerobatics must not result in unrecoverable spins—

(1) With any use of the flight or engine power controls; or

(2) Due to pilot disorientation or incapacitation.

§ 23.220 Ground and water handling characteristics.
The FAA has removed prescriptive requirements related to land airplanes establishing cross wind landing information in the AFM, in parallel, the FAA should allow means of compliance to address operational specificity related to water landings. We provide suggested changes to the language below.

§ 23.220 Ground and water handling characteristics

(a) For airplanes intended for operation on land or water, the airplane must have controllable longitudinal and directional handling characteristics during taxi, takeoff, and landing operations.
~~*(b) For airplanes intended for operation on water, the following must be established and included in the Airplane Flight Manual (AFM):*~~

~~*(1) The maximum wave height at which the aircraft demonstrates compliance to paragraph (a) of this section. This wave height does not constitute an operating limitation.*~~
~~*(2) Any necessary water handling procedures.*~~

§ 23.225 Vibration, buffeting, and highspeed characteristics.
The language from which this requirement originates (23.251) includes the term "excessive fatigue" and therefore we believe the same term should be applied to 23.225(a).

Additionally, the current requirement for a high-speed trim upset is based on designs with adjustable horizontal stabilizers. As there is no indication that this issue extends beyond adjustable horizontal stabilizers, we recommend the FAA adjust the wording of this rule to account for susceptible designs but not to require this test of all high-speed airplanes.

§ 23.225 Vibration, buffeting, and highspeed characteristics.
(a) Vibration and buffeting, for operations up to VD/MD, must not interfere with the control of the airplane or cause ***excessive*** *fatigue to the flightcrew. Stall warning buffet within these limits is allowable.*
(b) For high-speed airplanes and all airplanes with a maximum operating altitude greater than 25,000 feet (7,620 meters) pressure altitude, there must be no perceptible buffeting in cruise configuration at 1g and at any speed up to VMO/MMO, except stall buffeting.
(c) For high-speed airplanes, the applicant must determine the positive maneuvering load factors at which the onset of perceptible buffet occurs in the cruise configuration within the operational envelope. Likely inadvertent excursions beyond this boundary must not result in structural damage.
(d) High-speed airplanes must have recovery characteristics that do not result in structural damage or loss of control, beginning at any likely speed up to VMO/MMO, following—

(1) An inadvertent speed increase; and
(2) ***for airplanes that incorporate flight adjustable stabilizers,*** *A high-speed trim upset.*

§ 23.230 Performance and flight characteristics requirements for flight in icing conditions.
23.230 (a) applies to normal operations (i.e. not failure conditions). We recommend the following changes to assure this is clear.

23.230 (a)(2) should be clearer to indicate that the stall warning in icing needs to provide similar notification but does not need to occur in the same way (natural stall versus stick pusher for example).

Finally, 23.230(b) should be reworded to assure that the design includes a means to safely avoid and exit icing but this may not have to be demonstrated depending on the nature of the certification process demanded by part 21 (amended designs for example may use similarity).

§ 23.230 Performance and flight characteristics requirements for flight in icing conditions.
(a) If an applicant requests certification for flight in icing conditions as specified in part 1 of appendix C to part 25 of this chapter and any additional atmospheric icing conditions for which an applicant requests certification, the ***normally operating airplane ice protection systems must include***~~*applicant must demonstrate the following*~~*:*

(1) Compliance with each requirement of this subpart, except those applicable to spins and any that must be demonstrated at speeds in excess of—

(i) 250 knots CAS;
(ii) VMO or MMO; or
(iii) A speed at which the applicant demonstrates the airframe will be free of ice accretion.

(2) The stall warning for flight in icing conditions and non-icing conditions is ~~*the*~~ ***provided in the*** *same* ***manner****.*

(b) If an applicant requests certification for flight in icing conditions, the applicant must provide a means to detect any icing conditions for which certification is not requested and ~~demonstrate the aircraft's ability~~ to avoid or exit those conditions.
(c) The applicant must develop an operating limitation to prohibit intentional flight, including takeoff and landing, into icing conditions for which the airplane is not certified to operate.

§ 23.300 Structural design envelope.
Under certain configurations the airplane will stall at V_c at a load factor lower than the maximum design maneuvering load factor. We believe the definition of V_A must be modified to address these cases.

To clarify that the airplane must be evaluated at critical weights across the operational envelope, We request the FAA remove the word "all" from 23.300(c)(1) & 23.300(e).

§ 23.300 Structural design envelope.
The applicant must determine the structural design envelope, which describes the range and limits of airplane design and operational parameters for which the applicant will show compliance with the requirements of this subpart. The applicant must account for all airplane design and operational parameters that affect structural loads, strength, durability, and aeroelasticity, including:
(a) Structural design airspeeds and Mach numbers, including—
(1) The design maneuvering airspeed, V_A, which may be no less than the airspeed at which the airplane will stall at the maximum design maneuvering load factor or V_A;
(2) The design cruising airspeed, V_C or M_C, which may be no less than the maximum speed expected in normal operations;
(3) The design dive airspeed, V_D or M_D, which is the airspeed that will not be exceeded by inadvertent airspeed increases when operating at V_C or M_C;
(4) Any other design airspeed limitations required for the operation of high lift devices, landing gear, and other equipment or devices; and
(5) For level 4 airplanes, a rough air penetration speed, V_B.
(b) Design maneuvering load factors not less than those, which service history shows, may occur within the structural design envelope.
(c) Inertial properties including weight, center of gravity, and mass moments of inertia, accounting for—
(1) ~~All~~ weights from the airplane empty weight to the maximum weight; and
(2) The weight and distribution of occupants, payload, and fuel.
(d) Range of motion for control surfaces, high lift devices, or other moveable surfaces, including tolerances.
(e) ~~All~~ altitudes up to the maximum altitude.

§ 23.305 Interaction of systems and structures.
This section is intended to address systems which may use aerodynamic or other means to alleviate loads in certain conditions and to assure structural integrity remains in the event these systems were to fail. We request the following language changes to assure the intent of this section is clear and there are no unintended consequences, such as creating a requirement to perform systems safety assessments on all systems and structure interactions which would create a tremendous burden with no measurable benefit.

