DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. 23746; Amendment No. 23–44]

RIN 2120–AD48

Airworthiness Standards; Small Airplanes With Stall Speed Greater Than 61 Knots

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the stalling speed requirements applicable to single-engine airplanes and to certain multiengine small airplanes of less than 6,000 pounds maximum weight. The rule permits those airplanes to have a stall speed greater than 61 knots, provided they meet certain additional occupant protection standards. These changes are needed to permit the design and type certification of higher performance airplanes with increased cruise speeds and better specific fuel consumption. The amendments are intended to achieve the benefits of certificating higher performance airplanes while affording their occupants the same level of protection in an emergency landing that is presently provided by airplanes with a 61-knot stall speed.

EFFECTIVE DATE: August 18, 1993.

FOR FURTHER INFORMATION CONTACT: Mike Downs, Standards Office (ACE–112), Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426–6941.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 91–12, which was published on May 13, 1991, (56 FR 22070). Comments to the NPRM were requested with a closing date of September 10, 1991. All comments received in response to Notice No. 91–12 have been considered in adopting this amendment.

Discussion of Comments

General

Ten commenters submitted responses to Notice No. 91–12. One commenter objects to a statement made by the FAA in the background material of the notice. Five commenters favor the proposal and four commenters oppose the proposal.

One commenter objects to a statement in the background material of the notice and indicates that the FAA erred in stating that airplanes with a V_{S0} less than 61 knots and high wing loading would require complex high lift systems that may result in a reduction of low speed flying qualities and lessen the level of safety of both normal and emergency operations in approach and landing conditions. The commenter adds that complex high lift devices have been around since the late 1920's and many of the devices used at that time maintained excellent control down to and through stall speeds lower than 40 mph. The FAA is aware of these devices and some of the airplanes on which they are installed. The use of these devices may result in a reduction of the low speed flying qualities of the airplane. The pilot of an airplane equipped with a more complex high lift system may choose to land at a higher speed in normal operation to reduce piloting tasks. Another pilot may choose to land at a higher speed in an emergency situation in order to ensure ground impact under controlled conditions. At a higher approach speed, an airplane is less responsive to gusts, and the control of the airplane about all three axes is improved. In short, the handling qualities of an airplane are also dependent on the type and design of the high lift devices, and on the controls employed and the skill required to operate them.

One commenter argues that the current 61-knot stall rule does not account for advancements made in airplane engine reliability. The commenter states that, due to the increased reliability of airplane engines, the 61-knot stall requirement should be deleted. Another commenter indicates that the excellent airplane engine reliability record cannot be improved, and that a change in stall speed is not warranted. The FAA agrees that even though the probability of a powerplant failure may decrease with increased powerplant reliability, the probability of an emergency forced landing condition may remain constant or be minimally affected. As pointed out by the Small Aircraft Stall Speed Study Group, the predominant cause of emergency forced landings is fuel starvation caused by poor management or handling of the fuel system by the pilot. Since increased powerplant reliability has little effect on the number of emergency forced landings, the occupants of airplanes having a stall speed greater than 61 knots must be afforded the benefits of the same structural crashworthiness as those occupants in airplanes having a stall speed of 61 knots.

The commenter mentions that estimates for the cost and weight penalty for staying within the current 61-knot stall requirement using high lift devices should be investigated, as should the cost and weight penalty for providing equivalent occupant protection for airplanes having a stall speed greater than 61 knots. The commenter adds that insurance rates and liability implications should also be investigated for those new airplanes that will have a stall speed greater than 61 knots. The FAA disagrees. This rule will allow the applicant to select the combination of stall speed and occupant protection requirements that will be most cost beneficial and appropriate to the airplane design. Since specific estimates of potential structure and weight penalty costs are design specific, this information is unavailable at this time.

One commenter feels that this amendment and the 61 knot limitation have no relevance to commuter category aircraft and the contemplated value of peak acceleration level (32g) that the commenter believes is being considered for commuter category aircraft. The FAA agrees that this amendment has no relationship with the contemplated commuter category airplane NPRM for seats. The rationale used to provide an alternative to the 61-knot stall speed limitation is based partly on a methodology found in the U.S. Army's Aircraft Crash Survival Design Guide and in the comprehensive FAA/NASA full scale general aviation airplane impact test data base. The alternative to the 61-knot stall speed limitation is also consistent with the two analytical methodologies considered by the Simpson Crashworthiness Subcommittee. They emphasize and address crash and occupant inertia load attenuation.

This amendment adjusts the current combined vertical/longitudinal design standard found in the emergency landing dynamic conditions to require an increase in seat/occupant impact load attenuation that is consistent with the potential increase in impact acceleration level. The impact acceleration levels determined by the methods specified in this amendment are also consistent with the results of the full scale general aviation airplane impact test program.

The maximum acceleration levels found in this amendment are well within the survivability envelope for small airplanes found in the National Transportation Safety Board (NTSB) Phase III, General Aviation Crashworthiness Project Safety Report. The NTSB concludes that "Acceleration levels and velocity changes of 23 to 30g and 50 to 60 feet per second in the vertical direction are generally survivable but the loads experienced by the occupants must be limited to a lower level to prevent crippling injuries to the back and neck". This amendment is consistent with that conclusion and it should reduce or minimize spinal injuries since the amendment addresses crash and occupant inertia load attenuation.

One commenter suggests that a number of additional risks may be associated with the emergency landing. These risks should be addressed in this amendment and include the following: failure to avoid obstacles (aircraft maneuverability), failure of occupant restraints, failure of structure, failure of the pilot to execute the landing successfully (skill and training), and post impact fire.

Prior to issuing Notice No. 91–12, the FAA studied a recommendation to require additional flight instruction for pilots of single-engine airplanes with a power-off stall speed in the landing configuration of more than 61 knots. The FAA concluded that adequate flight instruction was already included in the normal flight training curriculum, though it did not relate specifically to an increase in stall speed. Pilot skill and training, including the ability to avoid obstacles, are covered adequately by the current flight training requirements.

The commenter does not provide supportive data or specific recommendations regarding failure of occupant restraints. However, occupant restraint and occupant impact load attenuation are addressed adequately by this amendment and by amendment 23–36 on emergency landing conditions (53 FR 30802, Aug. 15, 1988).

The commenter does not cite a rationale or justify a need to address failure of structure. The FAA has no reason to extend this amendment to include enhancements to airframe structure. The airframe structures of all part 23 airplanes, including those that currently exceed the 61-knot stall speed limitation, are similar. There is no evidence to justify amending the airframe structure design standards at this time.

