Federal Aviation Administration
Aviation Rulemaking Advisory Committee

General Aviation Certification and Operations Issue Area
JAR/FAR 23 Harmonization Working Group

Task 6 – Disposition of Comments to NPRM 94-19, 94-20 and 94-22

Task Assignment

[Federal Register: April 13, 1995 (Volume 60, Number 71)]
[Notices]
[Page 18874-18875]
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DEPARTMENT OF TRANSPORTATION

Aviation Rulemaking Advisory Committee; General Aviation and Business Airplane Issues--New Task

AGENCY: Federal Aviation Administration (**FAA**), DOT.

ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC).

SUMMARY: Notice is given of a new task assigned to and accepted by the Aviation Rulemaking Advisory Committee (ARAC). This notice informs the public of the activities of ARAC.

FOR FURTHER INFORMATION CONTACT:
Mr. John Colomy, Assistant Executive Director, Aviation Rulemaking Advisory Committee, **FAA** Small Airplane Directorate, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426-6930.

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SUPPLEMENTARY INFORMATION:

Background

The **FAA** has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the **FAA** Administrator, through the Associate Administrator for Regulation and Certification, on the full range of the **FAA**'s rulemaking activities with respect to aviation--related issues. This includes obtaining advice and recommendations on the **FAA**'s commitment to harmonize its Federal Aviation Regulations (FAR) and practices with its trading partners in Europe and Canada.

One area ARAC deals with is general aviation and business airplane issues. These issues involve the airworthiness standards for small and commuter category airplanes in 14 CFR part 23 and parallel provisions in 14 CFR parts 91 and 135.

The Task

This notice is to inform the public that the **FAA** has asked ARAC to provide advise and recommendation on the following harmonization task:

Recommend disposition of comments made to Notices of Proposed Rulemaking (NPRM) Nos. 94-19, 94-20, and 94-22, which propose to harmonize 14 CFR part 23 with the Joint Aviation Requirements (JAR) 23. If ARAC determines rulemaking documents or advisory circulars are appropriate to dispose of these comments, those documents should be developed by ARAC along with the proper justification and any legal and economic analysis. Harmonize any resulting Federal Aviation Regulations with the Joint Aviation Requirements.

ARAC Acceptance of Task

ARAC has accepted the task and has chosen to assign it to the existing JAR/FAR 23 Harmonization Working Group. As a result of the new task assigned to the working group, membership is being reopened. The working group will serve as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working group's recommendations, if forwards them to the **FAA** as ARAC recommendations.

Working Group Activity

The JAR/FAR 23 Harmonization Working Group is expected to comply with the procedures adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a work plan for completion of the tasks, including the rationale supporting such a plan, for consideration at the meeting of ARAC to consider general aviation and business airplane issues held following publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with the work stated in item 3 below.
3. For each task, draft appropriate regulatory documents with supporting economic and other required analyses, and/or any other related guidance material or collateral documents the working group determines to be appropriate; or, if new or revised requirements or compliance methods are not recommended, a draft report stating the rationale for not making such recommendations.
4. A status report at each meeting of ARAC held to consider general aviation and business airplane issues.

Participation in the Working Group

The JAR/FAR 23 Harmonization Working Group is composed of experts from those organizations having an interest in the assigned task. A working group member need not be a representative of a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the tasks, and stating the expertise he or she would bring to the working group. The request will be reviewed by the assistant chair, the assistant executive director, and the working group chair, and the individual will be advised whether or not the request can be accommodated.

The Secretary of Transportation has determined that the formation and use of ARAC are necessary and in the public interest in connection with the performance of duties imposed on the **FAA** by law.

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the JAR/FAR 23 Harmonization Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on April 10, 1995.
Chris A. Christie,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 95-9153 Filed 4-12-95; 8:45 am]
BILLING CODE 4910-13-M

Recommendation Letter

RAA
Regional Airline Association
1200 19th Street, NW • Suite 300 • Washington, DC 20036-2401 • 202 857-1170 • FAX 202 429-5113 • ARINC "WASRAXD"

August 16, 1995

Mr. Anthony J. Broderick
Associate Administrator, Regulation and Certification
FEDERAL AVIATION ADMINISTRATION - AVR - 1
800 Independence Avenue, SW
Washington, D. C. 20591

Subject: ARAC Task - Harmonization of CFR Part 23; Disposition of Comments
Reference: Your letter dated February 3, 1995, to Mr. Bernard Brown

Dear Mr. Broderick:

ARAC has completed its task to recommend disposition of comments made to NPRM's 94-19, 94-20, and 94-22.

The chairman of the ARAC working group, Mr. Jim Dougherty, reported at a meeting of ARAC General Aviation/Business Airplane Issues today that all comments received have been coordinated with the Joint Aviation Authorities (JAA) and resolved. Based on that report, ARAC has accepted the working group's recommendations.

Draft final rules, which have also received FAA Legal and Economic approval, are hereby transmitted to you for implementation.

Sincerely,

William C. Keil
Assistant Chair (Acting)
ARAC General Aviation/Business Airplane Issues

attachments

Acknowledgement Letter

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

SEP - 6 1995

Mr. William C. Keil
Regional Airline Association
1200 19th Street, NW
Suite 300
Washington, DC 20036-2401

Dear Mr. Keil:

Thank you for your August 16 letter forwarding the Aviation Rulemaking Advisory Committee (ARAC) recommendations to harmonize the Joint Aviation Requirements (JAR)/Federal Aviation Regulations (FAR) Part 23 airframe, flight, and powerplant regulations.

The recommendations were submitted in a format suitable for processing and, therefore, will be presented to Federal Aviation Administration (FAA) management as quickly as possible. If management agrees with the recommendations, they will be published in the Federal Register as final rules.

I would like to thank the aviation community for its commitment to ARAC and its expenditure of resources to develop the recommendations. We in the FAA pledge to process them expeditiously as high-priority actions.

Again, let me thank the ARAC and, in particular, the JAR/FAR Part 23 Harmonization Working Group for its prompt action on the tasks the FAA imposed.

Sincerely,

Margaret Gilligan

for Anthony J. Broderick
Associate Administrator for
Regulation and Certification

Recommendation

[4910-13] August 10, 1995

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. 27804; Amendment No. 23-]

RIN 2120-AE60

Airworthiness Standards; Powerplant Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the powerplant airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certificated in these categories. This amendment will provide nearly uniform powerplant airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirements 23, simplifying international airworthiness approval.

EFFECTIVE DATE: [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]

FOR FURTHER INFORMATION CONTACT: Norman Vetter, ACE-111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426-5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94-19 (59 FR 33822). All comments received in response to Notice 94-19 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment pertain to powerplants. Three other final rules are to be issued that pertain to airworthiness standards for systems and equipment (xx FR xxx), **[INSERT PROPER FEDERAL REGISTER CITATIONS]** flight (xx FR xxx), and airframe (xx FR xxx). These related rulemakings are also part of the harmonization effort. Interested persons should review all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the U.S. regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23 and part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeene des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice 94-19 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the powerplant airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR and part 23 harmonization, which ARAC assigned to the JAR 23/FAR 23 Harmonization Working Group. The proposals for powerplant airworthiness standards contained in Notice No. 94-19 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking, and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before October 28, 1994. Four commenters responded to Notice 94-19. Two commenters (Transport Canada and the Air Line Pilots Association) expressed overall support for the proposed changes. The JAA stated its overall support while commenting on specific proposed changes. The fourth commenter (Beechcraft) commented on several specific sections. The specific comments of JAA and Beechcraft are discussed in detail in this document and include an FAA response and a description of any changes to the final rule language. Other minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with the ARAC, and further review by the FAA.

Discussion of Amendments

Section 23.777 Cockpit controls.

The FAA proposed to revise § 23.777(c)(2) so that for single-engine airplanes designed for a single cockpit occupant, the powerplant controls would be located in the same position as they are for airplanes with tandem seats.

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

Section 23.779 Motion and effect of cockpit controls.

The FAA proposed to revise § 23.779(b)(1) by adding a new item, "fuel," to the "motion and effect" table to require that any fuel shutoff control other than mixture must move forward to open.

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

Section 23.901 Installation.

The FAA proposed to revise § 23.901(d)(1), which concerns turbine engine installation and vibration characteristics that do not exceed those established during the type certification of the engine. The FAA proposed to add the word "carcass" before vibration in this paragraph in order to restrict analyses to those vibrations that are caused by external excitation to the main engine frame or "carcass." While the word "carcass" has not traditionally been used in this context in the United States, it is used in Europe and was proposed in the interest of harmonization.

The FAA proposed to revise § 23.901(d)(2) by deleting the last sentence, which reads: "The engine must accelerate and decelerate safely following stabilized operations under these rain conditions." This requirement is already provided for in the first sentence of paragraph (d)(2), which states that the turbine engine must be constructed and arranged to provide "continued safe operation."

The FAA proposed to revise paragraph (e) of this section by adding the word "powerplant" in front of "installation" to make clear that it pertains to all powerplant installations. The FAA proposed to revise paragraph (e)(1) by adding the word "installation" in front of "instruction" to make clear which instructions are applicable.

The FAA proposed that new paragraph (e)(1)(i) contain the requirement for an engine type certificate currently set forth in paragraph (e)(1). The FAA proposed that paragraph (e)(1)(ii) continue the current requirement for a propeller type certificate, and to allow an equivalency finding for certain propellers not type certificated in the United States. This revision was proposed to be consistent with the proposed revisions to § 23.905, Propellers.

No comments were received on the proposals. However, as discussed below, the FAA has determined that the proposed amendment to § 23.905(a) concerning propellers should be withdrawn. Consequently, proposed revisions to § 23.901(e) are no longer appropriate and are being withdrawn.

The proposal is adopted with the above change.

Section 23.903 Engines.

The FAA proposed to revise § 23.903(c) and (g) by adding the headings "Engine isolation" and "Restart capability," respectively, in order to identify the subjects of these paragraphs as is done for the other paragraphs in this section. The FAA also proposed to change the heading of paragraph (f) from "Restart capability" to "Restart envelope" since the paragraph addresses the altitude and airspeed envelope for restarting the engines in flight.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.905 Propellers.

The FAA proposed to revise § 23.905(a) to permit approval, on part 23 airplanes, of propellers by a means other than the currently required type certificate.

Comment: Beechcraft objects to what it characterizes as "an unknown method of compliance." Beechcraft states that it appears that the economic burden of certification would be placed on the end user of the propeller without any guidance as to the means of compliance. Beechcraft asserts that experience indicates that equivalent level of safety findings are very subjective, that propellers would be certificated to various standards, and that this creates a liability for the aircraft manufacturer. Beechcraft believes tht uniform airworthiness standards should be maintained and that "an aircraft manufacturer could not, for economic and liability reasons, afford to purchase a propeller without a type certificate, U.S. or foreign."

FAA Response: The FAA re-evaluated the proposal and determined that public interest would be best served if the proposal were withdrawn. Therefore, the FAA is withdrawing the proposal and will consider it for future rulemaking action.

Section 23.907 Propeller vibration.

The FAA proposed to revise § 23.907(a) to require that propellers "other than a conventional fixed-pitch wooden propeller" be evaluated for vibration. Fixed-pitch wooden propellers are not highly stressed, as are all metal and most composite propeller blades.

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

Section 23.925 Propeller clearance.

The FAA proposed to revise § 23.925 to require that propeller clearance must be evaluated with the airplane at the most adverse combination of weight and center of gravity, and with the propeller in the most adverse pitch position. This revision would make the requirement consistent with current certification practice.

Comment: The JAA pointed out that, under the JAR, the clearances provided in this section are intended to represent minimum values and that it had previously rejected the introductory text language that states "Unless smaller clearances are substantiated. . . ."

FAA Response: The language quoted by the JAA is in present § 23.925 and would not be affected by the proposed change. The FAA acknowledges that the introductory language cited by the JAA has been previously identified as an area of known disharmony between the two sets of regulations that would not be affected by the proposed revisions.

No comments other than the JAA acknowledgement of disharmony were received on the changes proposed for this section in Notice 94-19, and the proposal is adopted as proposed.

Section 23.929 Engine installation ice protection.

The FAA proposed to replace the word "power" in § 23.929 in the phrase "without appreciable loss of power" with the word "thrust" because "thrust" is more descriptive of the loss experienced when ice forms on a propeller.

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

Section 23.933 Reversing systems.

The FAA proposed to revise § 23.933(a)(1) so that these provisions correspond to the turbojet and turbofan reversing system airworthiness standards of part 25.

The FAA also proposed to delete as unnecessary the word "forward" from paragraph (a)(3).

No comments were received on the proposals, and they are adopted as proposed.

Section 23.955 Fuel Flow.

The FAA proposed to revise § 23.955(a) by deleting the word "and" where it occurs between the subparagraphs. Each of the four paragraphs is independent and all of them apply under subparagraph (a).

The FAA also proposed to revise § 23.955(a)(3) by adding the word "probable" so that the requirement would read as follows: "If there is a flow meter without a bypass, it must not have any probable failure mode . . . ." The addition of the word "probable" would clarify the intent of the requirement that only probable failures need be analyzed.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.959 Unusable fuel supply.

The FAA proposed that the text of § 23.959 be redesignated as paragraph (a), and proposed the addition of a new paragraph (b) to require that the effect of any fuel pump failure on the unusable fuel supply be established. This change would not require any change in the fuel quantity indicator marking required by § 23.1553.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.963 Fuel tanks: general.

The FAA proposed to clarify § 23.963(b), which concerns fuel tank liners, by replacing the phrase "must be of an acceptable kind" with the phrase "must be shown to be suitable for the particular application." Also, the FAA proposed to revise the cross reference in this section to coincide with the proposed revision of § 23.959 discussed above.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.965 Fuel tank tests.

The FAA proposed to revise § 23.965(b)(3)(i) by changing the phrase "the test frequency of vibration cycles per minute is obtained by . . ." to "the test frequency of vibration is the number of cycles per minute obtained by . . ." to clarify that it is the number of cycles per minute that is to be used during testing of a fuel tank.

No comments were received on the proposal. After further review of the proposal, however, the FAA determined that the second portion of paragraph (b)(3)(i), which includes the test frequency vibration cycles, should be redesignated as paragraphs (b)(3)(i)(1) and (2), and that the phrase "except that" should be removed and the word "and" added in its place. This would not be a substantive revision.

The proposal is adopted with the above change.

Section 23.973 Fuel tank filler connection.

The FAA proposed to revise § 23.973(f) by removing the language that limits its applicability so that the regulation would apply to all airplanes with turbine engines, including turbine engines that are equipped with pressure fueling systems.

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

Section 23.975 Fuel tank vents and carburetor vents.

The FAA proposed to revise the first sentence of § 23.975(a)(5) to clarify that there may be no point in any vent line where moisture can accumulate unless drainage is provided. The FAA explained that the intent of this requirement is to allow low spots in the fuel tank vent system if a drain is provided for each low spot.

Comment: No comments were received concerning the proposed revision of the first sentence of § 23.975(a)(5). However, the JAA submitted a comment on the second sentence, for which no change was proposed. That sentence currently reads, "Any drain valve installed in the vent lines must discharge clear of the airplane and be accessible for drainage." The JAA's comment is threefold. First, JAA states that, in smaller, less complex part 23 airplanes, whether a vent will remain clear in all phases of operation cannot be guaranteed. Second, JAA states that, on more complex part 23 airplanes, "considerations of inaccessibility during operation of an aircraft when the need for a drain valve has been considered essential, has very often resulted in the acceptance of automatic valves that drain back into the fuel tank." Finally, JAA states that drainage/discharge clear of the airplane is not in accord with environmental concerns.

FAA Response: The FAA has concluded after reviewing the JAA comment and after discussions within the ARAC working group that further clarification of this drainage requirement is appropriate, since the rule language was never intended to limit discharge to an external drain valve. Therefore, the last sentence of § 23.975(a)(5), as adopted, reads "Any drain valve installed must be accessible for drainage."

Section 23.979 Pressure fueling systems.

The FAA proposed to revise § 23.979(b) to require, for commuter category airplanes, an indication at each fueling station of failure of the automatic shutoff means. This revision would make the commuter category automatic shutoff means requirements similar to the requirements for transport category airplanes in § 25.979.

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

Section 23.1001 Fuel jettisoning system.

The FAA proposed to revise § 23.1001(b)(2) to redefine the speed at which the fuel jettisoning system tests should be conducted by referencing § 23.69(b). The JAA states that a comparable change will be made to JAR 23.

No other comments were received, and this proposal is adopted as proposed.

Section 23.1013 Oil tanks.

The FAA proposed to delete the word "crankcase" in § 23.1013(d)(1) to make this paragraph applicable to all engine installations.

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

Section 23.1041 General.

The FAA proposed to revise § 23.1041, under the "Cooling" heading, to require, for all airplanes regardless of engine type, a demonstration of adequate cooling at one maximum ambient atmosphere temperature for which approval is requested.

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

Section 23.1043 Cooling tests.

The FAA stated in the preamble to Notice 94-19 that it proposed to revise § 23.1043(a)(3) to show that the minimum grade fuel requirement applies to both turbine and reciprocating engines and that the lean mixture requirement applies to reciprocating engines only.

The FAA proposed to simplify the introductory text of paragraph (a) by deleting the requirement that compliance must be shown "under critical ground, water, and flight operating conditions to the maximum altitude for which approval is requested" since this requirement is already contained in § 23.1041.

The FAA proposed to improve the organization of the section by moving to paragraph (a)(4) the requirement in the introductory text of paragraph (a) that for turbocharged engines, each turbocharger must be operated through the part of the climb profile for which turbocharger operation is requested.

The FAA proposed a non-substantive change to paragraph (a)(1) to make it consistent with proposed changes to § 23.1041.

The FAA proposed to reword paragraph (a)(2) without substantive change to make this language identical to the JAR.

The FAA proposed to revise paragraph (a)(3) to clarify that the requirement for mixture settings applies to reciprocating engines and that the mixture settings must be the leanest recommended for the climb. The FAA pointed out that the "leanest recommended for climb" mixture setting is considered a normal operating condition.

The FAA proposed to remove paragraph (a)(5) because water taxi tests are already required by § 23.1041 as amended by Amendment 23-43 (58 FR 18958, April 9, 1993).

The FAA proposed to revise paragraphs (c) and (d) by adding the requirement that cooling correction factors be determined for the appropriate altitude. This proposed change was intended to codify current certification practice and increase safety by ensuring that the proper correction factor is determined.

Comment: Beechcraft comments that the minimum fuel requirement of present paragraph (a)(3) should be deleted for turbine engines since there are not real measurable differences for turbine engine fuel as there are for reciprocating engine fuel.

FAA Response: The proposed rule did not contain any change to the minimum fuel grade requirements and the preamble statement may be unclear. The FAA agrees with the Beechcraft statement that today, turbine engine fuels are not graded. Since no change was proposed in this wording in the NPRM and since the present wording has no effect on the use of turbine engine fuels, no change is made for this final rule. However, after discussion within the ARAC Working Group, the FAA has determined that paragraph (a)(3) can be clarified by moving the second part of the sentence concerning mixture settings for reciprocating engines to a new subparagraph (a)(5). This is not considered a substantive change to the proposed language, but a clarification of a current requirement.

The only comment received on the changes proposed for § 23.1043 concerned paragraph (a)(3), and that paragraph is adopted as explained above. The remaining changes are adopted as proposed.

Section 23.1045 Cooling test procedures for turbine engine powered airplanes.