§ 23.305 Interaction of systems and structures.
*For airplanes equipped with systems that ~~affect structural performance~~ **that are intended to alleviate structural loads**~~, either directly or as a result of failure or malfunction,~~ the applicant must account for the influence and failure conditions of these systems when showing compliance with.*

§ 23.310 Structural design loads.
As structural design loads calculations will vary based upon the type of operations that will occur (ground, water, etc.) it is appropriate to include "as applicable" in 23.310(a). Further, the calculation of "any" externally or internally applied pressure, force or moment would result in boundless design and calculation. The FAA has made previous legal determinations that the word "any" does in fact mean any and in this case, that would be inappropriate and the word "likely" should be used instead.

§ 23.310 Structural design loads.
The applicant must:
*(a) Determine structural design loads**, as applicable,** resulting from ~~any~~ **likely** externally or internally applied pressure, force, or moment which may occur in flight, ground and water operations, ground and water handling, and while the airplane is parked or moored.*
(b) Determine the loads required by paragraph (a) of this section at all critical combinations of parameters, on and within the boundaries of the structural design envelope.
(c) The magnitude and distribution of these loads must be based on physical principles and may be no less than service history shows will occur within the structural design envelope.

§ 23.325 Component loading conditions.
The use of the term "relief valve" is a design specific solution which should be broadened to include any relief type system (control of inflow for example or use of a digital backup system on an outflow valve). We recommend the following changes.

§ 23.325 Component loading conditions.
The applicant must determine the structural design loads acting on:
(a) Each engine mount and its supporting structure resulting from engine operation combined with gusts and maneuvers.
(b) Each flight control and high lift surface, their associated system and supporting structure resulting from—
(1) The inertia of each surface and mass balance attachment;
(2) Gusts and maneuvers;
(3) Pilot or automated system inputs;
(4) System induced conditions, including jamming and friction; and
(5) Ground operations, including downwind taxi and ground gusts.
(c) A pressurized cabin resulting from the pressurization differential—
*(1) From zero up to the maximum relief ~~valve~~ **pressure** setting combined with gust and maneuver loads;*
*(2) From zero up to the maximum relief ~~valve~~ **pressure** setting combined with ground and water loads if the airplane may land with the cabin pressurized; and*
*(3) At the maximum relief ~~valve~~ **pressure** setting multiplied by 1.33, omitting all other loads.*

§ 23.330 Limit and ultimate loads.
As written this section would not require the establishment of limit loads if a special factor of safety is used to meet the requirement. We recommend the following changes to address this issue properly:

§ 23.330 Limit and ultimate loads.
*Unless ~~special or other factors of safety are necessary to meet the requirements of~~ **ultimate loads are specified in** this subpart, the applicant must determine—*
(a) The limit loads, which are equal to the structural design loads; and
(b) The ultimate loads, which are equal to the limit loads multiplied by a 1.5 factor of safety.

§ 23.400 Structural strength.
We recommend some changes to assure that this requirement can follow the normal part 21 process for determination of compliance. We also suggest a change to 23.400(a)(1) to assure that "unsafe" interference is addressed and not interference such as thrust reverser buckets making normal contact with each other as they are actuated under airloads.

§ 23.400 Structural strength.
*The ~~applicant must demonstrate that the~~ structure **must be designed to** ~~will~~ support:*
(a) Limit loads without—
*(1) **Unsafe** Interference with the operation of the airplane; and*
(2) Detrimental permanent deformation.
(b) Ultimate loads.

§ 23.405 Structural durability.
As compared to other sections of the proposed regulations this section remains far too prescriptive and design oriented. We recommend the following changes to address the objectives of the rule while not being so design focused.

> *§ 23.405 Structural durability.*
> *(a) The applicant must develop and implement procedures to prevent structural failures due to foreseeable causes of strength degradation, which could result in ~~serious or fatal injuries, loss of the airplane, or extended periods of operation with reduced safety margins~~* ***unsafe conditions****. The Instructions for Continued Airworthiness must include procedures developed under this section.*
> *(b)* ***The airplane must be designed so it can maintain continued safe flight and landing with likely structural damage caused by the following in-flight structural failures*** *~~If a pressurized cabin has two or more compartments separated by bulkheads or a floor, the applicant must design the structure for a sudden release of pressure in any compartment that has a door or window, considering failure of the largest door or window opening in the compartment.~~*
> *~~(c) For airplanes with maximum operating altitude greater than 41,000 feet, the procedures developed for compliance to paragraph (a) of this section must be capable of detecting damage to the pressurized cabin structure before the damage could result in rapid decompression that would result in serious or fatal injuries.~~*
> *~~(d) The airplane must be capable of continued safe flight and landing with structural damage caused by highenergy fragments from an uncontained engine or rotating machinery failure.~~*
> ***(1)High-energy fragments from an uncontained engine or rotating machinery failure; and***
> ***(2) Sudden release of pressure from the pressurized cabin structure, including doors and window failures; and***
> ***(c) For airplanes with maximum operating altitude greater than 41,000 feet, the procedures developed for compliance to paragraph (a) of this section must be capable of detecting damage to the pressurized cabin structure before the damage could result in rapid decompression that would result in serious or fatal injuries.***

§ 23.410 Aeroelasticity.
We recommend the word "any" (in 23.410(a)(2)) be removed from the regulation and replaced as suggested to assure the airplane is free from flutter across the operational envelope.

The term "tolerances" in 23.401(b) has a very specific meaning that would require applicants to specify ±X % tolerance on items such as cross sectional moments of inertia. A proper flutter analysis is a collection of flutter sensitivity analysis and we recommend the wording be changed as annotated below to properly account for the issues involved.

> *§ 23.410 Aeroelasticity.*
> *(a) The airplane must be free from flutter, control reversal, and divergence—*
> *(1) At all speeds within and sufficiently beyond the structural design envelope;*
> *(2) For ~~any~~* ***approved*** *configuration****s*** *and condition****s*** *of operation;*
> *(3) Accounting for critical degrees of freedom; and*
> *(4) Accounting for ~~any~~ critical failures or malfunctions.*
> *(b) The applicant must establish and account for ~~tolerances~~* ***sensitivities*** *for all quantities that affect flutter.*

§ 23.500 Structural design.
It is appropriate for the methods of compliance to specify how airframe and control system interactions will be tested up to limit loads. Depending on the nature of the control system it may be more or less appropriate to perform such a test. To assure the appropriate level of testing is always applied to traditional flight controls and also to future systems which may include fans or thrusters, we suggest this level of detail be contained in accepted standards.