Finally, the JAA mentions their concern over the risks associated with post impact fire. The nature of post crash fires is difficult to define in terms of precisely where the fire starts and how it spreads. Clearly a prerequisite is the spillage of fuel followed by a source of ignition. Studies conducted by the General Aviation Safety Panel (GASP) indicate that existing data fails to identify precisely what advantages would accrue from increasing the crashworthiness of fuel systems in small general aviation airplanes. The purpose of improving the crashworthiness of a fuel system is to prevent considerable spillage in a survivable accident and delay the onset of rapid propagation of post crash fire in order to increase the time available for the pilot and passengers to remove themselves from the airplane. These improvements in crashworthiness may not in all cases prevent a post crash fire. GASP contends that the means for increasing the time available for extrication in a survivable accident by preventing large quantities of fuel spillage near obvious ignition sources needs to be considered for each design individually. It is not practical to develop a universal specification for the design of crash resistant fuel systems that would be applicable to all airplanes. It is for these reasons that this final rule does not specifically address crashworthiness of fuel systems. However, this final rule does require applicants for type certification of designs with a stall speed greater than 61 knots to provide the crashworthiness in terms of airframe and occupant protection equivalent to those airplanes with a stall speed less than 61 knots. The FAA continues to explore ways of dealing with post crash fires and, at this time, is preparing a supplemental notice of proposed rulemaking for crash resistant fuel systems.

Discussion of Comments to Specific Sections of Part 23

Section 23.49. This proposes to amend part 23 of the Federal Aviation Regulations to permit type certification of both single and multiengine airplanes with stall speeds greater than 61 knots, provided they incorporate additional occupant protection provisions to compensate for the increased kinetic energy dissipated during a forced landing. This would be accomplished by amending § 23.49 to require compliance with certain additional occupant protection requirements included in this proposal.

Two comments were received on this proposal.

One commenter refers to the conclusion reached by the Small Aircraft Stall Speed Study Group. The study group found that it was impossible to conclude, based on the accident record, that the retention of the 61-knot stall limitation in part 23 for single-engine airplanes has provided any degree of crash protection to occupants. The commenter believes that this conclusion was made because the data related to airplanes that meet the present airworthiness standards.

The FAA notes that the Crashworthiness Subcommittee of the Small Aircraft Stall Speed Study Group found that "Increasing the stall speed, with no other stipulations, would increase the potential range of ground contact speeds in controlled emergency situations and would, therefore, increase the probability for serious injury." This subcommittee saw no valid reason for maintaining 61 knots or any other specified stall speed in part 23. The subcommittee concluded that if the 61-knot stall limitation is removed, a means should be incorporated to maintain a controlled emergency landing speed range. Since the ultimate concern should be to provide the airplane occupants with a reasonable probability of surviving a controlled crash situation, the subcommittee proposed crashworthiness criteria that would provide the level of safety previously achieved by the 61-knot stall speed limitation. The crashworthiness subcommittee examined two methodologies that address occupant crashworthiness protection. The methodologies used were based on an equivalent safety and occupant survivability approach, and emphasized crash and occupant inertia load attenuation. However, the crashworthiness subcommittee did not pursue either of its approaches to a methodology that addressed occupant impact protection for an airplane that exceeds the 61-knot stall speed limitation. The subcommittee noted that definitive crash dynamic design standards for small airplanes did not exist at that time. Since the publication of the Small Aircraft Stall Speed Study Group report, emergency landing dynamic conditions have been adopted into FAR part 23, by amendment 23–36 This final rule extends the current emergency landing dynamic conditions specified in § 23.562 to small airplanes that exceed the 61-knot stall speed limitation. In provides crashworthiness criteria that addresses crash and occupant loan attenuation.

One commenter indicates that airplanes having lower stalling speeds have lower fatal accident rates and points to recent statistics in the June 1, 1991, and June 15, 1991, edition of "Aviation Consumer," which indicates that the Cessna 172 and the Cessna 206/207 have the lowest fatal accident rate for four and six place single-engine airplanes. The commenter also indicates that there is a higher percentage of fatal emergency landing accidents for light multiengine airplanes compared to single-engine airplanes. This may support the conclusion that airplanes with higher stalling speeds also have higher fatal accident rates because typical multiengine airplanes usually have a higher stalling speed than typical light single-engine airplanes.

The Small Aircraft Stall Speed Study Group reviewed data consisting of 37,530 reports for the 6-year period from 1976 to 1981, which revealed the following: Emergency forced landings accounted for 14.7 percent of all accidents, representing 16.6 percent of single-engine airplane accidents and 7.2 percent of multiengine airplane accidents. Fatalities resulted from 2.6 percent of controlled emergency forced landings and 17 percent of uncontrolled emergency forced landings. For single-engine airplanes, these values were 2.1 percent and 13.4 percent, respectively, while for multiengine airplanes, these percentages were 8.5 and 34.2 percent, respectively. Therefore, the chances for a fatal emergency forced landing are much higher for a multiengine airplane than for a single-engine airplane. However, a single-engine airplane is twice as likely to have an emergency forced landing as a multiengine airplane. Overall, the percentage of fatal emergency landing accidents where the pilot retained control until the crash was 2.7 percent for single-engine airplanes and 3.5 percent for multiengine airplanes.

One multiengine airplane with the highest stall speed of 76 knots had the lowest survivability ratio (one minus the number of fatalities/number of accidents), of 84 percent. This value matched the survivability ratio of a single-engine airplane whose stall speed was 55 knots. There were two multiengine airplanes that had 100 percent survivability; one had a stall speed of 60 knots, the other had a stall speed of 74 knots. Furthermore, survivability values for multiengine airplanes above 70 knots did not appear different from values for airplanes below 60 knots. Statistical data like these resulted in two conclusions. Survivability of controlled emergency forced landings is not dependent upon landing stall speed and a clear correlation between safety and landing stall speed cannot be found. This proposal is adopted as proposed.

Section 23.67. This proposal would clarify the change made to § 23.67 by amendment 23–42 (56 FR 344, January 3, 1991). The provisions of § 23.67(b)(1) require that all reciprocating engine-powered multiengine airplanes with a stall speed of more than 61 knots meet the one-engine-inoperative climb gradient requirements. A change to § 23.67, paragraphs (b)(1) and (b)(2), is required to clarify that multiengine airplanes of less than 6,000 pounds maximum weight that meet the improved occupant protection requirements prescribed in § 23.562(d) and have a stall speed greater than 61 knots would comply only with the climb gradient determination requirements of § 23.67(b)(2)(i). This proposal does not change the one-engine-inoperative climb requirements.