The FAA proposed to clarify § 23.1045(a) by stating more generally that (1) compliance with § 23.1041 must be shown for all phases of operations, not only the four listed phases: takeoff, climb, enroute, and landing; and that (2) the airplane must be flown in the configuration, at the speeds, and following the procedures recommended in the Airplane Flight Manual for the relative stage of flight that corresponds to the applicable performance requirements critical to cooling.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.1047 Cooling test procedures for reciprocating engine powered airplanes.

The FAA proposed to revise the cooling test procedures in § 23.1047 for reciprocating engine powered airplanes by deleting the specific procedures because experience has shown that some of the listed detailed procedures are not directly applicable to certain engine configurations and certain operating conditions.

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

Section 23.1091 Air induction system.

The FAA proposed to revise § 23.1091(c)(2) to require that air induction system design protect against foreign matter, from whatever source, "during takeoff, landing, and taxiing" rather than be limited, as is the present rule, to foreign material located on the runway, taxiway, or other airport operating surfaces.

Comment: Beechcraft comments that increasing the scope of the foreign material environment poses very difficult technical questions and potentially costly solutions. Beechcraft states that it is extremely difficult to compensate for and protect against airborne debris and also states its concern that the proposed rule language gives no guidance as to the levels of protection that are necessary.

FAA Response: As stated in the NPRM preamble, the proposed language is consistent with current certification practice and, therefore, would not be a significant new burden on aircraft manufacturers. However, it was not the FAA's intent to create an opportunity for an extreme interpretation of this rule, as suggested by Beechcraft. To clarify the intent, and after discussion within the ARAC Working Group, the FAA has added the words "hazard of" to the second sentence of § 23.1091(c)(2) to make it clear that the intent of the rule is to minimize the hazard of ingestion of foreign matter rather than to require zero ingestion.

This proposal is adopted with the change explained above.

Section 23.1093 Induction system icing protection.

The FAA proposed to revise § 23.1093(c) by adding the heading "Reciprocating engines with superchargers" so that this paragraph would be consistent with paragraphs (a) and (b) of this section, which have headings.

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

Section 23.1105 Induction system screens.

The FAA proposed to revise § 23.1105 to include fuel injection systems, since some reciprocating engines incorporate a fuel injection system and the same provisions required for a carburetor are necessary for a fuel injection system.

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

Section 23.1107 Induction system filters.

The FAA proposed to revise the introductory text of § 23.1107 by deleting the reference to reciprocating engine installations to make the section applicable to airplanes with either reciprocating or turbine engines.

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

Section 23.1121 General.

The FAA proposed to revise § 23.1121(g) by adding standards for APU exhaust systems because these standards were overlooked when APU standards were introduced into part 23 by Amendment 23-43 (58 FR 18958, April 9, 1993).

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

Section 23.1141 Powerplant controls: general.

The FAA proposed to clarify § 23.1141(b), which concerns flexible controls, by replacing the phrase "must be of an acceptable kind" with the phrase "must be shown to be suitable for the particular application."

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

Section 23.1143 Engine controls.

The FAA proposed to revise § 23.1143(f) to add a requirement that a fuel control (other than a mixture control) must have a means to prevent the inadvertent movement of the control into the shutoff position.

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

Section 23.1153 Propeller feathering controls.

The FAA proposed to revise § 23.1153 to require that it be possible to feather each propeller separately, in order to prevent inadvertent operation.

After further review of the proposal, the FAA decided to remove the phrase "whether or not they are separate from the propeller speed and pitch controls" and add the word "installed" in its place. The meaning is maintained without the deleted phrase, which would be redundant.

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

Section 23.1181 Designated fire zones; regions included.

The FAA proposed new § 23.1181(b)(3) to add as a designated fire zone for turbine engines "any complete powerplant compartment in which there is no isolation between compressor, accessory, combustor, turbine and tailpipe sections."

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

Section 23.1183 Lines, fittings, and components.

The FAA proposed to clarify the intent of § 23.1183(a), which concerns the approval of flexible hose assemblies, by replacing the word "approved" with the words "shown to be suitable for the particular application."

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

Section 23.1191 Firewalls.

The FAA proposed to amend § 23.1191(b) to require that each "firewall or shroud must be constructed so that no hazardous quantity of liquid, gas, or flame can pass from the compartment created by the firewall or shroud to other parts of the airplane." The intent of the proposed change was to clarify that the requirement applies to any compartment created by a firewall or shroud.

Comment: The JAA states that the additional wording proposed to be added to paragraph (b) is superfluous and will not be proposed for JAR 23.

FAA Response: The FAA has determined that the proposed change to § 23.1191(b) is needed to retain the intent of the rule and that it will not create a technical disharmony between the two bodies of regulation.

This proposal is adopted as proposed.

Section 23.1203 Fire detector system.

The FAA proposed to revise § 23.1203(e), which concerns the wiring and other components of each fire detector system in an engine compartment, by replacing the words "fire zone" with "designated fire zone" to make the wording consistent with § 23.1181.

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

Section 23.1305 Powerplant instruments.

The FAA proposed to revise § 23.1305(b)(3), concerning cylinder head temperature indicators, by deleting paragraph (b)(3)(ii), which refers to compliance with § 23.1041 at a speed higher than V_Y, to be consistent with a general deletion of the requirements for a determination of the V_Y speed.

No comments were received on the proposal. However, after further review, the FAA has determined that it would be simpler to remove the text of paragraph (b)(3)(ii) and to reserve paragraph (b)(3)(ii) for future use in order to avoid confusion that could come from redesignation of paragraph (b)(3)(iii).

The proposal is adopted as explained above.

Section 23.1337 Powerplant instruments.

The FAA proposed to change the reference in § 23.1337(b) from "§ 23.959" to "§ 23.959(a)" to conform the reference to a revision of § 23.959 made elsewhere in this document.

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

Regulatory Evaluation, Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations or modify existing regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: 1) will generate benefits exceeding its costs and is not "significant" as defined in Executive Order 12866; 2) is not "significant" as defined in DOT's Policies and Procedures; 3) will not have a significant impact on a substantial number of small entities; and 4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

Two comments were received regarding the economic impact of the proposals; one concerning an existing regulation (§ 23.1043 Cooling tests) and one concerning a new proposal (§ 23.1091 Air induction systems). Both of these comments, as well as the FAA's responses, are included above in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has determined that the benefits of the final rule, though not directly quantifiable, will exceed the expected costs. Minor costs, ranging from $240 to $6,000 per certification, are projected for four of the provisions. No costs are attributed to the other provisions. The benefits of the final rule are considered below in four categories: (1) harmonization, (2) safety, (3) reduced need for special conditions, and (4) clarification.

Harmonization

These changes, in concert with other rulemaking and policy actions, will provide nearly uniform powerplant airworthiness standards for airplanes certificated in the United States and the JAA member countries. The resulting greater uniformity of standards simplifies airworthiness approval for import and export purposes.

Safety

In addition to the harmonization benefits, five provisions of the rule provide additional safety benefits. First, the final rule revises § 23.933(a)(1) to more closely agree with the corresponding turbojet and turbofan reversing system airworthiness standards of part 25. The FAA estimates that this provision will necessitate an additional 100 hours of failure mode and effects analysis at an assumed cost rate of $60 per hour, including labor and overhead. The estimated $6,000 cost applies to each certification. The FAA projects that no additional production or operating costs will result from this provision.

The primary potential benefit of the provision is the additional safety that could result from analyzing the feasible range of reverser system failures, the effects of those failures, and the corresponding capabilities necessary to correct the failure or circumvent its effects. Such an analysis could reduce the possibility that an unanticipated condition with catastrophic potential would remain in the system. In addition to the safety benefit, it is expected that operating benefits and manufacturing economies will result from the uniformity of standards between parts 23 and 25. The FAA is not able to quantify the potential benefits of this provision but has determined that the benefits will exceed the expected minor costs.

Second, the final rule adds a new paragraph (b) to § 23.959 requiring that the effect of any fuel pump failure on the unusable fuel supply be determined. Though not previously required, it has been industry practice to include this information in the Airplane Flight Manual. The FAA estimates that the nominal cost of making this determination will be $240 per certification (4 hours at $60 per hour). In addition, an insignificant cost ($1) will be incurred in adding a table entry to the manual for each airplane that is produced. The fact that this requirement is already standard practice supports the FAA's position that the potential benefits of the provision exceed the minor costs. The safety benefits of this provision derive from the assurance that this vital information will continue to be provided for future airplane models.

Third, under § 23.979, the final rule adds the requirement for commuter category airplanes that an indication be provided at each fueling station in the event of a failure of the shutoff means to stop fuel flow at the maximum level. The FAA estimates that the required device will necessitate an incremental design and development cost of $3,000 per certification (50 hours at $60 per hour) and an additional nominal manufacturing cost of $10 per airplane. The benefit of the provision is the avoidance of a potentially catastrophic condition whereby excess fuel could unknowingly be forced out of the contained fuel system by the pressure fueling system. The FAA has determined that these potential benefits will exceed the minor associated costs.

Fourth, § 23.1041 establishes the requirement that the powerplant cooling system must be able to maintain the temperature of the powerplant components and fluids. The ambient temperature for testing reciprocating engine airplanes is currently required to be corrected to show the capacity of the cooling system at 100°F. Under the amendment, this temperature standard is revised to the "maximum ambient temperature conditions for which approval is requested."

No costs are attributed to this provision. Reciprocating engine airplane manufacturers will continue to have the option to request approval for operations at the existing 100°F temperature. A decision to request approval for a higher temperature would necessitate demonstration of the capability of the cooling system at that temperature. That choice, however, will be made at the manufacturer's discretion and will be based on its decision that any associated incremental cooling system costs would be recovered in the marketplace or offset by other considerations. The potential benefit of this provision is the reduced likelihood that an inadequate cooling system would be relied on during high temperature operations.

Finally, paragraph (a) of § 23.1045 is revised to state more generally that compliance with the cooling margin requirements of § 23.1041 must be shown for all phases of operation, as compared to the four phases of flight currently listed. In effect, the amendment adds the taxi phase.

The FAA estimates that the specific addition of the taxi phase will necessitate an incremental 5 hours of engineering analysis valued at $60 per hour, for a total of $300 per certification. The potential benefit of this provision is the enhanced safety that could result from evaluating the efficacy of the cooling system during the taxi phase of operation. In the taxi phase of operation, engine power settings and heat production may be generally lower than that experienced during flight, but available air circulation might also be lower. The heat mechanics of the two conditions are distinct and warrant separate evaluation. The FAA has determined that the potential benefits of this provision will exceed the nominal associated costs.

Reduced Need for Special Conditions

The final rule includes five provisions that will replace the need for "special conditions" processing of certain parts or materials that were previously considered as novel or unusual design features. The subjects of these provisions include composite propellers, fuel injection systems for reciprocating engines, induction filters on turbine engines, fuel shutoff controls other than mixture controls, and auxiliary power units. No additional costs are attributed to these provisions. Formalization of the equivalent safety standards and requirements for these subjects obviates the need for special conditions actions and simplifies the certification process for manufacturers.

Clarification

Several unclear provisions of part 23 were revealed during the harmonization review. In response to this finding, the final rule includes a number of no-cost, editorial revisions that clarify the existing requirements. These changes benefit manufacturers by removing potential confusion about the specific standards and requirements necessary for certification.

In summary, the FAA has determined that each of the amendments, as well as the final rule as a whole, will be cost beneficial.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) 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 would have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. Based on implementing FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that this rule will not have a significant economic impact on a substantial number of small entities.

Trade Impact Assessment

The final rule will not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the amended powerplant airworthiness standards have been harmonized with foreign aviation authorities and will reduce restraints on trade.

FEDERALISM IMPLICATIONS

The regulations 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 rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

CONCLUSION

The FAA is revising the airworthiness standards to provide propulsion standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards that have been adopted for the same category airplanes by the Joint Aviation Authorities in Europe. The revisions will reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is not significant under Executive Order 12866. In addition, the FAA certifies that this rule 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 rule is not considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule 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 Amendments

In consideration of the foregoing, the Federal Aviation Administration amends 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. 106(g), 40113, 44701, 44702, 44704.

§ 23.777 [Amended]

2. Section 23.777(c)(2) is amended by adding the words "single and" between the words "for" and "tandem".

3. The table in § 23.779(b)(1) is amended by adding a new item between the items "mixture" and "carburetor air heat or alternate air" to read as follows:

§ 23.779 Motion and effect of cockpit controls.

* * * * *

(b) * * *

	Motion and effect
(1) Powerplant controls:	
* * * * *	
Fuel	Forward for open.
* * * * *	

4. Section 23.901 is amended by revising paragraphs (d)(1) and (d)(2) to read as follows:

§ 23.901 Installation.

* * * * *

(d) * * *

(1) Result in carcass vibration characteristics that do not exceed those established during the type certification of the engine.

(2) Provide continued safe operation without a hazardous loss of power or thrust while being operated in rain for at least three minutes with the rate of water ingestion being not less than four percent, by weight, of the engine induction airflow rate at the maximum installed power or thrust approved for takeoff and at flight idle.

* * * * *

5. Section 23.903 is amended by adding headings to paragraphs (c) and (g), and by revising the heading of paragraph (f) to read as follows:

§ 23.903 Engines.

* * * * *

(c) Engine isolation. * * *

* * * * *

(f) Restart envelope. * * *

(g) Restart capability. * * *

§ 23.907 [Amended]

6. Section 23.907(a) introductory text is amended by removing the phrase "with metal blades or highly stressed metal components" and adding the phrase "other than a conventional fixed-pitch wooden propeller" in its place.

7. Section 23.925 introductory text is revised to read as follows:

§ 23.925 Propeller clearance.

Unless smaller clearances are substantiated, propeller clearances, with the airplane at the most adverse combination of weight and center of gravity, and with the propeller in the most adverse pitch position, may not be less than the following:

* * * * *

§ 23.929 [Amended]

8. Section 23.929 is amended by removing the word "power" and adding, in its place, the word "thrust".

9. Section 23.933 is amended by removing the word "forward" in the two instances in which it is used in paragraph (a)(3); by removing the reference in paragraph (b)(2) that reads "(a)(1)" and adding the reference "(b)(1)" in its place; and by revising paragraph (a)(1) to read as follows:

§ 23.933 Reversing systems.

(a) * * *

(1) Each system intended for ground operation only must be designed so that, during any reversal in flight, the engine will produce no more than flight idle thrust. In addition, it must be shown by analysis or test, or both, that--

(i) Each operable reverser can be restored to the forward thrust position; or

(ii) The airplane is capable of continued safe flight and landing under any possible position of the thrust reverser.

* * * * *

10. Section 23.955 is amended by revising paragraphs (a)(1) through (a)(4) to read as follows:

§ 23.955 Fuel flow.

(a) * * *

(1) The quantity of fuel in the tank may not exceed the amount established as the unusable fuel supply for that tank under § 23.959(a) plus that quantity necessary to show compliance with this section.

(2) If there is a fuel flowmeter, it must be blocked during the flow test and the fuel must flow through the meter or its bypass.

(3) If there is a flowmeter without a bypass, it must not have any probable failure mode that would restrict fuel flow below the level required for this fuel demonstration.

(4) The fuel flow must include that flow necessary for vapor return flow, jet pump drive flow, and for all other purposes for which fuel is used.

* * * * *

11. Section 23.959 is amended by designating the current text of the section as paragraph (a), and by adding a new paragraph (b) to read as follows:

§ 23.959 Unusable fuel supply.

* * * * *

(b) The effect on the unusable fuel quantity as a result of a failure of any pump shall be determined.

12. Section 23.963 is amended by removing the reference in paragraph (e) that reads "§ 23.959" and adding the reference "§ 23.959(a)" in its place, and by revising paragraph (b) to read as follows:

§ 23.963 Fuel tanks: general.

* * * * *

(b) Each flexible fuel tank liner must be shown to be suitable for the particular application.

* * * * *

13. Section 23.965 is amended by revising paragraph (b)(3)(i) to read as follows:

§ 23.965 Fuel tank tests.

* * * * *

(b) * * *

(3) * * *

(i) If no frequency of vibration resulting from any rpm within the normal operating range of engine or propeller speeds is critical, the test frequency of vibration is:

(A) The number of cycles per minute obtained by multiplying the maximum continuous propeller speed in rpm by 0.9 for propeller-driven airplanes, and

(B) For non-propeller driven airplanes the test frequency of vibration is 2,000 cycles per minute.

* * * * *

14. Section 23.973(f) is revised to read as follows:

§ 23.973 Fuel tank filler connection.

* * * * *

(f) For airplanes with turbine engines, the inside diameter of the fuel filler opening must be no smaller than 2.95 inches.

15. Section 23.975(a)(5) is revised to read as follows:

§ 23.975 Fuel tank vents and carburetor vapor vents.

(a) * * *

(5) There may be no point in any vent line where moisture can accumulate with the airplane in either the ground or level flight attitudes, unless drainage is provided. Any drain valve installed must be accessible for drainage;

* * * * *

16. Section 23.979(b) is revised to read as follows:

§ 23.979 Pressure fueling systems.

* * * * *

(b) An automatic shutoff means must be provided to prevent the quantity of fuel in each tank from exceeding the maximum quantity approved for that tank. This means must--

(1) Allow checking for proper shutoff operation before each fueling of the tank; and

(2) For commuter category airplanes, indicate at each fueling station, a failure of the shutoff means to stop the fuel flow at the maximum quantity approved for that tank.

* * * * *

17. Section 23.1001(b)(2) is revised to read as follows:

§ 23.1001 Fuel jettisoning system.

* * * * *

(b) * * *

(2) A climb, at the speed at which the one-engine-inoperative enroute climb data have been established in accordance with § 23.69(b), with the critical engine inoperative and the remaining engines at maximum continuous power; and

* * * * *

§ 23.1013 [Amended]

18. Section 23.1013(d)(1) is amended by removing the word "crankcase".

§ 23.1041 [Amended]

19. Section 23.1041 is amended by adding the phrase "and maximum ambient atmospheric temperature conditions" between the phrases "maximum altitude" and "for which approval".

20. Section 23.1043 is amended by revising paragraphs (a), (c), and (d) to read as follows:

§ 23.1043 Cooling tests.

(a) General. Compliance with § 23.1041 must be shown on the basis of tests, for which the following apply:

(1) If the tests are conducted under ambient atmospheric temperature conditions deviating from the maximum for which approval is requested, the recorded powerplant temperatures must be corrected under paragraphs (c) and (d) of this section, unless a more rational correction method is applicable.

(2) No corrected temperature determined under paragraph (a)(1) of this section may exceed established limits.

(3) The fuel used during the cooling tests must be of the minimum grade approved for the engine.

(4) For turbocharged engines, each turbocharger must be operated through that part of the climb profile for which operation with the turbocharger is requested.

(5) For a reciprocating engine, the mixture settings must be the leanest recommended for climb.

* * * * *

(c) Correction factor (except cylinder barrels). Temperatures of engine fluids and powerplant components (except cylinder barrels) for which temperature limits are established, must be corrected by adding to them the difference between the maximum ambient atmospheric temperature for the relevant altitude for which approval has been requested and the temperature of the ambient air at the time of the first occurrence of the maximum fluid or component temperature recorded during the cooling test.

(d) Correction factor for cylinder barrel temperatures. Cylinder barrel temperatures must be corrected by adding to them 0.7 times the difference between the maximum ambient atmospheric temperature for the relevant altitude for which approval has been requested and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test.

21. Section 23.1045(a) is revised to read as follows:

§ 23.1045 Cooling test procedures for turbine engine powered airplanes.

(a) Compliance with § 23.1041 must be shown for all phases of operation. The airplane must be flown in the configurations, at the speeds, and following the procedures recommended in the Airplane Flight Manual for the relevant stage of flight, that correspond to the applicable performance requirements that are critical to cooling.