*§ 23.500 ~~Structural design.~~**Design and construction principles.***

(a) The applicant must design each part, article, and assembly for the expected operating conditions of the airplane.

(b) Design data must adequately define the part, article, or assembly configuration, its design features, and ~~any~~ materials and processes used.

(c) The applicant must determine the suitability of each design detail and part having an important bearing on safety in operations.

*(d) The control system must be free from jamming, excessive friction, and excessive deflection when **the airplane is subjected to expected limit airloads.***

> *~~(1) The control system and its supporting structure are subjected to loads corresponding to the limit airloads;~~*
>
> *~~(2) The primary controls are subjected to the lesser of the limit airloads or limit pilot forces; and~~*
>
> *~~(3) The secondary controls are subjected to loads not less than those corresponding to maximum pilot effort.~~*

§ 23.515 Special factors of safety.

To assure special factors of safety continue to be applied in the same manner as they are in the prior amendment of part 23 while providing for more flexibility as new materials and construction techniques come into place, We believe the following changes to the proposal are appropriate.

§ 23.515 Special factors of safety.

*(a) ~~The applicant must determine a special factor of safety for any critical design value that~~ **Special factors of safety are established and applied in the design for each part, article or assembly whose critical design value affecting strength** is—*

> *(1) Uncertain;*
>
> *(2) ~~Used for a part, article, or assembly that is~~ likely to deteriorate in service before normal replacement; or*
>
> *(3) Subject to appreciable variability because of uncertainties in manufacturing processes or inspection methods.*

(b) The applicant must determine a special factor of safety using quality controls and specifications that account for each—

> *(1) ~~Structural~~ **Kind of** application;*
>
> *(2) Inspection method;*
>
> *(3) Structural test requirement;*
>
> *(4) Sampling percentage; and*
>
> *(5) Process and material control.*

*(c) The ~~applicant must apply any special~~ factor of safety in **§23.330(b)** ~~the design for each part of the structure by multiplying each limit load and ultimate load by the~~**of this part is multiplied by the highest pertinent** special factor of safety.*

§ 23.600 Emergency conditions.

As written 23.600(b) would apply dynamic landing conditions to items of mass, which would be a new requirement that is without foundation. We believe the FAA intended to apply this provision to occupant restraint systems and therefore we recommend the section be reorganized as indicated below to properly accomplish this.

We believe section 23.600(e)(3) should include a caveat so items that could be damaged would not “limit safe” operation as opposed to the current language which could be seen as requiring protection despite the nature of the impact on safety.

We also believe the language in FAA proposed 23.600(d) related to seating systems and torso restraint should be aligned with current DOT practices related to automobile safety. The current proposal may preclude some better methods of safety in crashworthiness and might unnecessarily restrict design capabilities.

§ 23.600 Emergency conditions.

(a) The airplane, even when damaged in an emergency landing, must protect each occupant against injury that would preclude egress when—

(1) Properly using safety equipment and features provided for in the design;

(2) The occupant experiences ultimate static inertia loads likely to occur in an emergency landing; and

(3) Items of mass, including engines or auxiliary power units (APUs), within or aft of the cabin, that could injure an occupant, experience ultimate static inertia loads likely to occur in an emergency landing.

~~(b) The emergency landing conditions specified in paragraph (a) of this section, must—~~

~~(1) Include dynamic conditions that are likely to occur with an impact at stall speed, accounting for variations in aircraft mass, flight path angle, flight pitch angle, yaw, and airplane configuration, including likely failure conditions at impact; and~~

~~(2) Not exceed established human injury criteria for human tolerance due to restraint or contact with objects in the airplane.~~

*(~~c~~**b**) The airplane must have seating and restraints for all occupants. The airplane seating, restraints, and cabin interior must account for likely flight and emergency landing conditions.*

*(~~d~~**c**) Each occupant restraint system must consist of a seat, a method to restrain the occupant's pelvis and torso, and a single action restraint release. For all flight and ground loads during normal operation and ~~any~~ emergency landing conditions, the restraint system must perform its intended function and not create a hazard that could cause a secondary injury to an occupant. The restraint system must not prevent occupant egress or interfere with the operation of the airplane when not in use.*

(d) The emergency landing conditions specified in paragraph (c) of this section, must—

(1) Include dynamic conditions that are likely to occur with an impact at stall speed, accounting for variations in aircraft mass, flight path angle, flight pitch angle, yaw, and airplane configuration, including likely failure conditions at impact; and

(2) Not exceed established human injury criteria for human tolerance due to restraint or contact with objects in the airplane.

(e) Each baggage and cargo compartment must—

(1) Be designed for its maximum weight of contents and for the critical load distributions at the maximum load factors corresponding to the flight and ground load conditions determined under this part;

(2) Have a means to prevent the contents of the compartment from becoming a hazard by impacting occupants or shifting; and

*(3) Protect ~~any~~ controls, wiring, lines, equipment, or accessories whose damage or failure would ~~affect~~ **limit safe** operations.*

§ 23.700 Flight control systems.

Historically flight control systems have been designed to prevent likely failure conditions and traditional failure analysis has not been applied to simple mechanical flight control systems which use reliable mechanical design practices. We believe the suggested language changes will assure that these well established and safe practices can continue while assuring that for items such as fly by wire, newer methods of compliance can be used.

We also believes that flutter is already addressed in the aeroelastic section and therefore the redundant reference should be removed.

We recommend that the term "misconfiguration" be replaced with "misrigging" for clarity and it would be anticipated that traditional misrigging practices would continue to apply.

We believe that a safe takoff position can be indicated by all part 23 aircraft without creating too much burden for the simplest vehicles.

Addressing the loss of any single flight control link in the realm of traditional mechanical flight controls has provided a substantial level of safety. As new stability and fly by wire systems are discussed, it will be increasingly important to develop adequate methods of compliance in acceptable documents. We believe the proposed wording changes will assure flexibility without penalizing the simplest airplanes and while holding more complex systems to the appropriate standard.