No comments were received on this proposal and it is adopted as proposed.

Section 23.562. The supporting technical data used in the development of § 23.562 was obtained from small airplanes whose stall speeds were not greater than 61 knots. Airplane occupants were not exposed to increased levels of kinetic impact energy. The increase in kinetic impact energy, above the 61 knot stall speed baseline, is proportional to the square of the stall speed of the airplane in the landing configuration. To compensate for increased energy levels, additional occupant protection requirements beyond those stated in § 23.562 are included in this final rule. The emergency landing dynamic conditions express the impact energy level in terms of an impact velocity. The increased occupant protection requirement in this proposal is obtained by multiplying the ultimate load factors of § 23.561(b) and the peak deceleration of the seat/restraint system test of § 23.562(b)(1) by the square of the ratio of the increased stall speed to the stall speed of 61 knots. The use of the velocity ratio squared to obtain the increased occupant protection requirement is consistent with an analytical methodology found in the U.S. Army's Aircraft Crash Survival Design Guide, USARTL–TR–79–22C, Volume III—Aircraft Structural Crashworthiness, which addresses the conservation of momentum associated with an aircraft impact that has earth plowing.

The FAA is limiting the maximum deceleration for the seat/restraint system dynamic test to 32g, which is the value that the FAA is considering proposing in a separate NPRM being developed for commuter category airplanes. The 32g limitation will be reached at a stall speed (V_{S0}) of 79 knots. At a higher stall speed, this maximum deceleration remains constant at 32g.

In addition, the static upward ultimate load factor for acrobatic category airplanes will be limited to a value of 5.0g. Because of the maneuvers they perform, acrobatic category airplanes are designed to higher maneuvering limit load factors, both positive and negative, than normal and utility category airplanes. The maximum upward value required in this rule for normal and utility category airplanes is 5.0g. Under emergency landing conditions, all categories of small airplanes would experience similar forces; therefore, requiring acrobatic airplane seats to be designed to higher load factors would not be warranted.

A total of five comments were received on this proposal.

One commenter expresses doubt that occupant safety levels can be engineered to remain at current levels and any engineering reports that claim 15g survivability at 70–75 knots are seriously in question. The maximum acceleration found in this amendment is well within the survivability envelope for small airplanes found in the NTSB Phase III, General Aviation Crashworthiness Project Safety Report. The NTSB concluded in its safety report that survival from crashes where longitudinal loads ranged from 30 to 35g, with a velocity change of 60 to 70 feet per second and vertical loads ranging from 25 to 30g, with a velocity change of 50 to 60 feet per second, could be expected. The commenter suggests that the FAA review the NTSB's statistics on rates for light multiengine airplanes after ground impact. The commenter does not indicate what NTSB report is being referenced and what light multiengine rates are being reported. The commenter adds that existing light multiengine airplanes are already marginal performers and that increasing wing loading and speeds for the most critical segments of flight would be counterproductive. The commenter further indicates that high horsepower, high wing loading, and high stall speed, are qualities of low technology and that most airplane manufacturers incorporate advanced aerodynamics to allow slow speeds during approach/takeoff and high performance cruise. The commenter does not clearly define what is meat by marginal performers. Furthermore, the commenter mentions high horsepower, high wing loading, and high stall speed as examples of low technology. Apparently, the commenter does not realize that these parameters are suitable for describing modern transport category airplanes, which are not examples of low technology airplanes.

One commenter indicates that there has not been any improvement in crashworthiness for airplanes weighing less than 6,000 pounds during the last 50 years; therefore, if stall speed requirements are relaxed, more fatalities and injuries to occupants will result because the occupants will absorb the additional energy generated by the increased speed. This is partially correct. If other conditions are unchanged, an increase in stall speed will probably result in airframes and occupants absorbing more energy on impact. However, with the development and adoption of emergency landing dynamic conditions into § 23.562 of the FAR by amendment 23-36, the current emergency landing dynamic conditions will be extended to those applicants who choose to design new airplanes with a stall speed greater than 61 knots. The extension of the current emergency landing dynamic requirements will provide crashworthiness standards that address load attenuation to the occupant. Furthermore, the results of the study conducted by the Small Aircraft Stall Speed Study Group, which consisted of the analysis of 37,530 accident reports over a 6-year period, failed to show a clear correlation between occupant survivability and landing stall speed. The commenter adds that airplane performance has not changed sufficiently in the last 50 years to warrant the proposed change. The commenter supports this with the commenter's own experience. The commenter then indicates that operator error is still the leading cause of aviation accidents and, since aircraft operators will continue to make mistakes, the existing stall speed requirement should remain, thereby protecting operators from themselves.

The commenter is correct that operator error is the leading cause of accidents. However, operator error and the need for improved pilot training are not airplane certification issues, and are beyond the scope of this rulemaking.

One commenter feels that the FAA was in error to assume that the NTSB data used to develop the emergency landing dynamic conditions for small airplanes was connected to the 61-knot stall speed. The commenter further asserts that most of the data in the NTSB data base were derived from airplanes that crashed under control at speeds in excess of 61 knots. The FAA disagrees. The conclusions found in the NTSB Safety Report "GENERAL AVIATION CRASHWORTHINESS PROJECT: PHASE III—ACCELERATION LOADS AND VELOCITY CHANGES OF SURVIVABLE GENERAL AVIATION ACCIDENTS, NTSB/SR-85/02" are contrary to those comments. In its analyses of airplane accidents, the NTSB relates the airplane impact speeds and respective acceleration levels to the stall speed of the airplanes. All but one of the thirty-nine small airplane accidents analyzed in the report were found to have a stall speed less than 61 knots.

Recent discussions with the NTSB personnel who compiled and analyzed all of the data in the three phase general aviation crashworthiness project also confirmed that, with few exceptions, all of the airplanes included in those studies had stall speeds that did not exceed 61 knots.

One commenter indicates that this amendment would require the means of retention of cabin mass items to be dynamically tested. The commenter also questions the different static ultimate design load factors for cabin mass items found in the emergency landing conditions for part 23 and part 25 airplanes. The FAA does not intend to require dynamic design or test standards for the retention of items of mass within the cabin. The ultimate design load factors for cabin mass items do indeed differ between part 23 and part 25 airplanes. They are representative of the expected emergency landing inertia load factors considering the respective airframe energy absorption characteristics and mass of those different category airplanes. Those differences were recognized and justified when the emergency landing dynamic conditions and respective amendments were adopted. Discussion and justification of those existing regulatory standards are not within the scope of this amendment.