* * * * *

22. Section 23.1047 is revised to read as follows:

§ 23.1047 Cooling test procedures for reciprocating engine powered airplanes.

Compliance with § 23.1041 must be shown for the climb (or, for multiengine airplanes with negative one-engine-inoperative rates of climb, the descent) stage of flight. The airplane must be flown in the configurations, at the speeds and following the procedures recommended in the Airplane Flight Manual, that correspond to the applicable performance requirements that are critical to cooling.

23. Section 23.1091(c)(2) is revised to read as follows:

§ 23.1091 Air induction system.

* * * * *

(c) * * *

(2) The airplane must be designed to prevent water or slush on the runway, taxiway, or other airport operating surfaces from being directed into the engine or auxiliary power unit air intake ducts in hazardous quantities. The air intake ducts must be located or protected so as to minimize the hazard of ingestion of foreign matter during takeoff, landing, and taxiing.

§ 23.1093 [Amended]

24. Section 23.1093 is amended by adding the heading "Reciprocating engines with Superchargers" to paragraph (c).

25. Section 23.1105(a) is revised to read as follows:

§ 23.1105 Induction system screens.

* * * * *

(a) Each screen must be upstream of the carburetor or fuel injection system.

* * * * *

26. Section 23.1107 introductory text is revised to read as follows:

§ 23.1107 Induction system filters.

If an air filter is used to protect the engine against foreign material particles in the induction air supply--

* * * * *

27. Section 23.1121(g) is revised to read as follows:

§ 23.1121 General.

* * * * *

(g) If significant traps exist, each turbine engine and auxiliary power unit exhaust system must have drains discharging clear of the airplane, in any normal ground and flight attitude, to prevent fuel accumulation after the failure of an attempted engine or auxiliary power unit start.

* * * * *

28. Section 23.1141(b) is revised to read as follows:

§ 23.1141 Powerplant controls: general.

* * * * *

(b) Each flexible control must be shown to be suitable for the particular application.

* * * * *

29. Section 23.1143(f) is amended by revising the introductory text to read as follows:

§ 23.1143 Engine controls.

* * * * *

(f) If a power, thrust, or a fuel control (other than a mixture control) incorporates a fuel shutoff feature, the control must have a means to prevent the inadvertent movement of the control into the off position. The means must--

* * * * *

30. Section 23.1153 is revised to read as follows:

§ 23.1153 Propeller feathering controls.

If there are propeller feathering controls installed, it must be possible to feather each propeller separately. Each control must have a means to prevent inadvertent operation.

31. Section 23.1181 is amended by adding a new paragraph (b)(3) to read as follows:

§ 23.1181 Designated fire zones; regions included.

* * * * *

(b) * * *

(3) Any complete powerplant compartment in which there is no isolation between compressor, accessory, combustor, turbine, and tailpipe sections.

* * * * *

§ 23.1183 [Amended]

32. Section 23.1183(a) is amended by removing the word "approved" in the next to the last sentence, and adding the phrase "shown to be suitable for the particular application" in its place.

33. Section 23.1191(b) is revised to read as follows:

§ 23.1191 Firewalls.

* * * * *

(b) Each firewall or shroud must be constructed so that no hazardous quantity of liquid, gas, or flame can pass from the compartment created by the firewall or shroud to other parts of the airplane.

* * * * *

34. Section 23.1203(e) is revised to read as follows:

§ 23.1203 Fire detector system.

* * * * *

(e) Wiring and other components of each fire detector system in a designated fire zone must be at least fire resistant.

* * * * *

§ 23.1305 [Amended]

35. Section 23.1305(b)(3)(ii) is removed and reserved.

§ 23.1337 [Amended]

36. Section 23.1337(b)(1) is amended by removing the reference "§ 23.959" and adding the reference "§ 23.959(a)" in its place.

Issued in Washington, D.C. on

August 11, 1995

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 1 and 23

[Docket No. 27807; **Amendment Nos. 1-   ,23-   ]**

RIN 2120-AE61

Airworthiness Standards; Flight Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certificated in these categories. This amendment will provide nearly uniform flight airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirements 23, simplifying international airworthiness approval.

EFFECTIVE DATE: [Insert date 30 days after date of publication in the Federal Register]

FOR FURTHER INFORMATION CONTACT: Lowell Foster, ACE-111, Small Airplane Directorate, Aircraft Certification Service, Federal

Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426-5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94-22 (59 FR 37878, July 25, 1994). All comments received in response to Notice 94-22 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment pertain to flight airworthiness standards. Three other final rules are to be issued that pertain to airworthiness standards for systems and equipment (xx FR xxx), **[INSERT PROPER FEDERAL REGISTER CITATIONS]** powerplant (xx FR xxx), and airframe (xx FR xxx). These related rulemakings are also part of the harmonization effort. Interested persons should review all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the United States regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23.

The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeanne des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice No. 94-22 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the flight airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR/part 23 harmonization, which ARAC assigned to the JAR/FAR 23 Harmonization Working Group. The proposal for flight airworthiness standards contained in Notice No. 94-22 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before November 21, 1994. Four commenters responded to Notice No. 94-22. Minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with ARAC, and further review by the FAA.

Discussion of Amendments

Section 1.1 General definitions.

The FAA proposed to amend § 1.1 to add a definition of "maximum speed for stability characteristics, V_{FC}/M_{FC}." This change harmonizes part 1 and JAR 1. The definition is deleted from § 23.175(b)(2).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.3 Airplane categories.

The FAA proposed to revise § 23.3(b)(2) to add an outside limit of 90 degrees in angle of bank for lazy eights, chandelles, and steep turns.

The FAA proposed to revise § 23.3(d) to remove chandelles and lazy eights as approved operations in commuter category airplanes. The FAA does not anticipate any operational need for such maneuvers.

The FAA proposed to revise § 23.3(e) to prohibit type certification of commuter category airplanes in any other category. This rule change will not preclude the type certification of similar airplanes with different model numbers, such as the present Cessna models 500 and 501.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.25 Weight limits.

The FAA proposed to revise § 23.25(a) to clarify that the maximum weight that must be selected is the least of the three choices given in § 23.25(a)(1). The FAA proposed to remove the commuter category zero fuel weight requirement from current § 23.25(a). The requirement was proposed to be moved to § 23.343 by the airframe NPRM, Notice No. 94-20 (59 FR 35198, July 8, 1994). The FAA proposed to remove the reference to standby power rocket engines in § 23.25(a)(1)(iii) and to remove appendix E because this is a rare and obsolete design feature. If a manufacturer proposed to use this approach, the FAA would issue special conditions to ensure adequate airworthiness.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.33 Propeller speed and pitch limits.

The FAA proposed to revise § 23.33(b)(1) to remove the reference to V_Y and to replace it with "the all engine(s) operating climb speed specified in § 23.65," to be consistent with other changes in performance requirements. The FAA proposed to revise § 23.33(b)(2) to use "V_{NE}" in place of "never exceed speed," since V_{NE} is defined in part 1, and to remove the word "placarded," which is unnecessary.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.45 General.

In Notice of Proposed Rulemaking, Small Airplane Airworthiness Review Program Notice No. 4, Notice No. 90-18 (55 FR 26534, June 28, 1990), the FAA requested comments on the need for weight, altitude, and temperature (WAT) criteria, as information or as a limitation on piston-powered, twin-engine part 23 airplanes. The FAA also requested comments about WAT criteria on turbine-powered twin-engine part 23 airplanes, specifically during takeoff and landing.

WAT criteria is used to determine the maximum weight an airplane can have in relation to altitude and temperature for safe takeoff. This criteria provides pilots with the information needed to determine if a takeoff and climb can be successfully completed if one engine becomes inoperative. WAT criteria has been required under part 23 for commuter category airplanes, at all approved altitudes. A limited WAT criteria has been required for turbine engine powered airplanes at 5,000 feet and at standard temperature plus 40°F, but not for higher altitudes or temperatures. For some multiengine powered airplanes, WAT data has been provided by the manufacturer as information to pilots.

The FAA received three comments on mandating WAT criteria in part 23 and addressed these comments in detail in the preamble to Notice 94-22.

Based on statistics and conclusions from an FAA 1991 study (discussed in detail in Notice 94-22) and on comments, the FAA determined that WAT limits are necessary for safe operation of multiengine airplanes of the type that will be involved in transporting passengers for hire.

The FAA proposed a complete revision of § 23.45 to require weight, altitude, and temperature (WAT) performance accountability for normal, utility, and acrobatic airplanes with a maximum takeoff weight over 6,000 pounds and all turbine-powered airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.49 Stalling speed.

The FAA proposed to revise § 23.49 by reorganizing and editing it for clarification. The FAA's proposed clarification merges, in paragraph (a), the V_{SO} and V_{S1} requirements, which were separated with parallel configuration items under paragraphs (a) and (d).

Other proposed changes to paragraph (a) are as follows:

(1) Proposed paragraph (a)(4) is a requirement that the airplane be in the condition existing in the test, in which V_{SO} and V_{S1} are being used.

(2) Proposed paragraph (a)(5) is a revised version of current paragraph (a)(6). The current requirement states that the center of gravity must be in the most unfavorable position within the allowable landing range. The proposed requirement would state that the center of gravity must be in the position that results in the highest value of V_{SO} and V_{S1}.

(3) Current paragraph (a)(5) is moved to § 23.45(c).

These changes are clarifying and are not an increase in requirements. The only comment received was from JAA, noting the existing disharmony between the JAR and the FAR concerning a V_{SO} more than 61 knots for single-engine airplanes and multiengine airplanes of 6,000 pounds maximum weight or less that do not meet the required minimum rate of climb.

The proposal is adopted as proposed.

Section 23.51 Takeoff speeds.

The FAA proposed to change the paragraph heading from "Takeoff" to "Takeoff speeds" and to incorporate the takeoff speed requirements currently contained in § 23.53. This revision to the heading and the reorganization of takeoff requirements is proposed for harmony with JAR 23.

The FAA proposed to move current § 23.51(a) to § 23.53(a). Current paragraph (a) requires that the distance required to take off and climb over a 50-foot obstacle must be determined with the engines operating within approved operating limitations and with cowl flaps in the normal takeoff position. These requirements for power and cowl flaps are now covered in final § 23.45, paragraphs (c) and (d), and in § 23.1587.

The FAA proposed to remove current § 23.51(b) on measuring seaplane and amphibian takeoff distances. It is a statement of an acceptable method of compliance, and there is no need to address a separate seaplane starting point.

The FAA proposed to remove current § 23.51(c) concerning pilot skills and conditions. It is covered under the general requirements in proposed § 23.45(f).

The FAA proposed to remove current § 23.51(d). The requirements are covered under § 23.45 in commuter category performance and other performance requirements, and the information requirements are covered under § 23.1587.

For multiengine normal, utility, and acrobatic category airplanes, the FAA proposed to transfer the determination of V_R from § 23.53(a) to § 23.51(a) with minor changes in the specified rotation speed. For multiengine airplanes in proposed paragraph (a)(1), the margin between rotation speed and V_{MC} or a margin of 1.10 V_{S1} is established between V_R and stall.

The FAA proposed to define V_R,, in proposed paragraph (a), as the speed at which the pilot makes a control input with the intention of lifting the airplane out of contact with the runway or water surface. This definition would apply to tail wheel and tricycle gear airplanes, seaplanes, and single-engine airplanes.

The FAA also proposed to include rotation speeds for single-engine airplanes, seaplanes, and amphibians in paragraph (a). This extends V_R applicability to all part 23 airplanes to establish a safe and standardized procedure that can be used by pilots to achieve AFM takeoff performance. This use of rotation speed is consistent with part 25.

In proposed paragraph (b), the speed at 50 feet is based on current § 23.53(b) with no change in requirements.

For commuter category airplanes, the FAA proposed to move the takeoff speed requirements from § 23.53(c) to proposed § 23.51(c) with editorial changes. The option is added, in proposed (c)(1)(i), for an applicant to determine a V_{MCG} and to establish a V_1 based on V_{MCG} rather than a margin above V_{MCA}.

The only comment on this section was a non-substantive one, in which JAA concurred.

The proposal is adopted as proposed.

Section 23.53 Takeoff performance.

The FAA proposed a new heading for § 23.53 and a content based primarily on the general takeoff performance requirement of the current § 23.51.

The FAA proposed to remove the takeoff speed requirements from current § 23.53 and to place them in § 23.51. (See discussion for § 23.51.) Section 23.53 provides general takeoff performance requirements for normal, utility, acrobatic, and commuter category airplanes. Proposed paragraph (a) is based on current § 23.51(a). Proposed paragraph (b) is a modification of current § 23.1587(a)(5). Proposed paragraph (c) is based on current § 23.51(d).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.55 Accelerate-stop distance.

The FAA proposed to revise § 23.55 to clarify the accelerate-stop segments and to make editorial changes.

The proposed requirement divides the accelerate-stop maneuver into three segments, rest to V_{EF} (paragraph (a)(1)), V_{EF} to V_1 (paragraph (a)(2)), and V_1 to rest (paragraph (a)(3)). The FAA proposed to remove the following four phrases: First, remove the phrase "in the case of engine failure," from current § 23.55(a)(2) because it is included in paragraph (a)(2). Second, remove the phrase, "assuming that . . . the pilot has decided to stop as indicated by application of the first retarding means at the speed V_1," from § 23.55(a)(2) because it is stated in § 23.51(c)(1)(ii). Third, remove the phrase "exceptional skill" from § 23.55(b)(3) because it remains in § 23.45(h)(5)(i). Fourth, remove the phrase "if that means is available with the critical engine inoperative" from § 23.55(b) because it is covered by the safe and reliable requirements of § 23.55(b)(1).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.57 Takeoff path.

The FAA proposed to revise § 23.57 to clarify and to specify the takeoff path segments that must be determined in flight. Proposed paragraph (a) clarifies that the transition to the enroute configuration should be completed on or before reaching 1500 feet above the takeoff surface. Section 23.57(c)(1) requires the slope of the airborne part of the takeoff path to be "positive at each point"; proposed paragraph (c)(1) is revised to "not negative at any point," to allow acceleration in level flight, which is implied by current § 23.61(c). Proposed § 23.57(c)(3) specifies that the climb gradient "must not be less than . . .," as opposed to "may not be less than. . . ." The option, in current § 23.57(d), to determine the takeoff path

August 11, 1995

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. 27805; Amendment No. 23-   ]

RIN 2120-AE61

Airworthiness Standards; Airframe Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the airframe airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certificated in these categories. This amendment will provide nearly uniform airframe airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirements 23, simplifying international airworthiness approval.

EFFECTIVE DATE: [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]

FOR FURTHER INFORMATION CONTACT: Kenneth W. Payauys, ACE-111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426-5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94-20 (59 FR 35196, July 8, 1994). All comments received in response to Notice 94-20 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment largely pertain to airframe airworthiness standards. Three other final rules are to be issued that pertain to airworthiness standards for systems and equipment (xx FR xxx), **[ARM-1 to INSERT PROPER FEDERAL REGISTER CITATIONS AND CORRECTLY REFORMAT THE DOCUMENT AND DO NOT BREAK APART OR DESTROY THE EQUATIONS]** flight (xx FR xxx), and powerplant (xx FR xxx). These related rulemakings are also part of the harmonization effort. Interested persons should review all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the U.S. regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeenne des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice 94-20 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the airframe airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR 23/part 23 harmonization, which ARAC assigned to the JAR/FAR 23 Harmonization Working Group. The proposal for airframe airworthiness standards contained in Notice No. 94-20 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before October 28, 1994. Five commenters responded to Notice 94-20. Minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with the ARAC, and further review by the FAA.

Discussion of Amendments

Section 23.301 Loads.

The FAA proposed to amend § 23.301(d) by limiting the applicability of Appendix A to part 23 to "single-engine, excluding turbines" airplanes, rather than the current single-engine limitation. The effect of the proposed changes would be to eliminate alternative Appendix A airplane design requirements for turbine engines because the JAA determined, and the FAA agrees, that only single-engine airplanes, excluding turbines, were envisioned when Appendix A was introduced. Turbine airplane designs could continue to be FAA certificated by substantiation to part 23.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.335 Design airspeeds.

The FAA proposed to revise portions of § 23.335 for clarification and harmonization with JAR 23. The FAA proposed to revise paragraph (a)(1) by adding the phrase "wing loading at the design maximum takeoff weight" as a definition for W/S and by revising paragraphs (a)(1)(i) and (ii) to correct the equations for design cruise speed from "33 W/S" to "33 $\sqrt{(W/S)}$" and from "36 $\sqrt{W/S}$" to "36 $\sqrt{(W/S)}$."

The FAA proposed to revise § 23.335(b)(4) by adding a new paragraph (b)(4)(iii) that includes a new mach number speed margin, 0.07M, for commuter category airplanes. Because commuter category airplanes are normally operated at higher altitudes than normal, utility, and acrobatic category airplanes, they experience greater atmospheric variations, such as horizontal gusts and the penetration of jet streams or cold fronts; therefore, a higher minimum speed margin is required. The JAR proposed adding this mach number speed margin. The original mach number speed margin of 0.05M would be retained for normal, utility, and acrobatic category airplanes.

An incorrect equation, $\sqrt{(n_g)}\ V_{S1}$, appears in § 23.335(d)(1). This equation for the design speed for maximum gust intensity, V_B, is corrected to $V_{S1}\ \sqrt{n_g}$.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.337 Limit maneuvering load factors.

The FAA proposed to revise § 23.337(a)(1) by clarifying the equation and by adding a definition for "W." This definition of "W," "design maximum takeoff weight," was requested by the JAA to harmonize with JAR 23.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.341 Gust load factors.

The FAA proposed to reorganize § 23.341 to provide a new paragraph (a), that would clarify that each airplane must be designed to withstand loads on each lifting surface that result from gusts specified in § 23.333(c). It also proposed to reorganize the section as follows: (1) redesignate existing paragraphs (a) and (b) as (b) and (c), respectively; (2) revise the text of new paragraph (b) to delete the phrase "considering the criteria of § 23.333(c), to develop the gust loading on each lifting surface" since this requirement would be located in proposed paragraph (a); and, (3) revise new paragraph (c) to delete the phrase "for conventional configurations" because it is no longer accurate, and to revise the definition for wing loading (W/S).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.343 Design fuel loads.

The FAA proposed a new § 23.343. The proposed requirement would apply to all part 23 airplane categories, except paragraph (c), which is limited to commuter category airplanes.

Comment: The JAA states that while the JAR 23 Study Group supports the technical intent of paragraph (c), since the JAA has no JAR 91 operating rule corresponding to Part 91. The JAA must wait for an operating rule to be developed. The JAA has proposed a Notice of Proposed Action (NPA) to adopt paragraph (c) in JAR 23 if and when an operating rule for a 45-minute fuel reserve is created.

FAA Response: The FAA decided to continue with the final rule, as proposed.

This proposal is adopted as proposed.

Section 23.345 High lift devices.

To place all "flap" requirements in one location, and to harmonize the requirements with JAR 23, the FAA proposed to revise § 23.345 as follows: (1) Make minor organizational, and non-substantive, clarifying changes; (2) Change the term "fully deflected" to "fully extended" because it more accurately describes flap conditions and positions; (3) Remove the phrase "resulting in limit load factors" because the requirement already exists in § 23.301(a); (4) Redesignate current paragraph (c) as paragraph (d) and revise it to include the flap requirements of § 23.457; (5) Redesignate current paragraph (d) as paragraph (c); and (6) Incorporate the flap requirements of § 23.457 into § 23.345(b) and § 23.345(d), as redesignated, and delete paragraph (e), which is redundant.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.347 Unsymmetrical flight conditions.