Including specific information for the verification of stall barrier systems is not beneficial as the issue being addressed is already covered by flight control reliability aspects and the simple checks being specified may not be appropriate for all stall barrier systems. Since stall barrier systems have traditionally included stick pushers, which is a type of automatic flight actuation which is only in use at one specific operating condition, it would be more appropriate to deal with the specifics this kind of system within detailed means of compliance while allowing the general flight control safety requirements in (a)(1) assure the required level of safety based on the failure that can occur. We suggest the following language:

§ 23.700 Flight control systems.
*(a) The ~~applicant must design airplane~~ flight control systems ~~to~~**must**:*
(1) Prevent major, hazardous, and catastrophic hazards, including—
*(i) **Likely** ~~F~~**f**ailure **conditions**;*
(ii) Operational hazards;
~~(iii) Flutter;~~
*(i~~v~~**ii**) Asymmetry; and*
*(v) Mis~~configuration~~**rigging**.*
(2) Operate easily, smoothly, and positively enough to allow normal operation.
*(b) The ~~applicant must design~~ trim systems ~~to~~**must**:*
(1) Prevent inadvertent, incorrect, or abrupt trim operation.
(2) Provide a means to indicate—
(i) The direction of trim control movement relative to airplane motion;
(ii) The trim position with respect to the trim range;
(iii) The neutral position for lateral and directional trim; and
(iv) ~~For all airplanes, except simple airplanes,~~ the range for takeoff for all applicant requested center of gravity ranges and configurations.
~~(3) Except for simple airplanes, provide control for continued safe flight and landing when any one connecting or transmitting element in the primary flight control system fails.~~
(4) Limit the range of travel to allow safe flight and landing, if an adjustable stabilizer is used.
~~(c) For an airplane equipped with an artificial stall barrier system, the system must—~~
~~(1) Prevent uncommanded control or thrust action; and~~
~~(2) Provide for a preflight check.~~
(d) For level 3 high-speed and all level 4 airplanes, an applicant must install a takeoff warning system on the airplane unless the applicant demonstrates the airplane, for each configuration, can takeoff at the limits of the trim and flap ranges.

§ 23.705 Landing gear systems.

We believe this section is particularly design oriented and diverges from the EASA A-NPA to a large extent. We recommend the following language changes:

~~§ 23.705 Landing gear systems.~~
~~(a) For airplanes with retractable landing gear:~~
~~(1) The landing gear and retracting mechanism, including the wheel well doors, must be able to withstand operational and flight loads.~~
~~(2) The airplane must have—~~
~~(i) A positive means to keep the landing gear extended;~~
~~(ii) A secondary means of extension for landing gear that cannot be extended using the primary means;~~
~~(iii) A means to inform the pilot that each landing gear is secured in the extended and retracted positions; and~~
~~(iv) Except for airplanes intended for operation on water, a warning to the pilot if the thrust and configuration is selected for landing and the landing gear is not fully extended and locked.~~

~~(3) If the landing gear bay is used as the location for equipment other than the landing gear, that equipment must be designed and installed to avoid damage from tire burst and from items that may enter the landing gear bay.~~

~~(b) The design of each landing gear wheel, tire, and ski must account for critical loads, including those experienced during landing and rejected takeoff.~~

~~(c) A reliable means of stopping the airplane must provide kinetic energy absorption within the airplane's design specifications for landing.~~

~~(d) For levels 3 and 4 multiengine airplanes, the braking system must provide kinetic energy absorption within the airplane's design specifications for rejected takeoff.~~

(a) The landing gear includes the parts and systems necessary to support and control the airplane during surface operation and to make a safe transition from flight to surface operation and vice versa.

(b) The landing gear is designed to:

(1) Provide stable support and control to the aeroplane during surface operation;

(2) Absorb energy and support loads from take-off, landing and surface operation;

(3) Support the expected loads with sufficient margin; and

(4) Account for likely system failures and likely operation environment (including anticipated limitation exceedances and emergency procedures).

(c) All airplanes must have a reliable means of stopping the airplane with sufficient kinetic energy absorption to account for landing. Airplanes that are required to demonstrate aborted take-off capability must account for this additional kinetic energy.

(d) For airplanes that have a system that actuates the landing gear, there is:

(1) A positive means to keep the landing gear in the landing position;

(2) Information provided when the landing gear is not in the intended position;

(3) Landing gear position information provided; and

(4) An alternative means available to bring the landing gear in the landing position when a non-deployed system position would be hazardous.

§ 23.710 Buoyancy for seaplanes and amphibians.

The current 23.710(b) is quite design specific and would prevent the benefits of technologies such as foam filled floats. We recommend this rule be written in a more objective based manner as suggested.

§ 23.710 Buoyancy for seaplanes and amphibians.

Airplanes intended for operations on water, must—

(a) Provide buoyancy of 80 percent in excess of the buoyancy required to support the maximum weight of the airplane in fresh water; and

(b) Have sufficient ~~watertight compartments~~ ***reliability*** *so the airplane will stay afloat at rest in calm water without capsizing if ~~any two compartments of any main float or hull are flooded~~* ***the flotation system experiences likely flooding****.*

§ 23.750 Means of egress and emergency exits.

While the demonstration of an evacuation in less than 90-seconds isn't a significant barrier for part 23 airplanes, we believe the proposed rule could be improved upon and could be more objective based in nature. The means of compliance could, for example, contain a 90-second test if the FAA thought this was an appropriate test, but there are also other good design practices which can also result in substantial safety. We recommend the following language changes.

§ 23.750 Means of egress and emergency exits.

~~(a) The airplane cabin exit design must provide for evacuation of the airplane within 90 seconds in conditions likely to occur following an emergency landing. Likely conditions exclude ditching for all but levels 3 and 4 multiengine airplanes.~~

~~(b) Each exit must have a means to be opened from both inside and outside the airplane, when the internal locking mechanism is in the locked and unlocked position. The means of opening must be simple, obvious, and marked inside and outside the airplane.~~

~~(c) Airplane evacuation paths must protect occupants from serious injury from the propulsion system.~~

~~(d) Each exit must not be obstructed by a seat or seat back, unless the seat or seat back can be easily moved in one action to clear the exit.~~

(a) With the cabin configured for take-off or landing, the airplane is designed to:

(1) Facilitate rapid and safe evacuation of the aeroplane in conditions likely to occur following an emergency landing, excluding ditching for level 1, level 2 and single engine level 3 airplanes.