One commenter proposes that the FAA limit the maximum stall speed to 70 knots, limit all the deceleration vectors according to the (stall speed/61 knots) ratio squared, multiply the impact velocity by the factor (V_{so}/61), and amend § 23.787(c) regarding the forward ultimate load factor (9g) for luggage and cargo. This amendment addresses and satisfies the intent of these comments. The amendment increases the occupant impact protection level for those single-engine airplanes and certain multiengine airplanes with a stall speed that exceeds the 61 knot limitation.

The design standards found in this amendment remain within the limits of the small airplane impact survivability envelope. The commenter's proposal, however, could provide design standards that would be outside the small airplane's impact survivability envelope. Furthermore, the applicability and the feasibility of the FAA's increased standard have been demonstrated by both seat dynamic and full scale airplane impact tests.

The commenter provides no rationale to limit the stall speed to 70 knots. This amendment does not limit the stall speed, but it does increase the deceleration vectors, as suggested by the commenter, for the combined vertical/longitudinal emergency landing dynamic impact condition. The new regulation represents the current limit of the impact survivability envelope for small airplanes. This limit has been defined by crash dynamics research and NTSB accident data, and it is consistent with the results of full scale impact tests of small airplanes.

The FAA has not elected to increase the impact velocity, as suggested by the commenter, since the current velocity changes found in the emergency landing dynamic conditions are consistent with the survivability envelopes for small airplanes.

In addition, the commenter provides no justification to increase the inertia load requirements found in § 23.787(c). The commenter's proposal is considered beyond the scope of this amendment. However, the FAA is increasing the static design requirements for items of mass within the cabin, which include luggage and cargo, when the emergency landing dynamic conditions are adopted. Amendment 23-36 should meet the intent of the commenter's proposal. This proposal is adopted as proposed.

Paperwork Reduction Act

There are no reporting and recordkeeping requirements associated with this final rule.

Regulatory Evaluation Summary

This section summarizes the full regulatory evaluation prepared by the FAA that provides more detailed estimates of the economic consequences of this regulatory action. This summary and the full evaluation quantify, to the extent practicable, estimated costs to the private sector, consumers, Federal, State, and local governments, as well as anticipated benefits.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if potential benefits to society for each regulatory change outweigh potential costs. The order also requires the preparation of a Regulatory Impact Analysis of all "major" rules except those responding to emergency situations or other narrowly defined exigencies. A "major" rule is one that is likely to result in an annual increase in consumer costs, a significant adverse effect on the economy of $100 million or more, a major increase in consumer costs, or a significant adverse effect on competition.

The FAA has determined that this rule is not "major" as defined in the executive order; therefore, a full regulatory analysis, which includes the identification and evaluation of cost-reducing alternatives to this rule, has not been prepared. Instead, the agency has prepared a more concise document termed a regulatory evaluation that analyzes only this rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains the regulatory flexibility determination required by the Regulatory Flexibility Act (RFA) and an International Trade Impact assessment. If more detailed economic information is desired, the reader may refer to the full regulatory evaluation contained in the docket.

Two comments were received concerning the economic aspects of this rulemaking. These comments were considered and no changes were made to the economic evaluation as a result of the comments. The reader is referred to the "Discussion of Comments" section above for more complete information.

Economic Evaluation

The FAA has determined that significantly more efficient airplanes could be developed by employing the advantages of higher wing loadings if the affected airplanes were not limited to a stall speed of 61 knots. The potential benefits of removing the stall speed limit will vary with the mission of individual airplane designs, but case specific analysis has shown that a 20 percent gain in specific fuel consumption could be achieved. Evidence suggests that these high-wing-loading efficiencies could also be accomplished by incorporating a very high-lift flap system (wide-span trailing edge flaps and leading edge Kruger flaps) and still remain within the 61-knot limit. However, if higher wing loadings were combined with larger and more complex high-lift flap systems in order to meet the 61-knot requirement, there would be accompanying penalties in low speed handling qualities. These penalties would have a detrimental effect on both normal and emergency operations in approach and landing conditions.

In order to retain the current level of airplane occupant protection, this rule requires additional occupant protection for the airplanes that the rule allows to be certificated with stall speeds above 61 knots. Specific estimates of the potential structural and weight penalty costs that could be incurred are design specific and are not available for this evaluation. Three petitions for exemption from the 61-knot stall speed requirement have been granted during the past ten years. None of these exemptions can be used to assist in the estimation of costs that would be incurred to exercise the option afforded by this rule. The concept design for one of the three airplane models was never pursued. The physical structures of the other two airplanes (a fire-fighting tanker and a high performance, fully aerobatic airplane) already substantially met the conditions and limitations necessary for the exemptions prior to their petitions.

The additional crashworthiness and occupant protection of the aerobatic airplane was necessitated by the loads that would be sustained in achieving its high-performance mission. Similarly, the occupant protection and crashworthiness features of the fire tanker were necessary for the airplane's intended high-risk operating environment and by the additional structure required to support and deliver a large volume of liquid.

None of the petitions isolated the costs that would be incurred to meet the conditions attendant to their exemptions. Conversely, one applicant did estimate that the cost necessary to build an airplane with the same design mission without the exemption would be approximately 50 percent higher per unit.

The provisions afforded by the rule are optional and constitute an alternative to the existing requirement. By definition, this alternative, including any associated costs, will be exercised only by those applicants who have determined that it would be in their own best interests to do so. The rule provides the option of selecting the combination of stall speed and occupant protection enhancement that the applicant has determined would be most cost beneficial and best suited for its particular airplane design. Therefore, the FAA finds that the potential benefits of this rule will exceed the expected costs.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 was enacted by Congress to ensure that small entities are not unnecessarily or disproportionately burdened by Government regulations. The RFA requires a Regulatory Flexibility Analysis if a rule will have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, establishes threshold cost values and small entity size standards for complying with RFA review requirements in FAA rulemaking actions. The FAA has determined that this amendment to part 23 will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The provisions of this rule will have little or no impact on trade for both U.S. firms doing business in foreign countries and foreign firms doing business in the United States. In the United States, foreign manufacturers must meet U.S. requirements, and thus they will gain no competitive advantage. In foreign countries, U.S. manufacturers are not bound by part 23 requirements and could, therefore, implement the alternative provision afforded by the rule solely on the basis of competitive considerations.