The FAA proposed to revise § 23.347 to redesignate the existing text as paragraph (a) and to add a new paragraph (b) to include requirements for a flick maneuver (snap roll), if requested for acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.349 Rolling conditions.

The FAA proposed to revise § 23.349(a)(2) to simplify the unsymmetric semispan load assumption for normal, utility, and commuter category airplanes to 100 percent on one wing semispan and 75 percent on the other wing semispan for all design weights up through 19,000 pounds. The preamble to the NPRM did not include the explanation that the proposed 100 percent and 75 percent load distribution applied only to normal, utility, and commuter category airplanes. The NPRM did not include acrobatic category airplanes in this proposed requirement. However, the proposed regulatory language for § 23.349(c)(2) correctly reflects the FAA's intent. While preparing the NPRM, the FAA had suggested varying the latter percentage linearly between 70 percent and 77.5 percent to include aircraft weighing up to 19,000 pounds. After discussion with the JAA, the FAA agreed that 75 percent is an appropriate assumption for all part 23 airplanes except acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.369 Rear lift truss.

The FAA proposed to amend § 23.369 by amending the equation and by adding a definition for wing loading (W/S) to clarify the rule.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.371 Gyroscopic and aerodynamic loads.

The FAA proposed to revise and reorganize § 23.371 by designating the existing text as paragraph (a) and adding new paragraphs (b) and (c).

The proposed revisions to the text of proposed paragraph (a) would delete the limitation for turbine powered engines; add inertial loads; and replace the word "engines" with "engine(s) and propeller(s), if applicable." The proposed changes clarify that these requirements apply to all part 23 airplanes.

The FAA proposed a new paragraph (b) to clarify and distinguish the requirements for airplanes approved for aerobatic maneuvers.

The FAA proposed new paragraph (c) to clarify that commuter category airplanes must comply with the gust conditions in § 23.341 in addition to the requirement of § 23.371(a).

Comment: The JAA recommended that the words "In addition," which appear at the beginning of JAR 23.371(b) but not in § 23.371(b), could result in misreading the requirements for airplanes approved for aerobatic maneuvers. The JAA's concern is that a reader might think that the requirements of paragraph (b) for airplanes approved for aerobatic maneuvers are in place of, rather than in addition to, the requirements of paragraph (a).

FAA Response: The FAA is aware that the words "in addition" appear in the JAR and understands that the JAA believes the words are necessary to prevent an interpretation that airplanes approved for aerobatic maneuvers need only comply with the requirements of paragraph (b).

Under standard rules of regulatory interpretation, it is not necessary to add the words "in addition" since the applicability of paragraph (a) should be based on its wording and not on the wording of paragraph (b). However, the FAA concludes that JAA's concern can be addressed by rewording paragraph (b) and new paragraph (c) to make it clear that persons subject to those paragraphs must meet both paragraphs (a) and certain additional requirements. As rewritten, paragraph (b) states "For airplanes approved for aerobatic maneuvers, each engine mount and its supporting structure must meet the requirements of paragraph (a) of this section and be designed to withstand the load factors expected during combined maximum yaw and pitch velocities."

Paragraph (c) uses parallel language. Paragraph (c) would apply to aircraft certificated in the commuter category, whereas, as proposed, paragraph (b) would apply to aircraft "approved for aerobatic maneuvers," since this approval can be given for aircraft not certificated in the acrobatic category.

This proposal is adopted with the above changes.

Section 23.391 Control surface loads.

The FAA proposed to revise § 23.391 by deleting paragraph (b). Paragraph (b) references Appendix B, which was removed by Amendment No. 23-42 (56 FR 344, January 3, 1991).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.393 Loads parallel to hinge line.

The FAA proposed a new § 23.393. Proposed new § 23.393 would contain a modified version of the requirement of § 23.657(c) concerning loads parallel to the hinge line, which were proposed to be deleted from § 23.657.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.399 Dual control system.

The FAA proposed to redesignate the text of § 23.399 as paragraph (a), and to add a new paragraph (b) that addresses the forces exerted on a dual control system when both pilots act together. This would clarify that it is the greater of the forces that apply.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.415 Ground gust conditions.

The FAA proposed to amend § 23.415 by revising paragraph (a)(2) to add a definition for wing loading (W/S). The FAA also proposed to revise paragraph (c), which was added in Amendment No. 23-45 (58 FR 42136, August 6, 1993), to incorporate a more comprehensive tie-down criteria.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.441 Maneuvering loads.

The FAA proposed to revise § 23.441(b) to include a new design requirement for the vertical tail of a commuter category airplane.

Comment: The JAA comments that while the intent of the proposed requirement is the same as the comparable requirement in JAR 23, the wording is different. The JAA reported that the FAA proposed final rule version will be considered for full harmonization by the JAA through NPA action once the final rule is published.

FAA Response: The proposal is adopted as proposed.

Section 23.443 Gust loads.

The FAA proposed to revise § 23.443(c) by changing the format of the formula, revising the definition of weight ("W"), and correcting the subscripts of the distance to the lift center, ("1_{vt}"). The current definition reads "W = airplane weight (lbs.)." The new definition reads "W = the applicable weight of the airplane in the particular load case (lbs.)." These changes are for clarity.

No comments were received on the proposal for this section, and it is adopted as proposed.

Sections 23.455 Ailerons.

The FAA proposed to amend the heading that precedes § 23.455 by deleting the term "Wing Flaps" so that the heading reads "AILERONS AND SPECIAL DEVICES." This change would reflect the deletion of the wing flap requirements from § 23.457 and their placement in § 23.345.

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

Section 23.457 Wing flaps.

The FAA proposed to delete this section. As discussed under § 23.345, above, the wing flap requirements have been revised and consolidated in § 23.345 to group these requirements together.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.473 Ground load conditions and assumptions.

The FAA proposed to revise § 23.473(c)(1) to change the incorrect reference to "§ 23.67(a) or (b)(1)" to "§ 23.67(b)(1) or (c)."

Because the FAA intended that turbine powered airplanes be included in § 23.473(c)(1), since these airplanes are required to be "climb positive" with one engine inoperative, the FAA proposed that § 23.473(c)(1) also reference § 23.67(c). The FAA also determined that to achieve the intent described, § 23.473(c)(1) should also reference § 23.67(b)(1) or (c).

The FAA also proposed to revise paragraph (f), which addresses energy absorption tests, to parallel the language of JAR 23.473(f). No substantive change from current paragraph (f) was proposed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.497 Supplementary conditions for tail wheels.

The FAA proposed a new § 23.497(c) to relocate tail wheel, bumper, or energy absorption device design standards for airplanes with aft-mounted propellers. These requirements currently exist in § 23.925(b). They are being moved because the FAA determined that certain portions of the design standards for these devices more properly belong in Subpart C--Structure.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.499 Supplementary conditions for nose wheels.

The FAA proposed to add new paragraphs (d) and (e) to § 23.499 to establish nose wheel conditions for airplanes with a steerable nose wheel controlled by hydraulic or other power and for airplanes with a steerable wheel that has a direct mechanical connection to the rudder pedals.

Comment: The JAA comments that the phrase "has a mechanical connection to the rudder pedals" in proposed paragraph (e), absent appropriate advisory material, could be interpreted to require different technical solutions than the comparable wording in JAR 23, "directly connected mechanically to the rudder pedals."

FAA Response: The FAA agrees that the proposed language in paragraph (e) requires clarification; in the final rule, the word "direct" is inserted before the word "mechanical". Also, the last phrase of paragraph (e) is revised to read "the mechanism must be designed to withstand the steering torque for the maximum pilot forces specified in § 23.397(b)."

This proposal is adopted with the above changes to paragraph (e).

Section 23.521 Water load conditions.

The FAA proposed to amend § 23.521 by deleting paragraph (c), which deals with previously approved floats, because the FAA agreed with the JAA that the requirements of paragraph (c) are covered by the general requirements of paragraph (a).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.561 General.

The FAA proposed to amend § 23.561 by revising paragraphs (b) and (d), and adding a new paragraph (e). These changes simplify, clarify, and "add references . . . to ensure." The FAA proposed to revise paragraph (b), concerning occupant protection, to make it correspond to 14 CFR part 25 and JAR 25 that cover large airplanes. The proposed revision of paragraph (d), concerning turnovers would simplify and clarify the requirements without making substantive changes. The FAA proposed a new paragraph (e) to ensure that items of mass that could injure an occupant are retained by the supporting structure.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.571 Metallic pressurized cabin structures.

The FAA proposed to revise § 23.571 by changing the heading from "Pressurized cabin" to "Metallic pressurized cabin structures" because nonmetallic structure is addressed in

§ 23.573(a). The FAA proposed to revise the introductory text to limit the applicability to normal, utility, and acrobatic categories because commuter category airplanes are addressed separately. The FAA proposed to revise paragraph (a) to require the fatigue strength investigation to show that the structure can withstand repeated loads of variable magnitude expected in service.

Comment: The JAA comments that the JAR will be revised to delete commuter category airplanes from this section. Kal-Aero comments that a literal interpretation of the proposed changes to §§ 23.571 and 23.572 "would require that every subsequent modification to an aircraft have a fatigue program to substantiate each major repair or alteration." Kal-Aero states that this change is both uneconomical (Kal-Aero estimates a part 23 fatigue test could cost at least $20 million per certification) and is unnecessary.

FAA Response: The FAA does not agree that the proposed rule language would require the result suggested by Kal-Aero. The intent is to provide that there be some test evidence to verify the analysis validity. The amount of test evidence needed would depend on the complexity of the design. The FAA points out that this evidence would be required only when fatigue analysis is used to satisfy the type certification requirements.

The proposals for this section are adopted as proposed.

Section 23.572 Metallic wing, empennage, and associated structures.

The FAA proposed to revise the section heading to add the word "metallic," to revise paragraph (a) to limit the applicability to normal, utility, and acrobatic category airplanes, and to make minor editorial changes. Paragraph (a)(1) would be revised to harmonize with JAR 23 by requiring tests, or analysis supported by test evidence, as discussed under § 23.571 of this preamble.

The only comment received on this section is from Kal-Aero, and applies to this section and to § 23.571. The comment was discussed under § 23.571.

The proposals are adopted as proposed.

Section 23.573 Damage tolerance and fatigue evaluation of structure.

The FAA proposed to amend § 23.573(a)(5) to make clear that the limit load capacity of a bonded joint must be substantiated only if the failure of the bonded joint would result in catastrophic loss of the airplane.

The FAA proposed to delete § 23.573(c) because its requirements for inspections and other procedures were proposed to be moved to § 23.575.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.574 Metallic damage tolerance and fatigue evaluation of commuter category airplanes.

The FAA proposed to add a new § 23.574 that addresses damage tolerance and fatigue evaluation requirements for commuter category airplanes. As discussed previously, §§ 23.571 and 23.572 are being revised to clarify that these sections apply only to normal, utility, and acrobatic category airplanes. Newly type certificated commuter category airplanes would have to meet proposed § 23.574 instead of §§ 23.571 and 23.572.

The only comment received on this proposed new section is a JAA statement that this change will be considered for JAR 23. The proposal is adopted as proposed.

Section 23.575 Inspections and other procedures.

The FAA proposed to add a new § 23.575 to clarify that airplane manufacturers are required to provide recommendations for inspection frequencies, locations, and methods when a design is approved by the FAA, and that these items must be included in the Limitations Section of the Instructions for Continued Airworthiness required by § 23.1529.

The requirements of § 23.573(c) would be moved to § 23.575 and the requirements are made applicable to §§ 23.571, 23.572, 23.573 and 23.574.

The only comment on this proposed new section is a JAA statement that this change will be considered for JAR 23. The proposals are adopted as proposed.

Section 23.607 Fasteners.

The FAA proposed to amend § 23.607 by changing the section heading, by redesignating the existing text as paragraph (c), and by adding new paragraphs (a) and (b), as outlined in the NPRM.

Comment: Transport Canada comments that it is possible the language of proposed paragraph (a) could be interpreted to mean that compliance is satisfied by the use of a self-locking nut alone in certain situations, such as when a bolt is not subject to rotation. Transport Canada suggests adopting the wording of § 27.607, which requires "two separate locking devices" when the loss of a removable bolt, screw, nut, pin or other fastener would jeopardize the safe operation of the aircraft.

FAA Response: The FAA agrees that the proposed language of paragraph (a) could be misinterpreted and that the intent of the section would be clearer if language comparable to § 27.607 is used. Also, the FAA finds that the section is clearer if it addresses all removable fasteners without specific mention of bolts, screws, nuts, pins, etc. Accordingly, paragraph (a) has been revised to read "Each removable fastener must incorporate two retaining devices if the loss of such fastener would preclude continued safe flight and landing" in the final rule.

This proposal is adopted with the noted change to paragraph (a).

Section 23.611 Accessibility provisions.

The FAA proposed to amend § 23.611 to require that, for any part requiring maintenance, such as an inspection or other servicing, there must be a means of access incorporated into the aircraft design to allow this servicing to be accomplished. The FAA pointed out in the NPRM that whether the access provided is appropriate in a particular case will depend on the nature of the item and the frequency and complexity of the required inspection or maintenance actions.

The only comment received on this proposed change is a JAA statement that this change will be considered for the JAR. The proposal is adopted as proposed.

Section 23.629 Flutter.

The FAA proposed to revise § 23.629 to require either flight flutter tests and rational analysis, or flight flutter tests and compliance with the FAA's "Simplified Flutter Prevention Criteria." Section 23.629 currently requires flutter substantiation by only one of three methods: a rational analysis, flight flutter test, or compliance with the "Simplified Flutter Prevention Criteria."

The FAA also proposed to revise paragraph (d)(3)(i) to change the phrase "T-tail or boom tail" to "T-tail or other unconventional tail configurations" to be more inclusive and to represent the standard used in current certification. The FAA also proposed to harmonize with JAR 23 by amending paragraphs 23.629(g) and (h) to remove the "or test" phrase to require that substantiation be done only by analysis. The FAA proposed a new paragraph (i) that would allow freedom from flutter to be shown by tests (under paragraph (a)) or by analysis alone if that analysis is based on previously approved data for an airplane that has undergone modification that could affect its flutter characteristics.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.657 Hinges.

The FAA proposed to amend § 23.657 by deleting paragraph (c) that covers loads parallel to the hinge line because it would be covered in proposed § 23.393.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.673 Primary flight controls.

The FAA proposed to revise § 23.673 to delete the requirements for two-control airplanes consistent with actions being taken in the proposed rule on flight requirements for part 23 airplanes (Docket No. 27807, Notice No. 94-22; [59 FR 37878, July 25, 1994]) that affect §§ 23.177 and 23.201. The two-control requirements are considered obsolete. Additionally, harmonization with JAR 23 would be accomplished by this action.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.725 Limit drop tests.

The FAA proposed to amend the effective weight equation in § 23.725(b) by adding mathematical brackets to the numerator and parentheses to the denominator to clarify the equation.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.755 Hulls.

The FAA proposed to amend § 23.755 by deleting paragraph (b), which provides that hulls of hull seaplanes or amphibians of less than 1,500 pounds need not be compartmented, because paragraph (b) is redundant. The applicable requirements are contained in paragraph (a). The FAA also proposed to redesignate paragraph (c) as new paragraph (b) and to edit it for clarification.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.865 Fire protection of flight controls, engine mounts, and other flight structures.

The FAA proposed to revise § 23.865 by changing the words "engine compartment" to "designated fire zones" for consistency with recent revisions to §§ 23.1203 and 23.1181. The proposed revision would also add the phrase "adjacent areas that would be subjected to the effects of fire in the designated fire zones."

Comment: The JAA agrees that the technical intent of proposed § 23.865 is similar to the JAR 23 requirement. Changes to JAR 23 to adopt the terms proposed in this part 23 section are being considered by the JAA.

FAA Response: No substantive comment was received, and the proposals are adopted as proposed.

Section 23.925 Propeller clearance.

The FAA proposed to amend § 23.925(b), Aft mounted propellers, by removing the requirements on tail wheels, bumpers, and energy absorption devices and moving them to § 23.497, Supplementary conditions for tail wheels, as discussed above. The FAA also proposed to delete the inspection and replacement criteria for tail wheel, bumper, and energy absorption devices because the inspection and replacement requirements are stated in § 23.1529.

No comments were received on the proposals for this section, and they are adopted as proposed.

Appendix A.

The FAA proposed to revise three areas of Appendix A: (1) A23.1 General; (2) A23.11 Control surface loads, paragraph (c), Surface loading conditions; and (3) Table 2 - Average limit control surface loading. The FAA proposed to add a new figure to Appendix A: Figure A7, Chordwise load distribution for stabilizer and elevator, or fin and rudder. The revisions specify the configurations for which the wing and tail surface loads, required by A23.7, are valid. The FAA discovered a need for a clarification change in paragraph A23.a(a)(1) during the post comment review period. The words "excluding turbine powerplants" are clearer than the words "excluding turbines." This revision is included in the final rule to more clearly convey the intended meaning.

No comments were received on the proposals for Appendix A, and they are adopted with the change explained above.

Final Regulatory Evaluation, Final Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: (1) will generate benefits exceeding its costs and is not "significant" as defined in the Executive Order; (2) is not "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

Two comments were received regarding the economic impact of the proposals; one concerning § 23.571, Metallic pressurized cabin structures, and one concerning § 23.572, Metallic wing, empennage, and associated structures. Both of these comments, as well as the FAA's responses, are included in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has identified 6 sections that will result in additional compliance costs, totalling between $10,000 and $17,000 per certification. When amortized over a production run, these costs will have a negligible impact on airplane price, less than $100 per airplane.

The primary benefit of the rule will be the cost efficiencies of harmonization with the JAR for those manufacturers that market airplanes in JAA countries as well as to manufacturers in JAA countries that market airplanes in the United States. Other benefits of the rule will be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

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 Federal 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. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The rule will not constitute a barrier to international trade, including the export of U.S. goods and services to foreign countries and the import of foreign goods and services into the

United States. Instead, the airframe certification procedures have been harmonized with those of the JAA and will lessen restraints on trade.

FEDERALISM IMPLICATIONS

The regulations 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 rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

CONCLUSION

The FAA is revising the airframe airworthiness standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards that were published for the same categories of airplanes by the Joint Airworthiness Authorities in Europe. The revisions reduce the regulatory burden on United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an

THE AMENDMENTS

In consideration of the foregoing, the Federal Aviation Administration amends 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. app. 1344, 1354(a), 1355, 1421, 1423, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g).

2. Section 23.301(d) is revised to read as follows:

§ 23.301 Loads.

* * * * *

(d) Simplified structural design criteria may be used if they result in design loads not less than those prescribed in §§ 23.331 through 23.521. For airplane configurations described in appendix A, § 23.1, the design criteria of appendix A of this part are an approved equivalent of §§ 23.321 through 23.459. If appendix A of this part is used, the entire appendix must be substituted for the corresponding sections of this part.

airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is not significant under Executive Order 12866. In addition, the FAA certifies that this rule will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This rule is not considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule 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.

Issued in Washington, DC on

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

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

2. Section 23.301(d) is revised to read as follows:

§ 23.301 Loads.

* * * * *

(d) Simplified structural design criteria may be used if they result in design loads not less than those prescribed in §§ 23.331 through 23.521. For airplane configurations described in appendix A, § 23.1, the design criteria of appendix A of this part are an approved equivalent of §§ 23.321 through 23.459. If appendix A of this part is used, the entire appendix must be substituted for the corresponding sections of this part.

3. Section 23.335 is amended by revising paragraph (a)(1) introductory text; by revising paragraphs (a)(1)(i), and (a)(1)(ii); by removing the period and adding "; and either--" to the end of paragraph (b)(4)(i); by revising paragraph (b)(4)(ii); by adding a new paragraph (b)(4)(iii); and by revising the introductory text of paragraph (d)(1) to read as follows:

§ 23.335 Design airspeeds.