(2) Have means of egress (openings, exits or emergency exits), that can be readily located and opened from the inside and outside. The means of opening must be simple and obvious.

(3) Have easy access to emergency exits when present.

*(~~e~~**b**) Airplanes certified for aerobatics must have a means to egress the airplane in flight.*

~~(f) Doors, canopies, and exits must be protected from opening inadvertently in flight.~~

§ 23.755 Occupant physical environment.

We believe there may be new systems which may include high amounts of energy that is not the result of rotating equipment and therefore this provision should be broadened to include these new items (very high voltage systems for example). Additionally, we believe that the section should be reordered to place the oxygen requirements after the pressurization requirements as follows:

§ 23.755 Occupant physical environment.

(a) The applicant must design the airplane to—

(1) Allow clear communication between the flightcrew and passengers;

(2) Provide a clear, sufficiently undistorted external view to enable the flightcrew to perform ~~any~~ maneuvers within the operating limitations of the airplane;

*(3) Protect the pilot from serious injury due to ~~high energy rotating failures in~~**hazards originating from high energy, associated with** systems and equipment; and*

(4) Protect the occupants from serious injury due to damage to windshields, windows, and canopies.

(b) For level 4 airplanes, each windshield and its supporting structure directly in front of the pilot must—

(1) Withstand, without penetration, the impact equivalent to a two-pound bird when the velocity of the airplane is equal to the airplane's maximum approach flap speed; and

(2) Allow for continued safe flight and landing after the loss of vision through any one panel.

(c) The airplane must provide each occupant with air at a breathable pressure, free of hazardous concentrations of gases and vapors, during normal operations and likely failures.

(e) If a pressurization system is installed in the airplane, it must include—

(1) A warning if an unsafe condition exists; and

(2) A pressurization system test.

*(~~d~~**e**) If an oxygen system is installed in the airplane, it must include—*

(1) A means to allow the flightcrew to determine the quantity of oxygen available in each source of supply on the ground and in flight;

(2) A means to determine whether oxygen is being delivered; and

(3) A means to permit the flightcrew to turn on and shut off the oxygen supply at any high-pressure source in flight.

~~(e) If a pressurization system is installed in the airplane, it must include—~~

~~(1) A warning if an unsafe condition exists; and~~

~~(2) A pressurization system test.~~

§ 23.800 Fire protection outside designated fire zones.

We request clarification related to the use of the word "or" in 23.800(b)(2) with respect to overload or fault. Does the FAA intend to allow some electrical systems (such as high reliability primary power wires in electrically powered aircraft) use reliable design practices in place of circuit protection for some wires?

Additionally, we believe that 23.800(d) has traditionally been limited to the ignition of materials in the cabin. There are other rules to assure that flammable fluids and insulations aren't ignited but requiring all items of heat to be mapped against materials across the airplane would create an undue burden and there has been no commensurate safety issue identified to justify such an approach. We have included language to address this issue below.

§ 23.800 Fire protection outside designated fire zones.

Outside designated fire zones:
(a) The following materials must be self-extinguishing—
(1) Insulation on electrical wire and electrical cable;
(2) For levels 1, 2, and 3 airplanes, materials in the baggage and cargo compartments inaccessible in flight; and
(3) For level 4 airplanes, materials in the cockpit, cabin, baggage, and cargo compartments.
(b) The following materials must be flame resistant—
(1) For levels 1, 2 and 3 airplanes, materials in each compartment accessible in flight; and
(2) Any electrical cable installation that would overheat in the event of circuit overload or fault.
(c) Thermal acoustic materials, if installed, must not be a flame propagation hazard.
(d) Sources of heat, ***located in the cargo compartment,*** *that are capable of igniting adjacent objects must be shielded and insulated to prevent such ignition.*
(e) For level 4 airplanes, each baggage and cargo compartment must—
(1) Be located where a fire would be visible to the pilots, or equipped with a fire detection system and warning system; and
(2) Be accessible for the manual extinguishing of a fire, have a built-in fire extinguishing system, or be constructed and sealed to contain ~~any~~ fire within the compartment.
(f) There must be a means to extinguish ~~any~~ fire in the cabin such that—
(1) The pilot, while seated, can easily access the fire extinguishing means; and
(2) For levels 3 and 4 airplanes, passengers have a fire extinguishing means available within the passenger compartment.
(g) Each area where flammable fluids or vapors might escape by leakage of a fluid system must—
(1) Be defined; and
(2) Have a means to make fluid and vapor ignition, and the resultant hazard, if ignition occurs, improbable.
(h) Combustion heater installations must be protected from uncontained fire.

§ 23.900 Powerplant installation.
We believe the FAA should include propulsion specific hazards that need to be accounted for within 23.900. These hazards include environmental issues unique to propulsion systems, ingestion of FOD, the dangers of propulsion aspects to ground personnel (propeller marking for example).

The proposed language would allow propulsion systems that meet required standards to be certified as part of the airframe provided the airplane is simple. We believe this capability should be based on the complexity of the propulsion system and not the airplane. The FAA must permit propulsion systems that comply with traditional engine type certification requirements whether the compliance was demonstrated by a standalone type certificate or through the airframe certification process. With electric propulsion on the verge of becoming mainstream, we believe such a provision is absolutely critical to the successful and safe integration of these technologies. With the suggested language below, the FAA would be able to accept propulsion systems, like electric motors or simpler traditional engines, which demonstrate compliance to the appropriate requirements as verified through the airplane type certification process. As an example, the FAA today allows APUs to demonstrate compliance via the TSO process, in the world of electric and hybrid vehicles, it would be expected that the APU might be the most complex piece of machinery in the system but today, that receives a TSO and not a TC. The proposed language would assure propulsion technology could be treated in an appropriate manner as the FAA gains experience with these new technologies.