Federalism Implications

The regulations adopted herein will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA is revising the airworthiness standards to permit single-engine and certain multiengine small airplanes of less than 6,000 pounds maximum weight to exceed the present 61-knot stall speed limitation. Airplane designs exceeding this limitation will be required to incorporate additional occupant protection to compensate for the higher kinetic energy that must be dissipated during emergency landings. This retains the current level of airplane occupant protection and permits the design and type certification of higher performance, single-engine airplanes capable of attaining an increase in cruise speeds with better specific fuel consumption. This improvement in performance and operating economics cannot be achieved without substantial increased cost and complexity if these designs are constrained by the present 61-knot stall speed limitation.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Flexibility Determination and the International Trade Impact Analysis, the FAA has determined that this regulation is not major under Executive Order 12291. In addition, the FAA certifies that this regulation will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This regulation is not considered significant under DOT Regulatory

Policies and Procedures (44 FR 11034; February 26, 1979). A regulatory evaluation of the regulation, including a Regulatory Flexibility Determination and International Trade Impact Analysis, has been placed in the docket. A copy may be obtained by contacting the person identified under "FOR FURTHER INFORMATION CONTACT."

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends part 23 of the Federal Aviation Regulations (14 CFR part 23) as follows:

PART 23—AIRWORTHINESS STANDARDS: NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

1. The authority citation for part 23 continues to read as follows:

Authority: 49 U.S.C. 1344, 1354(a), 1355, 1421, 1423, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g).

2. Section 23.49 is amended by revising paragraph (b) introductory text; by redesignating paragraphs (c), (d), and (e) as paragraphs (d), (e), and (f), respectively; and by adding a new paragraph (c) to read as follows:

§ 23.49 Stalling speed.

* * * * *

(b) Except as provided in § 23.49(c), V_{SO} at maximum weight may not exceed 61 knots for—

* * * * *

(c) All single-engine airplanes, and those multiengine airplanes of 6,000 pounds or less maximum weight with a V_{SO} of more than 61 knots that do not meet the requirements of § 23.67(b)(2)(i), must comply with § 23.562(d).

* * * * *

3. Section 23.67 is amended by revising paragraphs (b)(1) and (b)(2) to read as follows:

§ 23.67 Climb: One engine inoperative.

* * * * *

(b) * * *

(1) Each airplane of more than 6,000 pounds maximum weight must be able to maintain a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet at a speed not less than 1.2 V_{S1} and at standard temperature (41°F) with the airplane in the configuration prescribed in paragraph (a) of this section.

(2) For each airplane of 6,000 pounds or less maximum weight, the following apply:

(i) Each airplane that meets the requirements of § 23.562(d), or that has a V_{SO} of 61 knots or less, must have its steady climb gradient determined at a pressure altitude of 5,000 feet at a speed of not less than 1.2 V_{S1}, and at standard temperature (41°F), with the airplane in the configuration prescribed in paragraph (a) of this section.

(ii) Except for those airplanes that meet the requirements prescribed in § 23.562(d), each airplane with a V_{SO} of more than 61 knots must be able to maintain the steady climb gradient prescribed in paragraph (b)(1) of this section.

* * * * *

4. Section 23.562 is amended by revising the first sentence of the introductory text of paragraph (b), by redesignating paragraph (d) as paragraph (e), and by adding a new paragraph (d) to read as follows:

§ 23.562 Emergency landing dynamic conditions.

* * * * *

(b) Except for those seat/restraint systems that are required to meet paragraph (d) of this section, each seat/restraint system for crew or passenger occupancy in a normal, utility, or acrobatic category airplane, must successfully complete dynamic tests or be demonstrated by rational analysis supported by dynamic tests, in accordance with each of the following conditions. * * *

* * * * *

(d) For all single-engine airplanes with a V_{SO} of more than 61 knots at maximum weight, and those multiengine airplanes of 6,000 pounds or less maximum weight with a V_{SO} of more than 61 knots at maximum weight that do not comply with § 23.67(b)(2)(i):

(1) The ultimate load factors of § 23.561(b) must be increased by multiplying the load factors by the square of the ratio of the increased stall speed to 61 knots. The increased ultimate load factors need not exceed the values reached at a V_{SO} of 79 knots. The upward ultimate load factor for acrobatic category airplanes need not exceed 5.0g.

(2) The seat/restraint system test required by paragraph (b)(1) of this section must be conducted in accordance with the following criteria:

(i) The change in velocity may not be less than 31 feet per second.

(ii)(A) The peak deceleration (g_p) of 19g and 15g must be increased and multiplied by the square of the ratio of the increased stall speed to 61 knots:

$g_p=19.0\ (V_{SO}/61)^2$ or $g_p=15.0\ (V_{SO}/61)^2$

(B) The peak deceleration need not exceed the value reached at a V_{SO} of 79 knots.

(iii) The peak deceleration must occur in not more than time (t_r), which must be computed as follows:

$$t_r = \frac{31}{32.2(g_p)} = \frac{.96}{g_p}$$

where—

g_p=The peak deceleration calculated in accordance with paragraph (d)(2)(ii) of this section

t_r=The rise time (in seconds) to the peak deceleration.

* * * * *

Issued in Washington, DC on July 7, 1993.

Joseph M. Del Balzo,

Acting Administrator.

[FR Doc. 93–16917 Filed 7–16–93; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. 27358; Notice No. 93–9]

RIN 2120–AD42

Fatigue Evaluation of Structure

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice proposes to amend the fatigue requirements for damage-tolerant structure on transport category airplanes to require: Full-scale fatigue testing; and inspection thresholds based on a crack growth from likely initial manufacturing defects in the structure. These proposed changes are needed to ensure continued airworthiness of structures designed to the current damage tolerance requirements. The proposals are intended to ensure that should serious fatigue damage occur within the operational life of the airplane, the remaining structure can withstand loads that are likely to occur, without failure, until the damage is detected.

DATES: Comments must be received on or before November 16, 1993.

ADDRESSES: Comments on this proposal may be mailed in triplicate to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket (AGC–10), Docket No. 27358, 800 Independence Avenue SW., Washington, DC 20591, or delivered in triplicate to: Room 915G, 800 Independence Avenue SW., Washington, DC 20591. Comments delivered must be marked: Docket No. 27358. Comments may be inspected in room 915G weekdays, except Federal holidays, between 8:30 a.m. and 5 p.m. In addition, the FAA is maintaining an information docket of comments in the Office of the Assistant Chief Counsel (ANM–7), FAA, Northwest Mountain Region, 1601 Lind Avenue SW., Renton, Washington 98055–4056. Comments in the information docket may be inspected in the Office of the Assistant Chief Counsel weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

FOR FURTHER INFORMATION CONTACT: Rich Yarges, FAA, Airframe and Propulsion Branch (ANM–112), Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98055–4056; telephone (206) 227–2143.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in this proposed rulemaking by submitting such written data, views, or arguments as they desire. Comments relating to the environmental, energy, or economic impact that might result from adopting the proposals contained in this notice are invited. Substantive comments should be accompanied by cost estimates. Commenters should identify the regulatory docket or notice number and submit comments, in triplicate, to the Rules Docket address specified above. All comments received on or before the closing date for comments will be considered by the Administrator before taking action on this proposed rulemaking. The proposals contained in this notice may be changed in light of comments received. All comments will be available in the Rules Docket, both before and after the closing date for comments, for examination by interested persons. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments must submit with those comments a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. 27358." The postcard will be date stamped and returned to the commenter.