* * * * *

(a) * * *

(1) Where W/S = wing loading at the design maximum takeoff weight, V_c (in knots) may not be less than--

(i) $33 \sqrt{(W/S)}$ (for normal, utility, and commuter category airplanes);

(ii) $36 \sqrt{(W/S)}$ (for acrobatic category airplanes).

* * * * *

(b) * * *

(4) * * *

(ii) Mach 0.05 for normal, utility, and acrobatic category airplanes (at altitudes where M_D is established); or

(iii) Mach 0.07 for commuter category airplanes (at altitudes where M_D is established) unless a rational analysis, including the effects of automatic systems, is used to determine a lower margin. If a rational analysis is used, the minimum speed margin must be enough to provide for atmospheric variations (such as horizontal gusts, and the penetration of jet streams or cold fronts), instrument errors, airframe production variations, and must not be less than Mach 0.05.

* * * * *

(d) * * *

(1) V_B may not be less than the speed determined by the intersection of the line representing the maximum positive lift, $C_{N\ MAX}$, and the line representing the rough air gust velocity on the gust V-n diagram, or $V_{S1}\sqrt{n_g}$, whichever is less, where:

* * * * *

4. Section 23.337(a)(1) is revised to read as follows:

§ 23.337 Limit maneuvering load factors.

(a) * * *

(1) $2.1 + \frac{24,000}{W + 10,000}$ for normal and commuter category airplanes, where W = design maximum takeoff weight, except that n need not be more than 3.8;

* * * * *

5. Section 23.341 is amended by redesignating existing paragraphs (a) and (b) as paragraphs (b) and (c), respectively; by adding a new paragraph (a); by revising the redesignated paragraph (b); and by revising the introductory text, the

formula, and the definition of "W/S" in the redesignated paragraph (c) to read as follows:

§ 23.341 Gust loads factors.

(a) Each airplane must be designed to withstand loads on each lifting surface resulting from gusts specified in § 23.333(c).

(b) The gust load for a canard or tandem wing configuration must be computed using a rational analysis, or may be computed in accordance with paragraph (c) of this section, provided that the resulting net loads are shown to be conservative with respect to the gust criteria of § 23.333(c).

(c) In the absence of a more rational analysis, the gust load factors must be computed as follows--

$$n = 1 + \frac{K_g\ U_{de}\ V\ a}{498\ (W/S)}$$

* * * * *

W/S = Wing loading (p.s.f.) due to the applicable weight of the airplane in the particular load case.

* * * * *

6. A new § 23.343 is added to read as follows:

§ 23.343 Design fuel loads.

(a) The disposable load combinations must include each fuel load in the range from zero fuel to the selected maximum fuel load.

(b) If fuel is carried in the wings, the maximum allowable weight of the airplane without any fuel in the wing tank(s) must be established as "maximum zero wing fuel weight," if it is less than the maximum weight.

(c) For commuter category airplanes, a structural reserve fuel condition, not exceeding fuel necessary for 45 minutes of operation at maximum continuous power, may be selected. If a structural reserve fuel condition is selected, it must be used as the minimum fuel weight condition for showing compliance with the flight load requirements prescribed in this part and--

(1) The structure must be designed to withstand a condition of zero fuel in the wing at limit loads corresponding to:

(i) Ninety percent of the maneuvering load factors defined in § 23.337, and

(ii) Gust velocities equal to 85 percent of the values prescribed in § 23.333(c).

(2) The fatigue evaluation of the structure must account for any increase in operating stresses resulting from the design condition of paragraph (c)(1) of this section.

(3) The flutter, deformation, and vibration requirements must also be met with zero fuel in the wings.

7. Section 23.345 is revised to read as follows:

§ 23.345 High lift devices.

(a) If flaps or similar high lift devices are to be used for takeoff, approach or landing, the airplane, with the flaps fully extended at V_F, is assumed to be subjected to symmetrical maneuvers and gusts within the range determined by--

(1) Maneuvering, to a positive limit load factor of 2.0; and

(2) Positive and negative gust of 25 feet per second acting normal to the flight path in level flight.

(b) V_F must be assumed to be not less than 1.4 V_S or 1.8 V_{SF}, whichever is greater, where--

(1) V_S is the computed stalling speed with flaps retracted at the design weight; and

(2) V_{SF} is the computed stalling speed with flaps fully extended at the design weight.

However, if an automatic flap load limiting device is used, the airplane may be designed for the critical combinations of airspeed and flap position allowed by that device.

(c) In determining external loads on the airplane as a whole, thrust, slipstream, and pitching acceleration may be assumed to be zero.

(d) The flaps, their operating mechanism, and their supporting structures, must be designed to withstand the conditions prescribed in paragraph (a) of this section. In addition, with the flaps fully extended at V_F, the following conditions, taken separately, must be accounted for:

(1) A head-on gust having a velocity of 25 feet per second (EAS), combined with propeller slipstream corresponding to 75 percent of maximum continuous power; and

(2) The effects of propeller slipstream corresponding to maximum takeoff power.

8. Section 23.347 is amended by designating the existing text as paragraph (a) and by adding a new paragraph (b) to read as follows:

§ 23.347 Unsymmetrical flight conditions.

* * * * *

(b) Acrobatic category airplanes certified for flick maneuvers (snap roll) must be designed for additional asymmetric loads acting on the wing and the horizontal tail.

9. Section 23.349(a)(2) is revised to read as follows:

§ 23.349 Rolling conditions.

* * * * *

(a) * * *

(2) For normal, utility, and commuter categories, in Condition A, assume that 100 percent of the semispan wing airload acts on one side of the airplane and 75 percent of this load acts on the other side.

* * * * *

10. Section 23.369(a) is revised to read as follows:

§ 23.369 Rear lift truss.

(a) If a rear lift truss is used, it must be designed to withstand conditions of reversed airflow at a design speed of--

$V = 8.7 \sqrt{(W/S)} + 8.7$ (knots), where W/S = wing loading at design maximum takeoff weight.

* * * * *

11. Section 23.371 is revised to read as follows:

§ 23.371 Gyroscopic and aerodynamic loads.

(a) Each engine mount and its supporting structure must be designed for the gyroscopic, inertial, and aerodynamic loads that result, with the engine(s) and propeller(s), if applicable, at maximum continuous r.p.m., under either:

(1) The conditions prescribed in § 23.351 and § 23.423; or

(2) All possible combinations of the following--

(i) A yaw velocity of 2.5 radians per second;

(ii) A pitch velocity of 1.0 radian per second;

(iii) A normal load factor of 2.5; and

(iv) Maximum continuous thrust.

(b) For airplanes approved for aerobatic maneuvers, each engine mount and its supporting structure must meet the requirements of paragraph (a) of this section and be designed to withstand the load factors expected during combined maximum yaw and pitch velocities.

(c) For airplanes certificated in the commuter category, each engine mount and its supporting structure must meet the requirements of paragraph (a) of this section and the gust conditions specified in § 23.341 of this part.

§ 23.391 [Amended]

12. Section 23.391 is amended by removing paragraph (b) and removing the designation "(a)" from the remaining text.

13. A new § 23.393 is added to read as follows:

§ 23.393 Loads parallel to hinge line.

(a) Control surfaces and supporting hinge brackets must be designed to withstand inertial loads acting parallel to the hinge line.

(b) In the absence of more rational data, the inertial loads may be assumed to be equal to KW, where--

(1) K = 24 for vertical surfaces;

(2) K = 12 for horizontal surfaces; and

(3) W = weight of the movable surfaces.

14. Section 23.399 is revised to read as follows:

§ 23.399 Dual control system.

(a) Each dual control system must be designed to withstand the force of the pilots operating in opposition, using individual pilot forces not less than the greater of--

(1) 0.75 times those obtained under § 23.395; or

(2) The minimum forces specified in § 23.397(b).

(b) Each dual control system must be designed to withstand the force of the pilots applied together, in the same direction, using individual pilot forces not less than 0.75 times those obtained under § 23.395.

15. Section 23.415 is amended by revising paragraphs (a)(2) and (c) to read as follows:

§ 23.415 Ground gust conditions.

(a) * * *

(2) If pilot forces less than the minimums specified in § 23.397(b) are used for design, the effects of surface loads due to ground gusts and taxiing downwind must be investigated for the entire control system according to the formula:

$$H = K c S q$$

where--

H = limit hinge moment (ft.-lbs.);

c = mean chord of the control surface aft of the hinge line (ft.);

S = area of control surface aft of the hinge line (sq. ft.);

q = dynamic pressure (p.s.f.) based on a design speed not less than 14.6 $\sqrt{(W/S)}$ + 14.6 (f.p.s.) where W/S = wing loading at design maximum weight, except that the design speed need not exceed 88 (f.p.s.);

K = limit hinge moment factor for ground gusts derived in paragraph (b) of this section. (For ailerons and elevators, a positive value of K indicates a moment tending to depress the surface and a negative value of K indicates a moment tending to raise the surface).

* * * * *

(c) At all weights between the empty weight and the maximum weight declared for tie-down stated in the appropriate manual, any declared tie-down points and surrounding structure, control system, surfaces and associated gust locks, must be designed to withstand the limit load conditions that exist when the airplane is tied down and that result from wind speeds of up to 65 knots horizontally from any direction.

16. Section 23.441 is amended by revising paragraph (a)(2) and adding a new paragraph (b) to read as follows.

§ 23.441 Maneuvering loads.

(a) * * *

(2) With the rudder deflected as specified in paragraph (a)(1) of this section, it is assumed that the airplane yaws to the overswing sideslip angle. In lieu of a rational analysis, an overswing angle equal to 1.5 times the static sideslip angle of paragraph (a)(3) of this section may be assumed.

* * * * *

(b) For commuter category airplanes, the loads imposed by the following additional maneuver must be substantiated at speeds from V_A to V_D/M_D. When computing the tail loads--

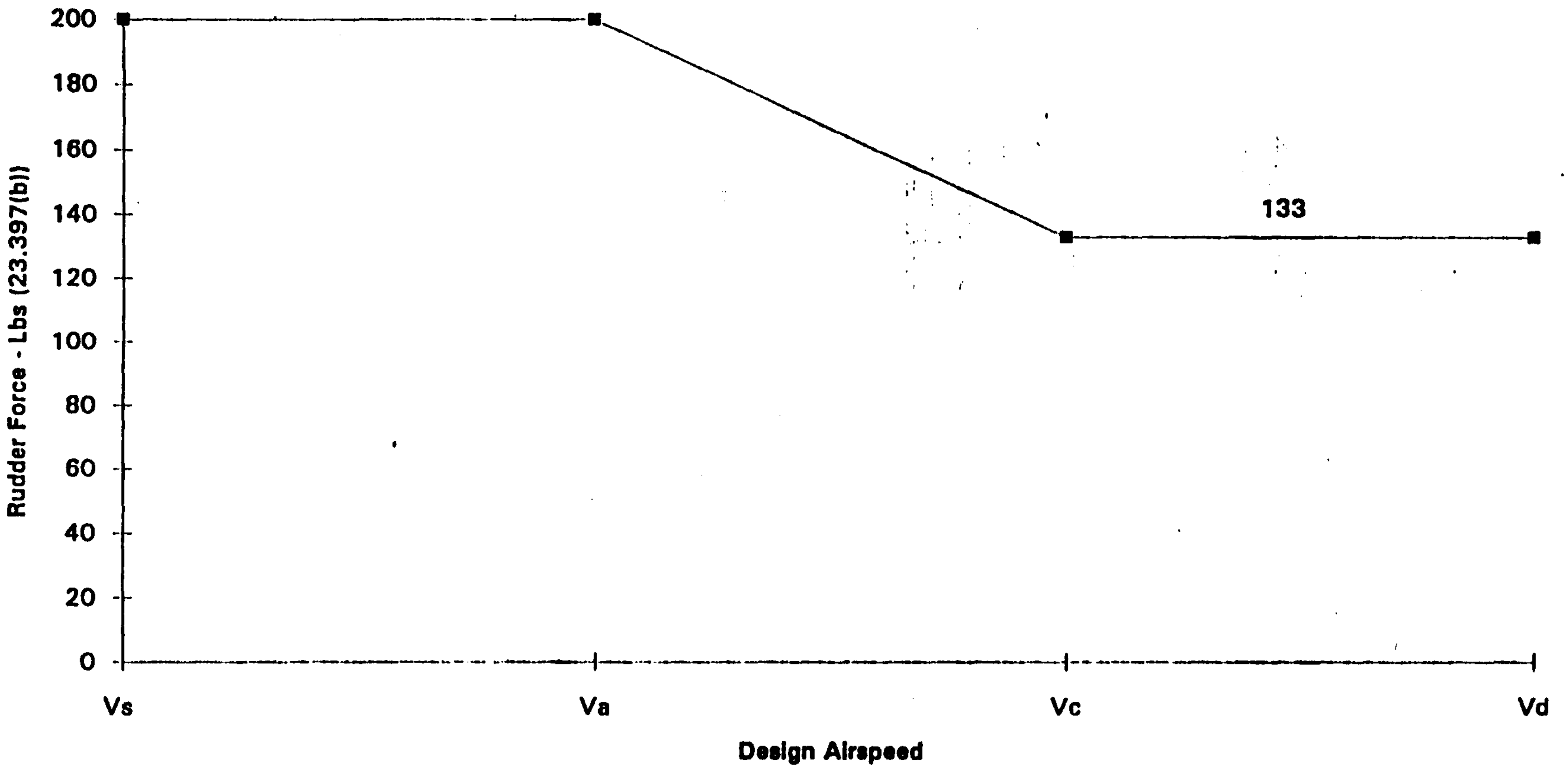
(1) The airplane must be yawed to the largest attainable steady state sideslip angle, with the rudder at maximum deflection caused by any one of the following:

(i) Control surface stops;

(ii) Maximum available booster effort;

(iii) Maximum pilot rudder force as shown below:

Maximum Pilot Rudder Force



(2) The rudder must be suddenly displaced from the maximum deflection to the neutral position.

* * * * *

17. Section 23.443(c) is revised to read as follows:

§ 23.443 Gust loads.

* * * * *

(c) In the absence of a more rational analysis, the gust load must be computed as follows:

$$L_{vt} = \frac{K_{gt} U_{de} V a_{vt} S_{vt}}{498}$$

where--

L_{vt} = Vertical surface loads (lbs.);

$$k_{gt} = \frac{0.88 \mu_{gt}}{5.3 + \mu_{gt}} = \text{gust alleviation factor;}$$

$$\mu_{gt} = \frac{2W}{\rho c_t g a_{vt} S_{vt}} {\frac{K}{l_{vt}}}^{2} = \text{lateral mass ratio;}$$

U_{de} = Derived gust velocity (f.p.s.);

ρ = Air density (slugs/cu.ft.);

W = the applicable weight of the airplane in the particular load case (lbs.);

S_{vt} = Area of vertical surface (ft.^{2});

$\overline{c}_t$ = Mean geometric chord of vertical surface (ft.);

a_{vt} = Lift curve slope of vertical surface (per radian);

K = Radius of gyration in yaw (ft.);

l_{vt} = Distance from airplane c.g. to lift center of vertical surface (ft.);

g = Acceleration due to gravity (ft./sec.^{2}); and

V = Equivalent airspeed (knots).

18. The heading "AILERONS, WING FLAPS, AND SPECIAL DEVICES" that appears between §§ 23.445 and 23.455 is revised to read "AILERONS AND SPECIAL DEVICES".

§ 23.457 [Removed]

19. Section 23.457 is removed.

20. Section 23.473 is amended by revising paragraphs (c)(1) and (f) to read as follows:

§ 23.473 Ground load conditions and assumptions.

* * * * *

(c) * * *

(1) The airplane meets the one-engine-inoperative climb requirements of § 23.67(b)(1) or (c); and

* * * * *

(f) If energy absorption tests are made to determine the limit load factor corresponding to the required limit descent velocities, these tests must be made under § 23.723(a).

* * * * *

21. Section 23.497 is amended by adding a new paragraph (c) to read as follows:

§ 23.497 Supplementary conditions for tail wheels.

* * * * *

(c) If a tail wheel, bumper, or an energy absorption device is provided to show compliance with § 23.925(b), the following apply:

(1) Suitable design loads must be established for the tail wheel, bumper, or energy absorption device; and

(2) The supporting structure of the tail wheel, bumper, or energy absorption device must be designed to withstand the loads established in paragraph (c)(1) of this section.

22. Section 23.499 is amended by adding new paragraphs (d) and (e) to read as follows:

§ 23.499 Supplementary conditions for nose wheels.

* * * * *

(d) For airplanes with a steerable nose wheel that is controlled by hydraulic or other power, at design takeoff weight with the nose wheel in any steerable position, the application of 1.33 times the full steering torque combined with a vertical reaction equal to 1.33 times the maximum static reaction on the nose gear must be assumed. However, if a torque limiting device is installed, the steering torque can be reduced to the maximum value allowed by that device.

(e) For airplanes with a steerable nose wheel that has a direct mechanical connection to the rudder pedals, the mechanism must be designed to withstand the steering torque for the maximum pilot forces specified in § 23.397(b).

§ 23.521 [Amended]

23. Section 23.521 is amended by removing paragraph (c).

24. Section 23.561 is amended by revising paragraph (b) introductory text; by revising paragraphs (d)(1)(i) through (d)(1)(iv); by removing paragraph (d)(1)(v); and by adding a new paragraph (e) to read as follows:

§ 23.561 General.

* * * * *

(b) The structure must be designed to give each occupant every reasonable chance of escaping serious injury when--

* * * * *

(d) * * *

(1) * * *

(i) The most adverse combination of weight and center of gravity position;

(ii) Longitudinal load factor of 9.0g;

(iii) Vertical load factor of 1.0g; and

(iv) For airplanes with tricycle landing gear, the nose wheel strut failed with the nose contacting the ground.

* * * * *

(e) Except as provided in § 23.787(c), the supporting structure must be designed to restrain, under loads up to those specified in paragraph (b)(3) of this section, each item of mass that could injure an occupant if it came loose in a minor crash landing.

25. Section 23.571 is amended by revising the heading, the introductory text, and paragraph (a), to read as follows:

§ 23.571 Metallic pressurized cabin structures.

For normal, utility, and acrobatic category airplanes, the strength, detail design, and fabrication of the metallic structure of the pressure cabin must be evaluated under one of the following:

(a) A fatigue strength investigation in which the structure is shown by tests, or by analysis supported by test evidence, to be able to withstand the repeated loads of variable magnitude expected in service; or

* * * * *

26. Section 23.572 is amended by revising the heading; by revising paragraph (a) introductory text; and by revising paragraph (a)(1) to read as follows:

§ 23.572 Metallic wing, empennage, and associated structures.

(a) For normal, utility, and acrobatic category airplanes, the strength, detail design, and fabrication of those parts of the airframe structure whose failure would be catastrophic must be evaluated under one of the following unless it is shown that the structure, operating stress level, materials and expected uses are comparable, from a fatigue standpoint, to a similar design that has had extensive satisfactory service experience:

(1) A fatigue strength investigation in which the structure is shown by tests, or by analysis supported by test evidence, to be able to withstand the repeated loads of variable magnitude expected in service; or

* * * * *

27. Section 23.573 is amended by removing the reference in paragraph (b) "§ 23.571(c)" and adding the reference "§ 23.571(a)(3)" in its place; by removing paragraph (c); and by revising the introductory text of paragraph (a)(5) to read as follows:

§ 23.573 Damage tolerance and fatigue evaluation of structure.