§ 23.900 Powerplant installation.
(a) For the purpose of this subpart, the airplane powerplant installation must include each component ***that is*** *necessary for propulsion,* ***that*** *affects propulsion safety, or* ***that*** *provides auxiliary power to the airplane.*
(b) The applicant must construct and arrange each powerplant installation to account ~~for likely hazards in operation and maintenance.~~
(1) all likely operating and environmental conditions, including foreign object threats;

(2) sufficient clearance of moving parts to other airplane parts or their surroundings; and

(3) likely hazards in operation, including hazards to ground personnel.

*(c) ~~Except for simple airplanes,~~ each aircraft power unit must be type certificated**, or meet accepted specifications**.*

(d) The installation of powerplant components that deviate from the component limitations or installation instructions are safe.

(e) As applicable, the powerplant installation must account for vibration and fatigue.

§ 23.905 Propeller installation.

The FAA's proposed regulation would allow a propeller to demonstrate compliance to the applicable propeller requirements at the time of airframe certification based on the simplicity of the airplane. We believe the FAA should base this determination upon the nature of the propeller and not on the airframe (based upon the same justification that is applied above to the powerplant installation).

§ 23.905 Propeller installation.

*(a) ~~Except for simple airplanes,~~ each propeller must be type certificated **or meet accepted specifications**.*

(b) Each pusher propeller must be marked so that it is conspicuous under daylight conditions.

(c) Each propeller installation must account for vibration and fatigue.

§ 23.910 Powerplant installation hazard assessment.

We believe that 23.910 should apply to likely powerplant systems failures as "any" failures would require complete redundancy which cannot be achieved in traditional single engine airplanes and even many smaller twin engine airplanes. We believe the slower stall speeds and higher levels of crashworthiness in these designs mitigate all but likely powerplant failures.

§ 23.910 Powerplant installation hazard assessment.

*The applicant must assess each powerplant separately and in relation to other airplane systems and installations to show that **hazards resulting from** a **likely** failure of ~~any~~ powerplant system component or accessory **are minimized, so they** will not—*

(a) Prevent continued safe flight and landing;

(b) Cause serious injury that may be avoided; and

(c) Require immediate action by crewmembers for continued operation of any remaining powerplant system.

§ 23.915 Automatic power control systems.

There are many new part 23 designs which are being discussed which would require full-time automatic power control systems, such as distributed electric propulsion systems. We believe compliance with 23.915(b) would be counter to safety in this case. In the event that automatic power control systems of less reliability are used, compliance with 23.910 should result in mitigations such as those suggested in 23.915(b).

§ 23.915 Automatic power control systems.

A power or thrust augmentation system that automatically controls the power or thrust on the operating powerplant, must—

(a) Provide indication to the flightcrew when the system is operating;

~~(b) Provide a means for the pilot to deactivate the automatic function; and~~

(c) Prevent inadvertent deactivation.

§ 23.920 Reversing systems.

The current proposal as written could be mis-construed to indicate that the FAA will no longer permit throttle gates which are traditionally used on turboprop designs. This would necessitate the development of weight on wheels lockouts and other complex designs that are not currently required and for which there is no measurable safety data to indicate this is an area of safety concern. We recommend the following language changes to address this issue.

§ 23.920 Reversing systems.
*The airplane must be capable of continued safe flight and landing under ~~any~~ **easily selectable** ~~available~~ reversing system setting**s**.*

§ 23.925 Powerplant operational characteristics.
Currently 23.925(a) only sets a requirement for negative acceleration, we believe these conditions need to apply to forward and negative deceleration. Changes to 23.935(a) are included.

We believe the FAA's intent is to assure that engines can be reliably restarted in flight, following an in-flight shutdown. We believe an independent power source may be an adequate solution for some designs, there are many for which an independent power source would be inappropriate. For example, it is envisioned that electric propulsion systems may include a single power source which manages many cells. It will be common place for electric propulsion systems to start and stop in flight but they will not have independent sources of power to restart them. As written this provision could be interpreted to require that a multi-engine airplane needs three batteries for restarting (one main and an independent source for each powerplant).

§ 23.925 Powerplant operational characteristics.
*(a) The powerplant must operate at any ~~negative~~ acceleration **or decleration** that may occur during normal and emergency operation, within the airplane operating limitations.*
(b) The pilot must have the capability to stop and restart the powerplant in flight.
*(c) The airplane must have ~~an independent~~ **a reliable** power source for restarting each powerplant following an in-flight shutdown.*

§ 23.930 Fuel system
The current fuel system rule remains extremely specific and technology based. As written, there is no way to field electric propulsion systems. We recommend the FAA adopt the language proposed by EASA in the A-NPA for this section.

§ 23.930 ~~Fuel~~ Energy storage and supply system
~~(a) Each fuel system must—~~
~~(1) Provide an independent fuel supply to each powerplant in at least one configuration;~~
~~(2) Avoid ignition from unplanned sources;~~
~~(3) Provide the fuel required to achieve maximum power or thrust plus a margin for likely variables, in all temperature and altitude conditions within the airplane operating envelope;~~
~~(4) Provide a means to remove the fuel from the airplane;~~
~~(5) Be capable of retaining fuel when subject to inertia loads under expected operating conditions; and~~
~~(6) Prevent hazardous contamination of the fuel supply.~~
~~(b) Each fuel storage system must—~~
~~(1) Withstand the loads and pressures under expected operating conditions;~~
~~(2) Provide a means to prevent loss of fuel during any maneuver under operating conditions for which certification is requested;~~
~~(3) Prevent discharge when transferring fuel;~~
~~(4) Provide fuel for at least one-half hour of operation at maximum continuous power or thrust; and~~

~~*(5) Be capable of jettisoning fuel if required for landing.*~~

~~*(c) If a pressure refueling system is installed, it must have a means to—*~~

~~*(1) Prevent the escape of hazardous quantities of fuel;*~~

~~*(2) Automatically shut-off before exceeding the maximum fuel quantity of the airplane; and*~~

~~*(3) Provide an indication of a failure at the fueling station.*~~

(a) Each energy storage and supply system is able to appropriately retain the energy under all permitted and likely environmental and operating conditions.