Availability of NPRM

Any person may obtain a copy of this Notice of Proposed Rulemaking (NPRM) by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Information Center, APA–230, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267–3484. Communications must identify the notice number of this NPRM. Persons interested in being placed on a mailing list for future rulemaking documents should also request a copy of Advisory Circular No. 11–2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedures.

Background

Prior to 1978, regulations related to the fatigue evaluation of airplane structure allowed a choice between safe-life and fail-safe criteria. Safe-life design criteria require the structure to withstand repeated loads of variable magnitude expected during its service life without developing detectable cracks. This requires full-scale fatigue testing to a predetermined number of lifetimes. Fail-safe design criteria require the structure to be evaluated to assure that catastrophic failure is not probable after fatigue failure or obvious partial failure of a single, principal structural element.

Most primary structure was designed to the fail-safe criteria. The residual strength load levels for structure designed to the fail-safe criteria were 92 percent of the required design load conditions (80 percent multiplied by a 1.15 factor to account for dynamics of the failure). It was acceptable practice to show compliance with the fail-safe requirements by substantiating the structures under static loading conditions with failure or obvious partial failure of single principal structural elements. Although inspections for continued airworthiness were required for the fail-safe structure, there was no specific requirement to determine the inspection periods based on crack growth or remaining life of secondary structure in the event failure in the primary member was not immediately obvious.

In December 1978 the Federal Aviation Administration (FAA) amended the fatigue evaluation requirements for transport category airplanes (§ 25.571, as amended by Amendment 25–45; 43 FR 46238, October 5, 1978) to require damage tolerance evaluation of structure. The damage tolerance evaluation of structure is intended to ensure that, should serious fatigue, corrosion, or accidental damage occur within the operational life of the airplane, the remaining structure can withstand reasonable loads without failure or excessive structural deformation until the damage is detected. Amendment 25–45 was prompted by significant state-of-the-art developments and current industry practice in the area of fatigue and damage tolerance evaluation of transport category airplane structure. The damage tolerance evaluation was deemed necessary to more directly relate the required structural inspection program to the damage-tolerant characteristics of the airplane. A companion advisory circular (AC 25.571–1) was also issued that outlined an acceptable means of compliance. A more recent revision to § 25.571, Amendment 25–54, changed the reporting procedure for documenting the fatigue evaluation requirements, but it did not change the damage tolerance criteria of Amendment 25–45.

Section 25.571, as amended by Amendment 25–45, requires that structure be damage-tolerant, unless it can be established that damage tolerance is impractical. The residual strength level was increased to 100 percent of limit load, and the 1.15 factor for dynamic failure was removed. The inspection program for continued airworthiness is based on crack propagation and residual strength data. Amendment 25–45 also added a requirement to consider multiple site damage. The criteria for safe-life substantiation of structure was not changed by Amendment 25–45, but the extent of applicability was limited.

Some of the principles of damage tolerance criteria, as defined in Amendment 25–45, have been applied retroactively to the existing fleet of aging transport airplanes. Supplemental Inspection Documents (SID) based on damage tolerance analyses of the principal structural elements have been developed for several models of transport airplanes. These documents were made mandatory by airworthiness directive action.

There have been several incidents of failure in flight-critical structure due to fatigue cracks progressing simultaneously in several locations in the structure, such as along rows of fastener holes in skin panels. The panels failed because the fail-safe residual strength capability, for which the airplane was originally designed, was degraded by the presence of widespread, multiple-site fatigue cracking of less than readily detectable size. This phenomenon of multiple-site cracking due to fatigue damage has been a problem in the past and is expected to continue to be a problem until measures are taken in the design and testing of structure to ensure that widespread, multiple-site cracking will not occur in service during the design lifetime of the airplane.

Discussion

The requirements for damage tolerance evaluation of structures contained in § 25.571 are written in terms of general objectives so as to allow manufacturers latitude in developing methods to demonstrate compliance. Because the requirements are stated in objective terms, manufacturers have experienced difficulty in judging the scope of the evaluation necessary for certification. For instance, the rule requires consideration of damage at multiple sites due to prior fatigue exposure where the design is such that this type of damage can be expected to occur. This is an objective requirement that provides no specific guidance on what is required for showing compliance.

Service experience has shown that widespread multiple site and other types of fatigue damage have occurred in parts of several transport category airplanes before the airplanes reached their design lifetime. Reliance on repeated detailed inspections along for continued airworthiness has not resulted in an acceptable level of safety for these parts. The more widespread the cracking problem becomes, the greater the probability that significant cracks may go undetected. Generally the overall reliability of any inspection program diminishes when time-consuming, detailed procedures required to find many small cracks increase the workload of the inspector. For this reason, it becomes impractical to inspect for safety when the damage becomes widespread. The FAA has therefore concluded that the most appropriate way to ensure continued safety in structure is to reinforce the existing damage tolerance criteria by requiring sufficient testing to demonstrate the absence of widespread multiple site and other types of fatigue cracking within the design life of the airplane. Generally, the FAA considers that, for conventional metal structure, full-scale testing for at least two design lifetimes would normally be sufficient to demonstrate that widespread multiple site cracking will not occur. Such testing would be conducted under simulated flight-by-flight operational loading spectra. Additional fatigue testing may be necessary for unconventional structure or structure made from composite materials. A detailed inspection after the full-scale testing has been completed is necessary to verify the absence of multiple-site fatigue damage. The detailed inspection could include pulling open a number of fastener holes to perform an examination, using an electron microscope, of fracture surfaces in representative areas to determine if any widespread, multiple-site damage is present. It may not be necessary to complete the fatigue testing prior to issuance of the type of certificate, provided the approval is based on a previously approved test plan and sufficient testing to establish that fatigue problems will not arise during the period required for completion of the test. If subsequent testing reveals longer term fatigue problems, they can be addressed by means of airworthiness directives or other means of ensuring continuing airworthiness. The FAA is in the process of revising Advisory Circular 25.571–1A to provide additional guidance on acceptable means of compliance with these proposed requirements.