(a) * * *

(5) For any bonded joint, the failure of which would result in catastrophic loss of the airplane, the limit load capacity must be substantiated by one of the following methods--

* * * * *

28. A new § 23.574 is added to read as follows:

§ 23.574 Metallic damage tolerance and fatigue evaluation of commuter category airplanes.

For commuter category airplanes--

(a) Metallic damage tolerance. An evaluation of the strength, detail design, and fabrication must show that catastrophic failure due to fatigue, corrosion, defects, or damage will be avoided throughout the operational life of the airplane. This evaluation must be conducted in accordance with the provisions of § 23.573, except as specified in paragraph (b) of this section, for each part of the structure that could contribute to a catastrophic failure.

(b) Fatigue (safe-life) evaluation. Compliance with the damage tolerance requirements of paragraph (a) of this section is not required if the applicant establishes that the application of those requirements is impractical for a particular structure. This structure must be shown, by analysis supported by test evidence, to be able to withstand the repeated loads of variable magnitude expected during its service life without detectable cracks. Appropriate safe-life scatter factors must be applied.

29. A new § 23.575 is added to read as follows:

§ 23.575 Inspections and other procedures.

Each inspection or other procedure, based on an evaluation required by §§ 23.571, 23.572, 23.573 or 23.574, must be established to prevent catastrophic failure and must be included in the Limitations Section of the Instructions for Continued Airworthiness required by § 23.1529.

30. Section 23.607 is revised to read as follows:

§ 23.607 Fasteners.

(a) Each removable fastener must incorporate two retaining devices if the loss of such fastener would preclude continued safe flight and landing.

(b) Fasteners and their locking devices must not be adversely affected by the environmental conditions associated with the particular installation.

(c) No self-locking nut may be used on any bolt subject to rotation in operation unless a non-friction locking device is used in addition to the self-locking device.

31. Section 23.611 is revised to read as follows:

§ 23.611 Accessibility provisions.

For each part that requires maintenance, inspection, or other servicing, appropriate means must be incorporated into the aircraft design to allow such servicing to be accomplished.

32. Section 23.629 is amended by revising the introductory text of paragraph (a); by redesignating existing paragraph (b) as paragraph (c) and revising it; by redesignating existing paragraph (c) as paragraph (b) and revising its introductory text; by revising paragraph (d)(3)(i); by revising paragraphs (g) and (h); and by adding a new paragraph (i) to read as follows:

§ 23.629 Flutter.

(a) It must be shown by the methods of paragraph (b) and either paragraph (c) or (d) of this section, that the airplane is free from flutter, control reversal, and divergence for any condition of operation within the limit V-n envelope and at all speeds up to the speed specified for the selected method. In addition--

* * * * *

(b) Flight flutter tests must be made to show that the airplane is free from flutter, control reversal and divergence and to show that-

* * * * *

(c) Any rational analysis used to predict freedom from flutter, control reversal and divergence must cover all speeds up to 1.2 V_D.

(d) * * *

(3) * * *

(i) Does not have a T-tail or other unconventional tail configurations;

* * * * *

(g) For airplanes showing compliance with the fail-safe criteria of §§ 23.571 and 23.572, the airplane must be shown by analysis to be free from flutter up to V_D/M_D after fatigue failure, or obvious partial failure, of a principal structural element.

(h) For airplanes showing compliance with the damage tolerance criteria of § 23.573, the airplane must be shown by analysis to be free from flutter up to V_D/M_D with the extent of damage for which residual strength is demonstrated.

(i) For modifications to the type design that could affect the flutter characteristics, compliance with paragraph (a) of this section must be shown, except that analysis based on previously approved data may be used alone to show freedom from flutter, control reversal and divergence, for all speeds up to the speed specified for the selected method.

§ 23.657 [Amended]

33. Section 23.657 is amended by removing paragraph (c).

§ 23.673 [Amended]

34. Section 23.673 is amended by removing paragraph (b) and the paragraph designation "(a)" for the remaining paragraph.

35. Section 23.725 is amended by revising the equation in paragraph (b) to read as follows:

§ 23.725 Limit drop tests.

* * * * *

(b) * * *

$$W_e = W \frac{[h + (1 - L) d]}{(h + d)}$$

* * * * *

36. Section 23.755 is amended by removing paragraph (b), and by redesignating paragraph (c) as paragraph (b) and revising it to read as follows:

§ 23.755 Hulls.

* * * * *

(b) Watertight doors in bulkheads may be used for communication between compartments.

37. Section 23.865 is revised to read as follows:

§ 23.865 Fire protection of flight controls, engine mounts, and other flight structure.

Flight controls, engine mounts, and other flight structure located in designated fire zones, or in adjacent areas that would be subjected to the effects of fire in the designated fire zones, must be constructed of fireproof material or be shielded so that they are capable of withstanding the effects of a fire. Engine vibration isolators must incorporate suitable features to ensure that the engine is retained if the non-fireproof portions of the isolators deteriorate from the effects of a fire.

38. Section 23.925 is amended by revising paragraph (b) to read as follows:

§ 23.925 Propeller clearance.

* * * * *

(b) Aft-mounted propellers. In addition to the clearances specified in paragraph (a) of this section, an airplane with an aft mounted propeller must be designed such that the propeller will not contact the runway surface when the airplane is in the maximum pitch attitude attainable during normal takeoffs and landings.

* * * * *

39. Appendix A is amended by revising the title, section A23.1, paragraphs A23.11(c)(1) and (d), and Table 2; and by adding a new Figure A7 to the end of the Appendix to read as follows:

APPENDIX A TO PART 23-SIMPLIFIED DESIGN LOAD CRITERIA

A23.1 General.

(a) The design load criteria in this appendix are an approved equivalent of those in §§ 23.321 through 23.459 of this subchapter for an airplane having a maximum weight of 6,000 pounds or less and the following configuration:

(1) A single engine excluding turbine powerplants;

(2) A main wing located closer to the airplane's center of gravity than to the aft, fuselage-mounted, empennage;

(3) A main wing that contains a quarter-chord sweep angle of not more than 15 degrees fore or aft;

(4) A main wing that is equipped with trailing-edge controls (ailerons or flaps, or both);

(5) A main wing aspect ratio not greater than 7;

(6) A horizontal tail aspect ratio not greater than 4;

(7) A horizontal tail volume coefficient not less than 0.34;

(8) A vertical tail aspect ratio not greater than 2;

(9) A vertical tail platform area not greater than 10 percent of the wing platform area; and

(10) Symmetrical airfoils must be used in both the horizontal and vertical tail designs.

(b) Appendix A criteria may not be used on any airplane configuration that contains any of the following design features:

(1) Canard, tandem-wing, close-coupled, or tailless arrangements of the lifting surfaces;

(2) Biplane or multiplane wing arrangements;

(3) T-tail, V-tail, or cruciform-tail (+) arrangements;

(4) Highly-swept wing platforms (more than 15-degrees of sweep at the quarter-chord), delta planforms, or slatted lifting surfaces; or

(5) Winglets or other wing tip devices, or outboard fins.

* * * * *

A23.11 Control surface loads.

* * * * *

(c) * * *

(1) Simplified limit surface loadings for the horizontal tail, vertical tail, aileron, wing flaps, and trim tabs are specified in figures 5 and 6 of this appendix.

(i) The distribution of load along the span of the surface, irrespective of the chordwise load distribution, must be assumed proportional to the total chord, except on horn balanced surfaces.

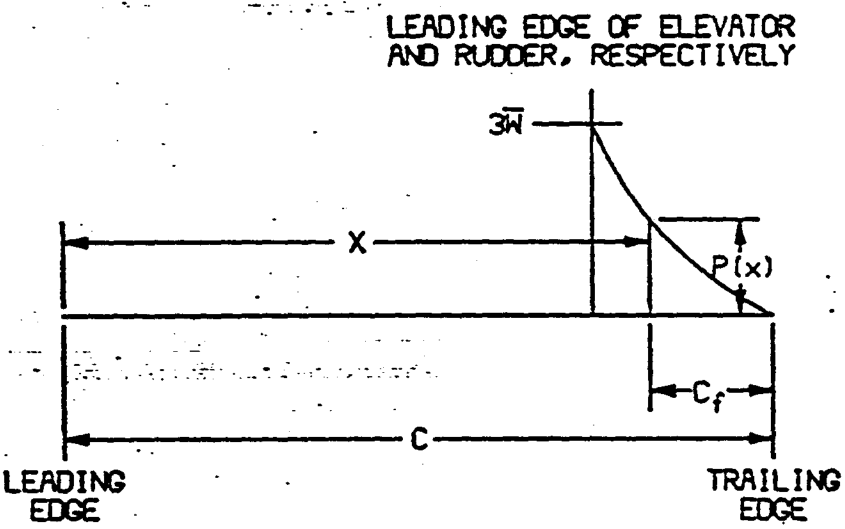
(ii) The load on the stabilizer and elevator, and the load on fin and rudder, must be distributed chordwise as shown in figure 7 of this appendix.

(iii) In order to ensure adequate torsional strength and to account for maneuvers and gusts, the most severe loads must be considered in association with every center of pressure position between the leading edge and the half chord of the mean chord of the surface (stabilizer and elevator, or fin and rudder).

(iv) To ensure adequate strength under high leading edge loads, the most severe stabilizer and fin loads must be further considered as being increased by 50 percent over the leading 10 percent of the chord with the loads aft of this appropriately decreased to retain the same total load.

(v) The most severe elevator and rudder loads should be further considered as being distributed parabolically from three times the mean loading of the surface (stabilizer and elevator, or fin and rudder) at the leading edge of the elevator and rudder, respectively, to zero at the trailing edge according to the equation:

$$P(x) = 3\ (\overline{w})\ \left(\frac{c - x}{c_f^2}\right)^2$$


LEADING EDGE OF ELEVATOR
AND RUDDER, RESPECTIVELY
3W̄
X
P(x)
C_f
C
LEADING EDGE
TRAILING EDGE

[20 lines space reserved for "Leading Edge of Elevator and Rudder, Respectively"]

[Contact Pat Nininger, ACE-111, (816) 426-5688. Master copy attached.]

Where--

$P(x)$ = local pressure at the chordwise stations x,

c = chord length of the tail surface,

c_f = chord length of the elevator and rudder respectively, and

$\overline{w}$ = average surface loading as specified in Figure A5.

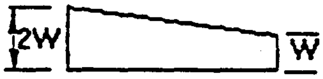
(vi) The chordwise loading distribution for ailerons, wing flaps, and trim tabs are specified in Table 2 of this appendix.

* * * * *

(d) Outboard fins. Outboard fins must meet the requirements of § 23.445.

* * * * *

Table 2 - Average limit control surface loading

AVERAGE LIMIT CONTROL SURFACE LOADING			
SURFACE	DIRECTION OF LOADING	MAGNITUDE OF LOADING	CHORDWISE DISTRIBUTION
Horizontal Tail I	a) Up and Down	Figure A5 Curve (2)	See Figure A7
	b) Unsymmetrical Loading (Up and Down)	100% $\bar{w}$ on one side of airplane ℄ 65% $\bar{w}$ on other side of airplane ℄ for normal and utility categories. For acrobatic category see A23.11(c)	
Vertical Tail II	Right and Left	Figure A5 Curve (1)	Same as above
Aileron III	a) Up and Down	Figure A6 Curve (5)	(C) 
Wing Flap IV	a) Up	Figure A6 Curve (4)	(D) 
	b) Down	.25 x Up Load (a)	
Trim Tab V	a) Up and Down	Figure A6 Curve (3)	Same as (D) above

NOTE: The surface loading I, II, III, and V above are based on speeds V_A min and V_C min.

The loading of IV is based on V_F min.

If values of speed <u>greater than</u> these minimums are selected for design, the appropriate surface loadings must be multiplied by the ratio $\left(\frac{V\text{selected}}{V\text{ minimum}}\right)^2$.

For conditions I, II, III, and V the multiplying factor used must be the higher of

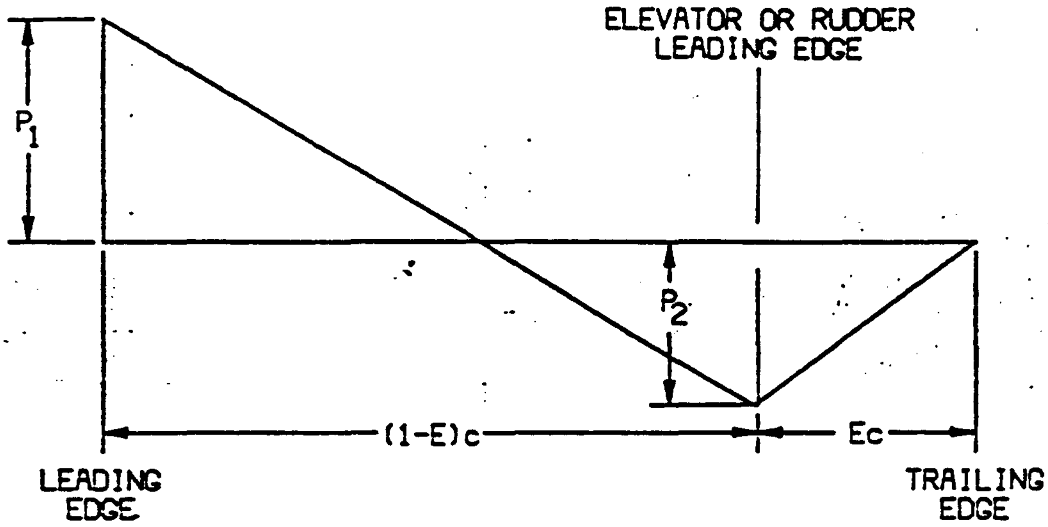
$$\left(\frac{V_A \text{ sel.}}{V_A \text{ min.}}\right)^2 \quad \text{or} \quad \left(\frac{V_C \text{ sel.}}{V_C \text{ min.}}\right)^2$$

[40 lines space reserved for "Table 2"]

[Contact Pat Nininger, ACE-111, (816) 426-5688. Master copy attached.]

* * * * *

FIGURE A7 - CHORDWISE LOAD DISTRIBUTION FOR STABILIZER AND ELEVATOR OR FIN AND RUDDER


ELEVATOR OR RUDDER LEADING EDGE
P_1
P_2
(1-E)c
Ec
LEADING EDGE
TRAILING EDGE

$$P_1 = 2\ (\overline{w})\ \frac{(2 - E - 3d')}{(1 - E)}$$

$$P_2 = 2\ (\overline{w})\ (3d' + E - 1)$$

where: $\overline{w}$ = average surface loading (as specified in figure A.5)

E = ratio of elevator (or rudder) chord to total stabilizer and elevator (or fin and rudder) chord.

d' = ratio of distance of center of pressure of a unit spanwise length of combined stabilizer and elevator (or fin and rudder) measured from stabilizer (or fin) leading edge to the local chord. Sign convention is positive when center of pressure is behind leading edge.

c = local chord.

Note: Positive values of $\overline{w}$, P_1 and P_2 are all measured in the same direction.

either by continuous demonstration or by synthesis from segments, does not reflect current practice. The best method to determine the takeoff path from rest to 35 feet above the takeoff surface is by a continuous demonstration. The most practical method to determine the takeoff path from 35 feet to 1500 feet above the takeoff surface is by synthesis from segments. Accordingly, § 23.57, paragraphs (d) and (e), incorporates these changes.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.59 Takeoff distance and takeoff run.

The FAA proposed to clarify § 23.59 with no substantial change in requirements. A change to the opening text is proposed to clarify that the determination of takeoff run is the applicant's option since the applicant may choose not to present clearway data. In current § 23.59(a)(2) and (b)(2), the reference to "along the takeoff path," in a takeoff with all engines operating, is proposed to be removed since takeoff path is a one-engine-inoperative condition. Additionally, the FAA proposed to replace the reference to V_{LOF} with the words "liftoff point" to clarify that the requirements specify a point and related distance, not a speed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.63 Climbs: general.

The FAA proposed a new § 23.63 to assemble general climb requirements from current §§ 23.65 and 23.67 into a single section and to differentiate between WAT limited airplanes and those airplanes that are not WAT limited. (See discussion under § 23.45.) As proposed, new § 23.63(a)(1) requires that compliance be shown out of ground effect. This requirement is in current § 23.67(e), which applies to commuter category airplanes. New § 23.63(a)(3) requires that compliance must be shown, unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees. This requirement is in current § 23.149 and has been applied generally to part 23 airplanes except commuter category airplanes in certain circumstances.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.65 Climb: All engines operating.

The FAA proposed to change the applicability of § 23.65(a) from "each airplane," as adopted in Amendment No. 23-45 (58 FR 42136, August 6, 1993), to "each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight." The FAA also proposed to change the phrase "angle of climb" to "climb gradient" and to establish the climb gradient at 8.3 percent for landplanes and 6.7 percent for seaplanes and amphibians with certain specified performance conditions.

In paragraph (a)(4), the FAA proposed to establish a minimum climb speed for multiengine airplanes of not less than the greater of 1.1 V_{MC} and 1.2 V_{S1}, which provides a margin above V_{MC}.

The FAA proposed to move cowl flap requirements, in current paragraph (a)(5), to proposed § 23.45(c).

The FAA proposed to remove § 23.65(b) since these requirements should have been removed in Amendment No. 23-45 (58 FR 42136, August 6, 1993). Since the adoption of Amendment No. 23-45, there is no longer a rate of climb requirement in § 23.65(a).

The FAA proposed to add WAT limits to § 23.65(b), for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See § 23.45 discussion.)

The FAA proposed to move § 23.65(c) to § 23.65(b) and to remove the temperature and altitude requirements since WAT limits are required for turbine engine-powered airplanes and the four percent gradient applies at any approved takeoff ambient condition. In § 23.65(b)(2), the FAA proposed to require the landing gear be down for the test unless the gear can be retracted in not more than seven seconds. This is more stringent than the present requirement, but the same as the proposed one-engine-inoperative takeoff climb requirements, and is considered appropriate to this weight and class of airplane with WAT limits.

The FAA proposed to remove § 23.65(d) since the requirements are covered in amended § 23.45(h)(2) and in current § 23.21.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.66 Takeoff climb; one-engine inoperative.

The FAA proposed a new § 23.66 to require the determination of the one-engine-inoperative climb capability of all WAT limited reciprocating engine-powered and turbine engine-powered airplanes immediately after takeoff. Since most reciprocating engine-powered airplanes do not have autofeather, the condition immediately after takeoff can be critical. There is not a minimum climb requirement in this configuration, only the determination of the climb or descent gradient. This information is provided to the pilot in the AFM (see § 23.1587) to allow the pilot to make informed judgments before takeoff.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.67 Climb: one engine inoperative.

The FAA proposed to reorganize § 23.67 for harmonization with the JAR; to require WAT limits for some airplanes; to require wings level climb up to 400 feet for commuter category airplanes; and to make minor changes in airplane configuration requirements.

Revised § 23.67(a) specifies the climb requirements for non-WAT airplanes with no change in requirements for those airplanes.

Revised § 23.67(b) specifies climb requirements for WAT airplanes. WAT criteria are applied for both reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See the discussion under § 23.45.) Turbine engine-powered airplanes have been subject to limited WAT limitations under § 23.67(c), which the FAA proposed to incorporate into § 23.67(b).

The FAA proposed to change the takeoff flap position for normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less to "wing flaps retracted" from "most favorable position" (§ 23.67(a)(4)). Wing flaps retracted is the position most used in certification and in service for this size of airplane (see new § 23.67(a)(1)(iv) and (a)(2)(iv)).

The FAA proposed to remove § 23.67(d) since all climb speeds (both all-engine and one engine inoperative) are scheduled and the determination of V_Y is no longer required.