(b) Each energy storage and supply system provides energy to the thrust system or powerplant (meaning also APUs) with adequate reserves to ensure safe functioning under all permitted and likely operating conditions, considering possible other energy consumers.

(c) Uninterrupted energy supply is provided when usable energy is available in the system when correctly operated, also considering likely energy fluctuations.

(d) Safe removal or isolation of the energy stored within the system for safe maintenance is provided.

(e) Each energy storage device is able to withstand, without failure, the vibration, inertia loads, system loads, other structural loads and installation condition that it subjected to in operation.

§ 23.1000 Powerplant fire protection.

We recommend a minor change to the language proposed by the FAA to account for electric propulsion where the electric motor may not be a fire concern but the battery system may be.

§ 23.1000 Powerplant fire protection.

*(a) ~~A~~ **Flammable** powerplant **components** may only be installed in a designated fire zone.*

(b) Each component, line, and fitting carrying flammable fluids, gases, or air subject to fire conditions must be fire resistant, except components storing concentrated flammable material must be fireproof or enclosed by a fireproof shield.

(c) The applicant must provide a means to shut off fuel or flammable material for each powerplant that must—

(1) Not restrict fuel to remaining units; and

(2) Prevent inadvertent operation.

(d) For levels 3 and 4 airplanes with a powerplant located outside the pilot's view that uses combustible fuel, the applicant must install a fire extinguishing system.

(e) For levels 3 and 4 airplanes, the applicant must install a fire detection system in each designated fire zone.

(f) Each fire detection system must provide a means to alert the flightcrew in the event of a detection of fire or failure of the system.

(g) There must be a means to check the fire detection system in flight.

§ 23.1300 Airplane level systems requirements.

We believe it would be worthwhile clarifying what non-required systems and equipment include (i.e. systems and equipment other than those covered by 23.1300(a).

§ 23.1300 Airplane level systems requirements.

(a) The equipment and systems required for an airplane to operate safely in the kinds of operations for which certification is requested (Day VFR, Night VFR, IFR) must be designed and installed to—

(1) Meet the level of safety applicable to the certification and performance level of the airplane; and

(2) Perform their intended function throughout the operating and environmental limits specified by the applicant.

(b) Non-required airplane equipment and systems ***are those not covered by 23.1300(a)****,* ***and when*** *considered separately and in relation to other systems, must be designed and installed so their operation or failure does not have an adverse effect on the airplane or its occupants.*

§ 23.1305 Function and installation.

One of the drivers in defining required and non-required equipment was to alleviate the issues related to proving intended function on non-required equipment. Since this equipment is not required for safe flight, it must only be verified that it does not interfere with required equipment when operating or in failure.

We do not believe 23.1305(a)(1)(2) are necessary as the installed equipment needs to operate safely despite any markings. For example, a marking may say equipment is good to 25,000 feet but without substantiation data to verify that, the statement is meaningless. The same holds true of a piece of equipment marked to 10,000 feet but which has been demonstrated to 25,000 feet during compliance testing and with appropriate design and production controls in place. We recommend these sections of 23.1305 be removed. 23.1305(b) is already covered by the crew interface aspects of the proposed rule changes (23.15xxx).

§ 23.1305 Function and installation.

*(a) ~~Each item of~~****Required systems and*** *~~installed~~ equipment must—*

(1) Perform ~~its~~ ***the*** *intended function;*

~~(2) Be installed according to limitations specified for that equipment; and~~

~~(3) Be labeled, if applicable, as to its identification, function or operating limitations, or any combination of these factors.~~

~~(b) There must be a discernable means of providing system operating parameters required to operate the airplane, including warnings, cautions, and normal indications to the responsible crewmember.~~

*(~~c~~****b****) Information concerning an unsafe system operating condition must be provided in a timely manner to the crewmember responsible for taking corrective action. ~~Presentation of~~ this information must be clear enough to avoid likely crewmember errors.*

§ 23.1315 Equipment, systems, and installations.

We believe the FAA NPRM proposal for 23.1315 is superior to the EASA A-NPA language which may unduly tie means of compliance to the objective based rule. We suggest the FAA add the term "failure condition" in place of failure to assure the rule addresses the broader impacts of failures rather than those that occur only within the equipment that may have failed. Further, we suggest the FAA add a statement that would allow for significantly safety enhancing equipment to be treated in a less stringent manner to account for the significant benefit that it can have. In practical terms, we believe this would assure the cost of this equipment will be as low as possible without sacrificing the safety enhancing benefits.

§ 23.1315 Equipment, systems, and installations.

For any airplane system or equipment whose failure ***condition*** *or abnormal operation has not been specifically addressed by another requirement in this part, the applicant must:*

(a) Examine the design and installation of airplane systems and equipment, separately and in relation to other airplane systems and equipment to determine—

(1) If a failure ***condition*** *would prevent continued safe flight and landing; and*

(2) If any other failure ***condition*** *would significantly reduce the capability of the airplane or the ability of the flightcrew to cope with adverse operating conditions.*

(b) Design and install each system and equipment, examined separately and in relation to other airplane systems and equipment, such that—

(1) Each catastrophic failure condition is extremely improbable;

(2) Each hazardous failure condition is extremely remote; and

(3) Each major failure condition is remote.

(c) A higher failure probability may be accepted for functionality enhancing the safety of the aeroplane beyond required minimum functionality.

§ 23.1320 Electrical and electronic system lightning protection.

The FAA has recently approved required equipment for use in IFR airplanes without the need for lightning testing based on the history of lightning strike in the GA fleet. We believe the current rule as proposed would prohibit such an approach and the language should be slightly tailored to assure that airplanes which would have a low probability of lightning strike.

We believe the following language change would permit installations which may be affected by lightning provided the loss of the equipment doesn't result in a catastrophic event and in level 3 or 4 airplanes, the event could not have a significant impact on the ability of the flightcrew.

§ 23.1320 Electrical and electronic system lightning protection.