The current regulations do not prescribe criteria for establishing thresholds for the detailed structural inspection program. In the past, initial inspections were established based on service experience on similar type airplanes; but they did not account for premature failures due to undetected manufacturing defects (rogue flaws). The primary concern in establishing thresholds for inspections is in establishing the threshold early enough to detect cracks before they result in failures. Theoretically, perfect parts that have been fatigue tested for the expected operational life of the airplane, using a conservative loading spectrum and factors, would not fail throughout the operational life of the airplane. Service history, however, shows that parts are not always perfect as installed and do fail prematurely due to initial undetected defects. The FAA therefore concludes that it is necessary to account for undetected manufacturing defects when establishing thresholds for inspections. Initial inspection thresholds should be established based on cracks growing from likely defects developed during manufacture such as machining marks, improper installation of fasteners, etc. This should be substantiated by crack growth analyses and supported by test evidence. Under the fail-safe design philosophy, heavy reliance is placed on the fact that fatigue cracks, including those resulting from rogue flaws, will become obvious before they become critical because of the required redundancy of structural load paths. This practice is not appropriate for structures designed to the current damage tolerance requirements because cracks may not necessarily become obvious before they become critical.

The proposed regulation would require that inspection thresholds be established based on crack growth data. This would prevent cracks that emanate from initial defects incurred during manufacture from reaching unsafe dimensions within the interval established for the inspection threshold.

Three minor changes to § 25.571 are also proposed in this notice. The purposes of these changes are to clarify existing rules for consistency with current interpretations to achieve consistency with the corresponding requirements of Joint Airworthiness Requirements-25 (JAR–25). (JAR–25 has been adopted by a number of European countries as an acceptable basis for type certification of transport category airplanes. It is based on part 25 of the FAR; however, it does differ from part 25 in a number of specific areas.) Because American and European manufacturers are required to meet the standards of both part 25 and JAR–25 if they are to sell airplanes worldwide, there is an attempt within the international community to harmonize the two documents wherever possible. The following proposed changes have been requested by both the American and European manufacturers.

Section 25.571(b)(1) would be amended to clarify that all speeds up to V_c (design cruising speed) must be investigated. This is only a clarification because § 25.337, which is referenced in § 25.571(b)(1), already requires consideration of speeds up to V_c.

Section 25.571(b)(5)(ii) would be changed to specify a cabin pressure differential of 1.15 times the normal operating differential pressure in lieu of the present factor of 1.1. This change would make the sentence identical to the corresponding JAR rule. Although it would be slightly more stringent than the current FAR rule, both the domestic and foreign manufacturers support the proposed change.

Amendment 25–45 introduced a requirement in § 25.571(e)(1) that the aircraft structure must successfully withstand the impact of a four-pound bird at "likely operational speeds at altitudes up to 8,000 feet." For clarity and consistency with other bird strike standards, this section was amended by Amendment 25–72 to refer to "V_c at sea level." Since the adoption of Amendment 25–72, a manufacturer has attempted to circumvent the intent of the rule by proposing an unrealistically low V_c at sea level. In order to ensure that the intended level of safety will be maintained, § 25.571(e)(1) would be amended further to specify "V_c at sea level or 0.85 V_c at 8,000 feet, whichever is more critical." (In terms of true airspeed, 0.85 V_c at 8,000 feet is approximately equal to V_c at sea level.)

The proposed amendment would apply only to future transport category airplanes for which an application for type certificate is made after the effective date of the amendment. Although no retrofit requirement is proposed in this notice, the FAA is considering separate rulemaking action to require that certain provisions of this proposed rule be made applicable to the current fleet of aging airplanes.

Regulatory Evaluation

The FAA has conducted a draft regulatory evaluation of the proposal to amend the fatigue testing requirements for transport category airplanes to require: (1) Full-scale fatigue testing, and (2) inspection thresholds based on crack growth from likely initial manufacturing defects in an affected airplane structure.

Executive Order 12291 dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if the potential benefits to society from the regulatory change outweigh the potential costs it would impose on the industry. The order also requires the preparation of a draft regulatory impact analysis of all "major" proposals, except those responding to emergency situations or other narrowly defined exigencies. A "major" proposal is one that is likely to result in an annual affect on the economy of $100 million or more, a major increase in consumer costs, a significant adverse affect on competition or is highly controversial.

The FAA has determined that this regulatory action is not a "major" action as defined in the executive order, so a full draft regulatory impact analysis identifying and evaluating alternative proposal has not been prepared. A more concise draft regulatory evaluation has been prepared, however, that includes estimates of the economic impact of this regulation. This draft regulatory evaluation is included in the docket and quantifies, to the extent practicable, estimated costs to the private sector, to consumers, and to Federal, State, and local governments, as well as estimated anticipated economic costs.

The reader is referred to the draft regulatory evaluation for the complete detailed analysis. This section contains only a summary of the draft regulatory evaluation. This section also contains only an initial regulatory flexibility determination as required by the Regulatory Flexibility Act of 1980 and a trade impact assessment.

Costs

The proposed regulations would codify the current practices of Part 25 airplane manufactures. At present, transport airplane manufactures are voluntarily subjecting all new model airplanes to the full-scale testing equivalent of two lifetimes under simulated flight-by-flight operational loading spectra. For example, this practice has been or will be followed in the certification of the Boeing Model 757, 767, and 777; the McDonnell Douglas MD–11; and the Airbus A320, A330, and A340. The FAA is not aware of any new model transport airplanes certificated in the last ten years that have not been subjected to this practice. The proposed regulations would ensure the continuation of this practice, clarify the testing and inspection requirements, and establish a uniform minimum standard throughout the industry, both for conducting the fatigue tests and for establishing inspection procedures. Therefore little, if any, incremental costs would be incurred by the industry as a result of the proposed regulations.

Nevertheless, part 25 airplane manufacturers, as a result of the proposed rules, would be denied an option currently available to them and, thus, would no longer be able to avoid the cost of performing the proposed fatigue tests. The costs of the proposed fatigue tests are estimated to average $55 million per certification. These costs consist of $20 million for test equipment and for 400,000 man hours necessary to set up and test the airplane, and about $35 million for an airplane that would be destroyed by the tests. These costs are based on the experience of a manufacturer that recently conducted a full-scale test equivalent to two lifetimes under simulated flight-by-flight operational loading spectra on one of its new model airplanes.