The FAA proposed to redesignate § 23.67(e) for commuter category airplanes as § 23.67(c) with no change in requirements except that the takeoff climb with landing gear extended must be conducted with the landing gear doors open. This is a conservative approach offered by the JAA to specify a definite gear door configuration and to remove the requirement to determine performance during the transient condition of gear doors opening and closing. The FAA proposed to specify, in § 23.67(c)(1), that the first segment climb must be conducted with the wings level and to further specify that the climb speed for the segment must be V_2 instead of the requirement for a range of speeds from V_{LOF} and whatever the applicant selects at gear retraction. Also, the FAA proposed, in § 23.67(c)(2), to require conducting the second segment climb with wings level, which is appropriate for operational scenarios.

The FAA proposed to revise § 23.67 by removing paragraph (e)(1) and by moving the requirements to § 23.67(c) and § 23.63(a)(1) and (d).

In proposed § 23.67(c)(3), enroute climb, the FAA added a minimum climb speed to ensure an adequate margin above stall speed.

The FAA proposed to redesignate § 23.67(e)(3) as § 23.67(c)(4) and to remove the paragraph heading "Approach" and add "Discontinued approach" in its place. The FAA proposed to clarify, in new § 23.67(c)(4), that the climb gradients must be met at an altitude of 400 feet above the landing surface.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.69 Enroute climb/descent.

The FAA proposed a new § 23.69 to require the determination of all engine and one-engine-inoperative climb/descent rates and gradients in the enroute configuration under all operational WAT conditions. This information is necessary for enroute flight planning and dispatch. Climb speeds are specified to provide a margin above V_{S1}.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.71 Glide: Single-engine airplanes.

The FAA proposed a new § 23.71 to require the determination of glide distance and speed for single-engine airplanes. The information is necessary for flight planning and to provide the pilot with information from which to make informed decisions.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.73 Reference landing approach speed.

The FAA proposed a new § 23.73 to define the reference landing approach speeds, V_{REF}. Establishing a definition for these speeds simplifies the use of V_{REF} in other portions of the rule. The V_{REF} speeds for the various category airplanes are established as not less than 1.3 V_{S_0}. Also, the established speeds consider the appropriate relationship to V_{MC} determined under § 23.149.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.75 Landing distance.

The FAA proposed to revise the heading, reorganize § 23.75 for harmonization with the JAR, add the landing reference speed, V_{REF}, and move the portion on brake pressures to § 23.735, Brakes.

The FAA proposed to remove the reference to the AFM from the introductory paragraph. Part 23, subpart B, is generally used to specify flight test requirements, and part 23, subpart G, is generally used to specify the AFM requirements. The FAA also proposed to revise the introductory paragraph to require landing distances to be determined at standard temperature for each weight and altitude. Service experience has shown that landing distances are not sensitive to temperatures. The use of standard temperature is consistent with WAT requirements. The FAA proposed to remove from the introductory paragraph the reference to "approximately 3 knots" for seaplanes and amphibians because this information is considered advisory material on acceptable methods of compliance.

The FAA proposed to revise § 23.75(a) to add V_{REF} and to require its use. (See § 23.73.)

The FAA proposed to remove § 23.75(b) because § 23.45 specifies these general requirements. New § 23.75(b) clarifies that a constant configuration must be maintained throughout the maneuver.

The FAA proposed to revise § 23.75(d) by adding the requirement to specify the weight that must be considered for the transition to the balked landing conditions. This requirement reflects current industry practice.

The FAA proposed new § 23.75(e) as a general requirement to ensure the reliability of the brakes and tires.

The FAA proposed to revise § 23.75(f) to remove the first use of the word "means" and to add the phrase "retardation means" in its place, and to remove paragraph (f)(3). Paragraph (f)(3) required that no more than average skill shall be required to control the airplane. This topic is covered in § 23.45(f).

The FAA proposed to remove § 23.75(h) because the introductory paragraph of § 23.75 contains commuter category requirements and § 23.1587 requires landing distance correction factors.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.77 Balked landing.

The FAA proposed to revise this section to include additional WAT requirements and to make editorial changes.

The proposed revisions to § 23.77(a) and (b) differentiate between WAT and non-WAT. (See § 23.45.) Section 23.77(a)(4) adds a new climb speed requirement to ensure that acceleration is not necessary during the transition from landing to balked landing. The climb gradient of § 23.77(b) was selected to be slightly less than the non-WAT airplane sea level requirement in exchange for a balked landing climb capability at all altitudes and temperatures.

The commuter category climb gradient of 3.3 percent specified in § 23.77(c) changes to 3.2 percent for consistency with part 25. Additional editorial changes and deletions are made in § 23.77(c) because the general requirements are covered in final § 23.45.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.143. General.

The FAA proposed to revise § 23.143(a) to add the phrase "during all flight phases" to the introductory paragraph and to add "Go-around" to the list of flight phases.

The JAA and FAA decided, during FAA/JAA Harmonization meetings, that the term "go-around" included the all engine balked landings of § 23.77, various all engine and one-engine-inoperative aborted landings specified in the AFM, and the commuter category discontinued approach of § 23.67(c)(4). Balked landing refers only to the all engine balked landing of § 23.77.

The FAA proposed to revise the two-hand roll force in the table of paragraph (c) from 60 to 50 pounds, to be consistent with JAR 25. The FAA also proposed to revise the table to show a one-hand on the rim roll force of 25 pounds. This is an FAA/JAA harmonized value.

Comment: Raytheon Aircraft Company comments that the control force limits table is specifically tied to the flight phases of paragraph (a) and that this "could be interpreted as providing an upper limit of maneuvering force (stick force per g) such that all normal operational maneuvers would have to be performed within a pitch force limit of 75 lbs (wheel, two hands), for unspecified normal acceleration limits."

Raytheon states that this has not been previous policy and could become a costly requirement for larger part 23 aircraft with large cg ranges, "if substantial normal acceleration excursions are considered 'normal' maneuvering." Raytheon recommends "that either the normal acceleration excursions be defined for normal, utility, acrobatic, and commuter categories or the explicit tie to the flight phases in this rule be deleted."

FAA Response: Raytheon's concern is whether "normal acceleration excursions are considered 'normal' maneuvering." They are not.

Section 23.143 has historically been titled "General" and has always been considered broad enough to cover controllability and maneuverability in general. The inclusion of "all flight phases" is considered clarifying, and Raytheon's concern that the concept of normal being expanded is unwarranted. Adopting this proposal would not change current certification practice.

The proposals are adopted as proposed.

Section 23.145 Longitudinal Control.

The FAA proposed to revise § 23.145 to change the speed ranges applicable to the takeoff, enroute, and landing configurations.

Editorial changes were also proposed for the introductory text of paragraph (b) with no substantive change.

The FAA proposed in paragraph (b)(2) to change the requirement from "attaining and maintaining, as a minimum, the speed used to show compliance with § 23.77" to "allow the airspeed to transition from 1.3 V_{SO} to 1.3 V_{S1}."

The FAA also proposed to redesignate paragraphs (b)(2)(i) and (ii) as (b)(2) and (b)(3), respectively, and in paragraph (b)(3) to add more specific requirements if gated flap positions are used.

The FAA proposed to change the speed reference from 1.4 V_{SO} to V_{REF} for landing configuration in paragraph (b)(5). The FAA also proposed in paragraph (b)(5) to allow a two-handed control force since use of two hands is considered appropriate for a power off condition because the pilot does not need to change power settings.

Proposed paragraph (b)(6) is the same as former paragraph (b)(3).

In paragraph (c), the FAA proposed to change the speed range for maneuvering capability from "above V_{MO}/M_{MO} and up to V_D/M_D" to "above V_{MO}/M_{MO} and up to the maximum speed shown under § 23.251." This change is considered necessary because a range of speeds can be chosen as V_D/M_D, and reference to § 23.251 ensures a flight demonstrated speed instead of a design speed.

The FAA proposed in paragraph (d) to change the speed that must be maintained for power-off glide from 1.3 V_{so} to V_{REF}.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.147 Directional and lateral control.

The FAA proposed to make minor revisions to § 23.147(a) and to add two new requirements in proposed paragraphs (b) and (c). The flaps retracted configuration for § 23.147(a)(4) are consistent with proposed § 23.67.

In proposed § 23.147(b), the FAA proposed to add requirements for multiengine airplanes that, during an enroute climb, when an engine fails the airplane maintains a minimum standard of controllability after allowing for a pilot action delay of two seconds. This proposed change tests for a likely operational scenario and is intended to ensure satisfactory controllability.

In § 23.147(c), the FAA proposed to test for the failure or disconnection of the primary lateral control. This paragraph requires that the airplane exhibit adequate dihedral effect throughout the airplane's operational envelope to ensure continued safe flight and landings if a lateral control disconnects. In addition, this requirement complements the relaxed requirements of proposed § 23.177(b) (see proposal for § 23.177).

Comment: Raytheon comments that there is no basis provided for the new rules proposed in § 23.147(b) and (c). Raytheon states that the "two second delay and the 45 degree bank appear to be arbitrary choices" and that there "is no comparable FAR requirement."

FAA Response: The values of 2 seconds and 45 degrees in proposed paragraph (b) were determined from § 23.367, "Unsymmetrical loads due to engine failure," which contains a 2 second delay for pilot corrective action. Historically, the 2 second delay and the 45 degree bank angle correlate to a similar requirement used for years by the United Kingdom CAA.

Proposed paragraph (c), failure of the lateral control, is part of a reduction in the overall lateral stability requirements. In Amendment 23-45, the FAA reduced the power requirements for § 23.177(a) in the landing configuration from 75 percent maximum continuous power to the power required to maintain a three degree angle of descent. The § 23.177 requirement essentially demonstrated that the airplane had the wing dihedral effect and rudder control power to raise a low (banked) wing using rudder only. Prior to this amendment, many manufacturers had to install an aileron/rudder interconnect to meet this requirement because of the high power setting. An aileron/rudder interconnect is a mechanism that ties the two controls together such that when one control surface deflects, the other will also deflect. In the case of § 23.177, the pilot uses the rudder, which also deflects the aileron and raises the wing to level. The underlying intent of this rule is to demonstrate that the airplane is controllable after an aileron control failure, similar to the elevator control failure demonstration currently in the requirements. This change, in conjunction with Amendment 23-45, will allow manufacturers to eliminate the need for the aileron/rudder interconnect.

The proposals are adopted as proposed.

Section 23.149 Minimum control speed.

The FAA proposed to clarify § 23.149, to add a V_{MC} in the landing configuration, and to provide the procedure for determining a ground V_{MC}.

The FAA proposed to clarify § 23.149(a), with no requirement change. The FAA also proposed to clarify § 23.149(b) and to remove the reference to lesser weights in paragraph (b)(4) because the range of weights is covered in § 23.21.

The FAA proposed to revise § 23.149(c) to specify the requirements for a V_{MC} in the landing configuration for all WAT airplanes. This requirement is necessary for WAT airplanes to provide a V_{REF} margin above the V_{MC} determined in the landing configuration. (See proposal for § 23.73.)

The FAA proposed a new § 23.149(f) to contain requirements to determine a V_{MCG} for commuter category airplanes that could, at the option of the applicant, be used to comply with § 23.51. (See § 23.51.)

The only comment came from the JAA, which addressed a known disharmony, V_{SSE}, from a previous rule change.

The proposals are adopted as proposed.

Section 23.153 Control during landings.

The FAA proposed to revise § 23.153 to reference landing speeds to V_{REF} and to reorganize the section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.155 Elevator control forces in maneuvers.

The FAA proposed to revise § 23.155 to make changes to the power requirements and gradient of the stick force curve.

The FAA proposed to revise § 23.155(b) to specify the maximum continuous power for the test required by this section instead of allowing a power selected by the applicant as an operating limitation. This revision eliminates an unnecessary power specification and simplifes normal operations for the pilot.

The FAA proposed to revise § 23.155(c) to address stick force gradient to ensure that stick force lightening is not excessive. As stated in the preamble to Notice 94-22, the FAA will issue advisory material on acceptable methods of compliance.

Comment: Raytheon states that proposed paragraph (c) adds a new requirement that there must not be an "excessive decrease" in the gradient of the stick force per g with increasing load factor. Raytheon's concern is that this is a very loosely defined requirement and that the allowable decrease in maneuvering stability may be a function of aircraft size and mission.

FAA Response: The FAA agrees that every airplane is different and that, therefore, each must be considered separately. The FAA does not agree that paragraph (c) is loosely defined. For many of the flight requirements, including "excessive decrease," the FAA must evaluate the individual airplanes to determine if the handling qualities are safe.

This proposals are adopted as proposed.

Section 23.157 Rate of roll.

The FAA proposed to revise § 23.157(d) power and trim requirements and to clarify the flap position. In § 23.157(d)(1), the FAA proposed to clarify that the flaps should be in the landing position and § 23.157(d)(3) makes the power consistent with the approach configuration, which is the configuration being tested. The FAA proposed in § 23.157(d)(4) to relate the trim speed to V_{REF}. (See amendment for § 23.73.)

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.161 Trim.

The FAA proposed to revise § 23.161 power, configurations, and speeds.

The FAA proposed to revise § 23.161(a) to state the safety principles underlying the trim requirements and to provide a regulatory requirement for considering conditions that might be encountered outside the requirements addressed in paragraphs (b) through (d).

The FAA proposed to revise § 23.161(b)(1) to add a requirement to trim at M_{MO} in addition to V_{MO} to clarify that the airplane must trim in the Mach limited speed range.

The FAA proposed to revise § 23.161(b)(2) to require lateral and directional trim over a range of 1.4 V_{S1} to V_H or V_{MO}/M_{MO} for commuter category airplanes instead of only the high speed requirement in the present rules.

The FAA proposed, in the introductory paragraph of § 23.161(c), to remove the reference to V_{MO}/M_{MO} because it is covered in the applicable individual sections. In § 23.161(c)(1), the FAA proposed to require trim at takeoff power, as this is a likely operational scenario for most airplanes and the condition should be tested. In addition, the change relates the maximum continuous power climb speeds and configuration to § 23.69, the enroute climb requirement. The FAA proposed to redesignate § 23.161(c)(2) as § 23.161(c)(4), to change the reference V_{REF} for a landing speed, and to add a requirement for the airplane to trim at the steepest landing approach gradient the applicant chooses under § 23.75. The FAA proposed to redesignate § 23.161(c)(3) as § 23.161(c)(2) with editorial changes and to redesignate § 23.161(c)(4) as § 23.161(c)(3) with an increase in the trim speed from 0.9 V_{NO} or V_{MO} to V_{NO} or V_{MO}/M_{MO}. The increase in trim speed is appropriate because descent is permitted and is common at V_{MO}.

In § 23.161(d), the FAA proposed to make editorial changes in the introductory paragraph, to reference the appropriate § 23.67 requirements, and to remove commuter category speed ranges, which are moved to the new § 23.161(e). The FAA proposed to revise § 23.161(d)(4) to specify flaps retracted instead of referencing the § 23.67 configurations. Flaps retracted is the likely sustained configuration where a pilot would need to trim. Also, the flaps retracted configuration for § 23.161(d)(4) is consistent with § 23.67.

The FAA proposed a new § 23.161(e) to ensure that excessive forces are not encountered in commuter category airplanes during extended climbs at V_2 in the takeoff configuration, when climb above 400 feet is required.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.175 Demonstration of static longitudinal stability.

The FAA proposed to revise § 23.175(a)(1) to change the flap position from the climb position to the flaps retracted position. This is a clarifying change since virtually all part 23 airplanes use the flaps retracted position for climb. Also, this change aligns the part 23 and part 25 climb static longitudinal stability requirements.

The FAA proposed, in § 23.175(a)(3), to remove the option for the applicant to select some power other than maximum continuous power as an operating limitation. As noted in the discussion of § 23.155, this eliminates a power specification that is unnecessary and simplifies normal operations for the pilot. In § 23.175(a)(4), the FAA proposed to make the trim speed consistent with the enroute all-engine climb speed.

The FAA proposed in § 23.175(b) to rearrange the paragraph with no change in requirements. The definition of V_{FC}/M_{MC} contained in § 23.175(b)(2) is moved to part 1, to harmonize with JAR 1. (See the change to § 1.1.)

The FAA proposed to remove § 23.175(c). The test for gear down cruise static longitudinal stability required under paragraph (c) is considered superfluous to the landing configuration static longitudinal stability test and does not represent a likely operating scenario.

The FAA proposed to redesignate § 23.175(d) as § 23.175(c) with a change to V_{REF} as the trim speed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.177 Static directional and lateral stability.

The FAA proposed to revise § 23.177 to remove the requirements for two-control airplanes, to make minor clarifying changes, and to specify an exclusion for acrobatic category airplanes.

The FAA proposed in § 23.177 to remove the introductory phrase concerning three-control airplanes, which is consistent with the removal of the requirements for two-control airplanes in paragraph (b). The two-control airplane regulations were introduced in 1945 but no two-control airplanes have been certificated for several decades and no need is foreseen for these regulations. If an applicant proposes a two-control airplane, the FAA would issue special conditions.

The FAA proposed that, after removing the introductory portion of § 23.177(a), paragraph (a)(1) would be redesignated as (a). In the first sentence, "skid" is replaced with "wings level sideslip" to clarify the intended maneuver. Also, this change increases the power requirement for demonstration of directional stability in the landing configuration. The requirement specifies power necessary to maintain a three degree angle of descent. Maximum continuous power is considered appropriate since directional stability should be maintained during a balked landing, particularly since directional instability is an undesirable characteristic at any point in the flight envelope.

Also, the FAA proposed to replace V_A with V_O to be consistent with § 23.1507.

The FAA proposed, in § 23.177(b), to replace "any" with "all" in the first sentence to clarify that all landing gear and flap positions must be addressed. Also, the FAA proposed that the paragraph specify a minimum speed at which static lateral stability may not be negative, as 1.3 V_S, for all configurations except takeoff. This is consistent with the other speeds specified in § 23.177(b) and relieves the requirement for other than takeoff speeds.

The FAA proposed new § 23.177(c) to provide an exclusion for the dihedral effect for acrobatic category airplanes approved for inverted flight. This change recognizes that, in fully acrobatic airplanes, the dihedral effect is not a desired characteristic.

The addition of § 23.147(c), which ensures lateral control capability without the use of the primary lateral control system, compensates for the relieving nature of proposed § 23.177(b) and the exception from the requirements of § 23.177(b) for acrobatic category airplanes.

The FAA proposed to redesignate § 23.177(a)(3) as § 23.177(d) and to remove the next to the last sentence of § 23.177(d), concerning bank angle and heading. The requirement is not a necessary test condition and a constant heading during the sideslip may be impossible in some airplanes.

Comment: Raytheon commented on the requirements for stability in steady heading slips, which were changed in a previous amendment (Amendment 23-21; 43 FR 2318; January 16, 1978), and recommended clarifying language.

FAA Response: As Raytheon noted, the rule language they believe needs clarification was not addressed in Notice 94-22, and, therefore, is beyond the scope of this rulemaking.

The proposals are adopted as proposed.

Section 23.201 Wings level stall.

The FAA proposed to remove the two-control airplane requirements, altitude loss requirements, and to make clarifying changes in § 23.201.

The FAA proposed to revise § 23.201(a) to remove the applicability reference for an airplane with independently controlled roll and directional controls and to replace the last word "pitches" with "stalls" since stalls may be defined by other than nose-down pitching.

The FAA proposed to remove § 23.201(b) since it applies to two-control airplanes. (See § 23.177 for discussion of two-control airplane requirements.)