~~*For an airplane approved for IFR operations*~~

*(a) ~~Each~~ electrical or electronic system**s** that perform~~s~~ a function, the failure of which would prevent the continued safe flight and landing of the airplane, must be designed and installed such that—*

*~~(1)~~ The ~~airplane system level~~ function ~~continues to perform~~ **is not adversely affected** during and after the time the airplane is exposed to lightning; and*

~~*(2) The system automatically recovers normal operation of that function in a timely manner after the airplane is exposed to lightning unless the system's recovery conflicts with other operational or functional requirements of the system.*~~

*(b) ~~Each~~ **For level 3 and 4 airplanes approved for IFR operations,** electrical and electronic system**s** that perform~~s~~ a function, the failure of which would reduce the capability of the airplane or the ability of the flightcrew to respond to an adverse operating condition, must be designed and installed such that the function recovers normal operation in a timely manner after the airplane is exposed to lightning.*

§ 23.1325 High-intensity Radiated Fields (HIRF) protection.

We believe 23.1325(a)(2) is unnecessary as (a)(1) already requires that systems do not prevent safe flight and landing "after" a HIRF event. We believe this language would be sufficient to assure that means of compliance could be developed in a tiered manner based on the criticality of HIRF effects.

We believe that current policy and guidance may apply HIRF differently to part 23 products than in other areas. We suggest that the IFR discriminator for HIRF may not be as valid as other items, for example, perhaps airworthiness level.

§ 23.1325 High-intensity Radiated Fields (HIRF) protection.

(a) Electrical and electronic systems that perform a function, the failure of which would prevent the continued safe flight and landing of the airplane, must be designed and installed such that—

~~(1)~~ The ~~airplane system level~~ function is not adversely affected during and after the time the airplane is exposed to the HIRF environment~~; and~~.

~~*(2) The system automatically recovers normal operation of that function in a timely manner after the airplane is exposed to the HIRF environment, unless the system's recovery conflicts with other operational or functional requirements of the system.*~~

*(b) For **level 3 and 4** airplanes approved for IFR operations~~, the applicant must design and install each~~ electrical and electronic system**s** that perform~~s~~ a function, the failure of which would reduce the capability*

of the airplane or the ability of the flightcrew to respond to an adverse operating condition, ***must be designed and installed such that*** *~~so~~ the function recovers normal operation in a timely manner after the airplane is exposed to the HIRF environment.*

§ 23.1330 System power generation, storage, and distribution.

We are concerned that 23.1330(b)(1) may be an excessive requirement for airplanes which will have maximum ceilings that are much lower than 25,000 ft. It is conceivable that designs with electric propulsion systems may not have a total endurance of much more than 30 minutes initially and providing essential power for safe flight and landing in the event of a primary loss of thrust event would require nowhere near 30 minutes of time to execute a safe power off landing. We request that the FAA provide a reasonable window of essential power required for these lower flying aircraft for which electrical power will be controlled in a very reliable but efficient manner due to the nature of their design.

§ 23.1335 External and cockpit lighting.

We recommend the FAA remove 23.1335(e) as this requirement is already addressed by the regulators governing maritime vessels. Would those requirements change at some time, the FAA's part 23 could be in conflict and there is no safety benefit to having duplicate coverage in this regulatory area.

§ 23.1335 External and cockpit lighting.

(a) The applicant must design and install all lights to prevent adverse effects on the performance of flightcrew duties.

(b) Any position and anti-collision lights, if required by part 91 of this chapter, must have the intensities, flash rate, colors, fields of coverage, and other characteristics to provide sufficient time for another aircraft to avoid a collision.

(c) Any position lights, if required by part 91 of this chapter, must include a red light on the left side of the airplane, a green light on the right side of the airplane, spaced laterally as far apart as space allows, and a white light facing aft, located on an aft portion of the airplane or on the wing tips.

(d) The applicant must design and install taxi and landing lights so they provide sufficient light for night operations.

~~(e) For seaplanes or amphibian airplanes, riding lights must provide a white light visible~~

§ 23.1405 Flight in icing conditions.

We believe a better tie between 23.1405 and 23.230 may be necessary to specify the conditions through which icing certification is made. It may be appropriate to combine these sections.

§ 23.1457 Cockpit voice recorders.

§ 23.1459 Flight data recorders.

We believe these requirements for cockpit voice recorders and FDR stem from ICAO Annex 6 requirements which are already based upon industry standards (EUROCAE ED-55, 112 & 155), we suggest that the FAA write this section at an objective level and number the rules in accordance with any new numbering scheme. In the event the FAA is unable to change operational references at this time, these references should be changed as soon as practical.

§ 23.1500 Flightcrew interface.

We believe that the last sentence of this proposal should contain the term "make" seems to be misplaced, we believe the intent is to prevent likely crew errors associated with flight, nav, surveillance, powerplant controls and displays.

§ 23.1500 Flightcrew interface.

(a) The pilot compartment and its equipment must allow each pilot to perform his or her duties, including taxi, takeoff, climb, cruise, descent, approach, landing, and perform any maneuvers within the operating envelope of the airplane, without excessive concentration, skill, alertness, or fatigue.
*(b) The applicant must install flight, navigation, surveillance, and powerplant controls and displays so qualified flightcrew can monitor and perform all tasks associated with the intended functions of systems and equipment. The system and equipment design must ~~make~~ **prevent** the possibility that a **likely** flightcrew error could result in a catastrophic event.*

§ 23.1510 Airplane flight manual.
As this section is related to the AFM, the FAA should include the word "Airplane" in the begging of section (a).

§ 23.1510 Airplane flight manual.
The applicant must provide an Airplane Flight Manual that must be delivered with each airplane that contains the following information—
*(a) **Airplane** Operating limitations and procedures;*
(b) Performance information;
(c) Loading information; and
(d) Any other information necessary for the operation of the airplane.

Appendix A on ICA:
We believe the FAA should consider the detailed material in appendix A could better be supported in acceptable means of compliance via a standards reference. Varying aircraft complexity will derive the need for more or less prescription in the content of the ICA and standards are well suited to address this issue.

Respectfully,

Richard Peri
V.P. Government & Industry Affairs
Aircraft Electronics Association (AEA)

David Oord
Vice President, Regulatory Affairs
Aircraft Owners & Pilots Association (AOPA)

Gregory J. Bowles
Director, European Regulatory Affairs & Engineering
General Aviation Manufacturers Association (GAMA)

Sean Elliott
Vice President, Advocacy and Safety
Experimental Aircraft Association (EAA)