Benefits

The proposed rules are necessary to ensure the continued airworthiness of future airplanes. The intent of the proposed rules is to keep fatigue failures at a minimum in future airplanes and, in instances where a future critical flight structure may suffer a fatigue failure, guarantee that the airplane will continue to fly safely until the failure is detected.

A review of National Transportation Safety Board (NTSB) accident records reveals that during the period between 1974 and 1988, a total of 34 non-engine related fatigue accidents occurred involving 2,754 passengers and crewmembers. Miraculously, only 4 persons were fatally injured and 11 sustained minor injuries. These accidents involved airplanes as large as a Boeing 747 carrying 263 passengers and crewmembers. Therefore, the accidents could have been considerably more catastrophic than they proved to be. In addition, normal inspections of airplanes during maintenance procedures have revealed countless instances of fatigue cracks that, had they gone undetected, could have resulted in catastrophic accidents.

The proposed rules would have to prevent accidents that otherwise would result in 25 fatalities per new model of airplane for the benefits of the proposed rules to outweigh the costs. This assumes a value of $1.5 million per statistical fatality avoided,[1] no non-fatal

[1] In order to provide the public and government officials with a benchmark comparison of the expected safety benefits of rulemaking actions over an extended period of time with estimated costs in dollars, the FAA currently uses a value of $1.5 million to represent a statistical human fatality avoided. This is in accordance with guidelines

injuries, and $17.5 million as an expected allowance for loss of the airplane. The FAA believes that the existing accident record, plus the results of many inspections for fatigue cracks, has clearly demonstrated that the proposed rules are necessary to assure the extended airworthiness of future transport category airplanes. The prevention of just one catastrophic accident per new airplane design would produce benefits outweighing the cost of the proposal. Therefore, the agency believes that this action would be cost beneficial.

International Trade Impact Assessment

The proposal is unlikely to have any impact on international trade. U.S. airplane manufacturers are already performing the fatigue tests on their new models of transport category airplane that would be affected by the proposed rules, as are foreign manufacturers of this category of airplane.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by government regulations. The RFA requires agencies to review rules that may have "a significant economic impact on a substantial number of small entities." Since the Act applies to U.S. entities, only U.S. manufacturers of transport category airplanes would be affected.

In the United States, there are two manufactures that specialize in commercial transport category airplanes, The Boeing Company and McDonnell Douglas Corporation. In addition, there are a number of others that specialize in the manufacture of other transport category airplanes, such as those designed for executive transportation. These are Cessna Aircraft Corporation, Beech Aircraft Corporation, Gulfstream American Corporation and Gates Learjet Corporation.

The FAA size threshold for a determination of a small entity for U.S. airplane manufacturers is 75 employees; any manufacturer with more than 75 employees is not considered to be a small entity. None of the present U.S manufacturers of transport category airplanes can be considered a small entity; therefore, this proposed rule would not have a "significant economic impact on a substantial number of small entities," and no review is required in this regard by the RFA.

Federalism Implications

The regulations proposed herein would not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

Because the regulations proposed herein are expected to result only in negligible costs, the FAA has determined that this proposed rule is not major as defined in Executive Order 12291. This proposed rule is considered to be significant, as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034, February 26, 1979), as it involves an issue on which there has been considerable public interest. In addition, since there are no small entities affected by this rulemaking, it is certified, under the criteria of the Regulatory Flexibility Act, that this proposed rule, at promulgation, would not have a significant economic impact, positive or negative, on a substantial number of small entities. A copy of the initial regulatory evaluation prepared for this proposed rule may be obtained by contacting the person identified under "FOR FURTHER INFORMATION CONTACT."

List of Subject in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The Proposed Amendment

Accordingly, the Federal Aviation Administration (FAA) proposes to amend 14 CFR part 25 of the Federal Aviation Regulations (FAR) as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. The authority citation for part 25 continues to read as follows:

Authority: 49 U.S.C. app. 1344, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g); and 49 CFR 1.47(a).

2. By amending § 25.571 by revising the introductory text of paragraph (a), and paragraphs (a)(3), (b) introductory text, (b)(1), (b)(5)(ii), and (e)(1) to read as follows:

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

(a) *General.* An evaluation of the strength, detail design, and fabrication must show that catastrophic failure due to fatigue, corrosion, manufacturing defects, or accidental damage, will be avoided throughout the operational life of the airplane. This evaluation must be conducted in accordance with the provisions of paragraphs (b) and (e) of this section, except as specified in paragraph (c) of this section, for each part of the structure that could contribute to a catastrophic failure (such as wing, empennage, control surfaces and their systems, the fuselage, engine mounting, landing gear, and their related primary attachments). For turbojet powered airplanes, those parts that could contribute to a catastrophic failure must also be evaluated under paragraph (d) of this section. In addition, the following apply:

* * * * *

(3) Based on the evaluations required by this section, inspections or other procedures must be established, as necessary, to prevent catastrophic failure, and must be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness required by § 25.1529. These procedures must include thresholds for inspections that are based on analyses and tests considering the damage tolerance design concept, manufacturing quality, and susceptibility to in-service damage.

(b) *Damage-tolerance (fail-safe) evaluation.* The evaluation must include a determination of the probable locations and modes of damage due to fatigue, corrosion, or accidental damage. The determination must be made by analysis supported by test evidence and (if available) service experience. Damage at multiple sites due to prior fatigue exposure must also be included where the design is such that this type of damage is expected to occur. The evaluation must include repeated loads and static analyses supported by full-scale test evidence. Sufficient full-scale testing must be accomplished to ensure that widespread multiple-site damage will not occur within the design lifetime of the airplane. The extent of damage for residual strength evaluation at any time within the operational life must be consistent with the initial detectability and subsequent growth under repeated loads. The residual strength evaluation must show that the remaining structure is able to withstand loads (considered as static ultimate loads) corresponding to the following conditions:

Issued by the Office of the Secretary of Transportation dated June 22, 1990.

(1) The limit symmetrical maneuvering conditions specified in § 25.337 at all speeds up to V_c and in § 25.345.

* * * * *

(5) * * *

(ii) The maximum value of normal operating differential pressure (including the expected external aerodynamic pressures during 1g level flight) multiplied by a factor of 1.15, omitting other loads.

* * * * *

(e) * * *

(1) Impact with a 4-pound bird when the velocity of the airplane relative to the bird along the airplane's flight path is equal to V_c at sea level or $0.85V_c$ at 8,000 feet, whichever is more critical.

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Issued in Washington, DC, on Wednesday, July 7, 1993.

Thomas E. McSweeny,

Acting Director, Aircraft Certification Service.

[FR Doc. 93–16916 Filed 7–16–93; 8:45 am]

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