The FAA proposed to divide § 23.201(c) into § 23.201(b), stall recognition, and § 23.201(c), stall recovery. The FAA proposed, in § 23.201(b), to clarify that the test should start from a speed at least 10 knots above the stall speed, with no change in requirements. The FAA proposed to add § 23.201(c) to specify how long the control must be held against the stop. This change ensures that the procedure for determining stall speed is the same procedure used to test stall characteristics. The FAA proposed to remove the last sentence of paragraph (c) on the increase of power because it only applies to altitude loss.

The FAA proposed to remove § 23.201(d), as suggested by the JAA, since the determination of altitude loss, and its subsequent furnishing in the AFM, is not considered information useful to the pilot for safe operation of the airplane.

The FAA proposed new § 23.201(d) based on present § 23.201(e), to clarify that the roll and yaw limits apply during both entry and recovery.

The FAA proposed new § 23.201(e) based on former paragraph (f) with some revisions. During FAA/JAA harmonization meetings, the JAA pointed out to the FAA that, in high power-to-weight ratio airplanes, extreme nose-up attitudes were the principal criteria for use of reduced power, not the presence of undesirable stall characteristics. The FAA concurs, and, therefore, proposed to remove the phrase concerning stall characteristics.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.203 Turning flight and accelerated turning stalls.

The FAA proposed to revise § 23.203 to add the word "turning" before "stalls" and after "accelerated" in the heading, the introductory text, and in paragraphs (a)(2) and (b)(5). This change clarifies that accelerated stalls are performed in turning flight. This clarification reflects current practice.

In § 23.203(a) and (b), the FAA proposed to reference the stall definition in current § 23.201(b), which is more specific than the present general words "when the stall has fully developed or the elevator has reached its stop."

For clarification, the FAA proposed that paragraph (b)(4) be separated into paragraphs (b)(4) and (b)(5) without substantive change, and that former paragraph (b)(5) be redesignated as paragraph (b)(6).

The FAA proposed in § 23.203(c)(1) to clarify the wing flap positions by changing "each intermediate position" to "each intermediate normal operating position," and in § 23.203(c)(4) to clarify the use of reduced power. (See the final change to § 23.201(f).)

The FAA proposed new paragraph (c)(6) to be consistent with new § 23.207(c)(6) configurations (Amendment No. 23-45).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.205 Critical engine-inoperative stalls.

The FAA proposed to remove § 23.205. The stall demonstration conditions are not realistic because the engine operation and power asymmetry do not represent conditions likely to accompany an inadvertent stall in service. Service history shows, however, that stalls with significant power asymmetry can result in a spin, even on airplanes that are certificated to the present requirement. Based on this service history, the FAA determined that the requirement for demonstrating one-engine-inoperative stalls is not effective in ensuring that inadvertent stalls with one engine inoperative will have satisfactory characteristics and be recoverable. Sufficient protection against the hazard of stalling with one engine inoperative is provided by the one-engine-inoperative performance requirements and operating speed margins, coupled with the requirements for determination of V_{MC}, and the addition of a directional and lateral control test under § 23.147(b).

No comments were received on the proposal for this section, and the section is removed as proposed.

Section 23.207 Stall warning.

The FAA proposed, in § 23.207(c), to reference the stall tests required by § 23.201(b) and § 23.203(a)(1) and to specify that during such tests for one knot per second deceleration stalls, both wings level and turning, the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots. The FAA proposed to remove the quantified upper limit in the rule of 10 knots or 15 percent of the stalling speed. The upper limit has created problems for manufacturers because of the complex design features required to show compliance. The upper limit requirement is, in effect, replaced by the nuisance stall warning provision in § 23.207(d).

The FAA proposed to divide § 23.207(d) into § 23.207(d) and (e), with § 23.207(d) on nuisance stall warnings having no change in requirements. In § 23.207(e), the FAA proposed to remove the bottom limit of five knots for decelerations greater than one knot per second and to specify that the stall warning must begin sufficiently before the stall so that the pilot can take corrective action. This is considered appropriate because, at the higher deceleration rates of three to five knots per second, a specified five knots may not be enough stall warning.

The FAA proposed new § 23.207(f) to allow for a mutable stall warning system in acrobatic category airplanes, with automatic arming for takeoff and rearming for landing. This feature allows the pilot to disengage the warning during acrobatics while retaining the safety feature during takeoff and landing.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.221 Spinning.

The FAA proposed to change the point to start the one-turn-spin recovery count, to delete the "characteristically incapable of spinning" option, and to make minor changes in acrobatic category spins in § 23.221.

The FAA proposed, in § 23.221(a), to replace the exception for airplanes characteristically incapable of spinning with an exception for airplanes that demonstrate compliance with the optional spin resistant requirements of paragraph (a)(2) of this section. Criteria for an airplane incapable of spinning are unnecessary since criteria for spin resistant airplanes are provided. As proposed, § 23.221(a) changed the point at which the count for the one-turn-spin recovery begins. The change provides a specific point to begin the count by replacing the phrase "after the controls have been applied" with "after initiation of the first control action for recovery." Under the former rules, if an applicant proposed a multiple step recovery procedure that starts with the rudder, then the airplane may be effectively recovered before the start of the recovery count.

The FAA proposed, in § 23.221(a)(1)(ii), to specify that no control force or characteristic can adversely affect prompt recovery. This would be an improvement over the present requirement because it includes yaw and roll as well as pitch control.

The FAA proposed to recodify § 23.221(a)(1) into § 23.221(a)(1)(i) through (a)(1)(iv) with no changes in the requirements, and to restate § 23.221(a)(2) on spin resistant airplanes with minor editorial changes but with no change in requirements.

The FAA proposed to specify, in § 23.221(b), the emergency egress requirements of § 23.807(b)(5) for those utility category airplanes approved for spinning, thereby cross-referencing the requirements of § 23.807 to the flight requirements.

The FAA proposed, in the introductory paragraph of § 23.221(c), to require acrobatic category airplanes to meet the one-turn-spin requirements of § 23.221(a). This change is needed because acrobatic category airplanes should have sufficient controllability to recover from the developing one-turn-spin under the same conditions as normal category airplanes. The introductory paragraph also cross-references § 23.807 for emergency egress requirements.

The FAA proposed, in § 23.221(c)(1), pertaining to acrobatic category airplanes, to add a requirement for spin recovery after six turns or any greater number of turns for which certification is requested. This rule requires recovery within 1.5 turns after initiation of the first control action for recovery. This requirement ensures recovery within 1.5 turns if the spin mode changes beyond six turns. As an alternative, the applicant may stop at six turns and provide a limitation of six turns.

The FAA proposed, in § 23.221(c)(2), to remove the option to retract flaps during recovery and to provide the applicant with a choice of flaps up or flaps deployed for spin approval. The paragraph continues to prohibit exceeding applicable airspeed limits and limit maneuvering load factors.

The FAA proposed new § 23.221(c)(4) to ensure that the acrobatic spins do not cause pilot incapacitation.

The FAA proposed to remove § 23.221(d), relating to airplanes that are "characteristically incapable of spinning," which has been in the regulation since at least 1937. In 1942, the present weight, center of gravity, and control mis-rig criteria were introduced into Civil Air Regulation (CAR) 03. Since then, the National Aeronautics and Space Administration (NASA) spin resistant requirements, which are based on research, have been developed and incorporated in the regulations by Amendment No. 23-42 (56 FR 344, January 3, 1991). If an applicant proposes a non-spinable airplane, it would be appropriate to apply the requirements of § 23.221(a)(2) as proposed in Notice 90-22.

The only comment on this section was a JAA statement recognizing this as an existing disharmony.

The proposals are adopted as proposed.

Section 23.233 Directional stability and control.

The FAA proposed to make minor word changes to § 23.233(a) to harmonize this section with the corresponding JAR section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.235 Operation on unpaved surfaces.

The FAA proposed to revise the heading of § 23.235 and to remove water operating requirements, which are moved to new § 23.237.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.237 Operation on water.

New § 23.237, for operation on water, is the same as the former § 23.235(b).

The only comment on this section is a JAA statement acknowledging an existing disharmony.

The proposal is adopted as proposed.

Section 23.253 High speed characteristics.

The FAA proposed to remove paragraph (b)(1), since the requirement for piloting strength and skill is covered in § 23.141.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.562 Emergency landing dynamic conditions.

The FAA proposed to change the one engine inoperative climb to remove the reference in § 23.562(d) and to add it to § 23.67(a)(1).

The only comment on this section is a JAA statement acknowledging existing disharmony.

The proposal is adopted as proposed.

Section 23.1325 Static pressure system.

The FAA proposed to revise § 23.1325(e) to clarify that the static pressure calibration must be conducted in flight, which is standard practice, and to remove and reserve § 23.1325(f).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1511 Flap extended speed.

The FAA proposed to remove from § 23.1511(a) references to § 23.457. Section 23.457 is proposed to be removed in a related NPRM, Notice No. 94-20 (59 FR 35196, July 8, 1994), on the airframe.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1521 Powerplant limitations.

The FAA proposed to amend § 23.1521 to require maximum temperature be established for takeoff operation and to require an ambient temperature limit for reciprocating engines in airplanes of more than 6,000 pounds.

The FAA proposed in § 23.1521(b)(5) to require the establishment of maximum cylinder head, liquid coolant, and oil temperature limits for takeoff operation without regard to the allowable time. Previously, temperature limits were required only if the takeoff power operation is permitted for more than two minutes. It is appropriate to require operating temperature limitations because most takeoff operations will exceed two minutes.

The FAA proposed in § 23.1521(e) to require an ambient temperature limit for turbine engine-powered airplanes and reciprocating engine-powered airplanes over 6,000 pounds. These airplanes are subject to WAT limits and the revision will ensure that airplane engines will cool at the ambient temperature limit.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1543 Instrument markings: General.

The FAA proposed new § 23.1543(c) to require that all related instruments be calibrated in compatible units. This is considered essential for safe operation.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1545 Airspeed indicator.

The FAA proposed in § 23.1545(b)(5) to delete any one-engine-inoperative best rate of climb speed marking requirements for WAT limited airplanes. These airplanes already have scheduled speeds in case of an engine failure. The FAA proposed that paragraph (b)(5) apply only to non-WAT airplanes for which the one-engine-inoperative best rate of climb speed marking has been simplified to reflect performance for sea level at maximum weight. Since the blue arc rule was promulgated in Amendment No. 23-23 (43 FR 50593, October 30, 1978), certification experience has shown that the marking of an arc is unnecessarily complicated. For many airplanes, the approved arc was so narrow that the arc was a line; therefore, final paragraph (b)(5) requires a blue radial line instead of an arc.

The FAA proposed to revise § 23.1545(b)(6) to retain the existing V_{MC} requirement for non-WAT airplanes and to remove the requirement for V_{MC} markings for WAT airplanes since WAT airplanes already have scheduled speeds in case of engine failure.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1553 Fuel quantity indicator.

The FAA proposed to remove, from § 23.1553, the use of an arc to show a quantity of unusable fuel. The FAA proposed that the rule reference the unusable fuel determination and require only a red radial line, which provides a clearer indication of fuel quantity for pilots.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1555 Control markings.

The FAA proposed to add to § 23.1555(e)(2) a requirement that no controls except emergency controls be red.

Comment: Transport Canada states that certain cockpit controls serve a dual purpose in that they serve normal aircraft operation functions as well as emergency functions. Examples are fuel selector valves and door handles. Transport Canada recommends rule language that recognizes dual usage.

FAA Response: Transport Canada's statement about the existence of dual usage controls is correct. The FAA originally intended to address the dual usage issue in an AC. On further evaluation of the proposed rule language, dual usage controls would be prohibited, if it were adopted as proposed. Therefore, an AC could not be used to allow controls such as the mixture (which is usually red) to continue to be red without violating the rule. The FAA has incorporated the dual usage language in the final rule to avoid confusion between the intent of the rule and the current practice.

The proposal is adopted with the changes mentioned above.

Section 23.1559 Operating limitations placard.

The FAA proposed to simplify § 23.1559 and to remove duplicate material while requiring essentially the same information. Most airplanes currently operate with an AFM and the new rule places emphasis on using the AFM to define required operating limitations.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1563 Airspeed placards.

The FAA proposed to add a new paragraph (c) to § 23.1563. The new paragraph is applicable to WAT limited airplanes and requires providing the maximum V_{MC} in the takeoff configuration determined under § 23.149(b). This is desirable since the V_{MC} is not marked on the airspeed indicator for these airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1567 Flight maneuver placard.

The FAA proposed to add new § 23.1567(d) to apply to acrobatic and utility airplanes approved for intentional spinning, which requires a placard listing control actions for recovery. New paragraph (d) proposed to require a statement on the placard that the airplane be recovered when spiral characteristics occur, or after six turns, or at any greater number of turns for which certification tests have been conducted. This paragraph replaces the similar placard requirement in current § 23.1583(e)(3) for acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1581 General.

The FAA proposed to make editorial changes in § 23.1581 that recognize WAT limited and non-WAT limited airplanes.

In new § 23.1581(a)(3), the FAA proposed to require information necessary to comply with relevant operating rules. This is a FAR and JAR harmonization item and is considered necessary because some operational rules, such as § 135.391, require flight planning with one-engine-inoperative cruise speed and/or driftdown data. For airplanes operated under part 135 in the United States, it represents no change in requirements.

The FAA proposed § 23.1581(b)(2) to require that only WAT limited airplane AFM's provide data necessary for determining WAT limits.

The FAA proposed new § 23.1581(c) to require the AFM units to be the same as on the instruments.

The FAA proposed § 23.1581(d) to remove the requirement for a table of contents. This is considered a format requirement and is not appropriate for this section, which specifies AFM content. Section 23.1581(d) is replaced by a requirement to present all operational airspeeds as indicated airspeeds. This adopts current practice.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1583 Operating limitations.

The FAA proposed to revise § 23.1583 operating limitations information for the AFM. The FAA proposed to revise airspeed limitations for commuter category airplanes, to require AFM limitations for WAT limited airplanes, to furnish ambient temperature limitations and smoking restriction information, and to specify types of runway surfaces.

The FAA proposed, in § 23.1583(a)(3), to make the V_{MO}/M_{MO} airspeed operating limitations applicable only to turbine powered commuter category airplanes. This is consistent with current practice since no reciprocating engine-powered commuter category airplanes have been proposed.

In § 23.1583(c)(3), the FAA proposed to add takeoff and landing weight limitations for WAT limited airplanes. (See § 23.45.)

The FAA proposed to revise § 23.1583(c)(4) and (c)(5), to renumber § 23.1583(c)(3) and (c)(4), and to make editorial and cross-reference changes. In paragraph (c)(4)(ii), the FAA proposed a new requirement that the AFM include the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if available. This is currently required for transport category airplanes and is necessary for harmonization with JAR 23.

In new § 23.1583(c)(6), the FAA proposed to establish the zero wing fuel weight of § 23.343 as a limitation. This provides the pilot with information necessary to prevent exceeding airplane structural limits.

The FAA proposed editorial changes to § 23.1583(d) and, in paragraphs (e)(1) and (e)(2), to remove references to "characteristically incapable of spinning." As discussed under § 23.221, requirements for "characteristically incapable of spinning" are removed.

In § 23.1583(e)(4), the FAA proposed to add a requirement to specify limitations associated with spirals, six turn spins, or more than six turn spins. The requirement for a placard is removed since the requirement is covered in § 23.1567.

The FAA proposed to revise § 23.1583(e)(5) based on former paragraph (e)(4) for commuter category airplanes. This restates the maneuvers as those proposed for commuter category airplanes in § 23.3.

The FAA proposed to revise the heading of § 23.1583(f) and to add a limit negative load factor for acrobatic category airplanes.

The FAA proposed to revise § 23.1583(g) to make editorial changes with no change in requirements and to reference the flight crews' requirements in § 23.1523. As proposed, § 23.1583(k), (l), and (m) are redesignated as § 23.1583(i), (j), and (k).

The FAA proposed new § 23.1583(l) to require baggage and cargo loading limits in the AFM.

The FAA proposed a new § 23.1583(m) to require any special limitations on systems and equipment in the AFM. This provides the pilot with information necessary for safe operation of the airplane systems and equipment.

The FAA proposed a new § 23.1583(n) to require a statement on ambient temperature limitations. Maximum cooling temperature limits have been required for turbine powered airplanes by § 23.1521(e); however, the requirement for the limitation has never been specified in § 23.1583. Proposed § 23.1583(n) requires both maximum and minimum temperature limits if appropriate. A minimum temperature limit provides the pilot with information necessary to avoid airplane damage during low temperature operations.

The FAA proposed a new § 23.1583(o) to state any occupant smoking limitations on the airplane in the AFM.

The FAA proposed a new § 23.1583(p) to require the applicant to state what runway surfaces have been approved.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.1585 Operating procedures.

The FAA proposed to rearrange the material in § 23.1585(a). Also, the FAA proposed to add, for all airplanes, a requirement to paragraph (a) that information in the following areas be included: Unusual flight or ground handling characteristics; maximum demonstrated values of crosswinds; recommended speed for flight in rough air; restarting an engine in flight; and making a normal approach and landing in accordance with §§ 23.73 and 23.75. All of these requirements are in former § 23.1585(a) except for restarting a turbine engine in flight, which is in former paragraph (c)(5) pertaining only to multiengine airplanes. The FAA decided that a restart capability is not required for single reciprocating engine airplanes for the reasons given in the preamble discussion of proposal 3 in Amendment No. 23-43 (58 FR 18958, April 9, 1993). The requirement to provide restart information should apply to single turbine engines, however, since turbine engine designs incorporate a restart capability and inadvertent shutdowns may occur. The requirement for normal approach and landing information, in accordance with the landing requirement in §§ 23.73 and 23.75, is new. This information is necessary to enable pilots to achieve the published landing distances and, if necessary, to safely transition to a balked landing.

The FAA proposed to revise § 23.1585(b) by adding new requirements, which cover gliding after an engine failure for single-engine airplanes, to reference the new requirements proposed in § 23.71.

The FAA proposed to revise § 23.1585(c) to require compliance with paragraph (a) plus the following requirements from former paragraph (c): approach and landing with an engine inoperative; balked landing with an engine inoperative; and V_{SSE} as determined in § 23.149. The FAA also proposed to redesignate paragraph (c) requirements, information on procedures for continuing a takeoff following an engine failure and continuing a climb following an engine failure, as proposed (e) for normal, utility, and acrobatic multiengines.

The FAA proposed to revise § 23.1585(d) to apply to normal, utility, and acrobatic airplanes, which would have to comply with paragraph (a) and either (b) or (c). These airplanes must also comply with the normal takeoff, climb, and abandoning a takeoff procedures, which were contained in paragraph (a).

The FAA proposed to revise § 23.1585(c), for normal, utility and acrobatic multiengine airplanes, to require compliance with proposed (a), (c), and (d), plus requirements for continuing a takeoff or climb with one engine inoperative that were in former paragraph (c)(1) and (2).

The FAA proposed to revise § 23.1585(f) to amend normal takeoff requirements in former paragraph (a)(2); to add accelerate-stop requirements; and to continue takeoff after engine failure, which was in former paragraph (c)(1).

The FAA proposed no substantial changes in § 23.1585(g) and (h), which are based on paragraphs (d) and (e), respectively.

The FAA proposed to revise § 23.1585(i) based on former paragraph (g) on the total quantity of usable fuel and to add information on the effect of pump failure on unusable fuel.

The FAA proposed a new § 23.1585(j) to require procedures for safe operation of the airplanes' systems and equipment that, although not previously required, are current industry practice.

In the proposed revision of § 23.1585(h), the commuter category airplane procedures for restarting turbine engines in flight would no longer be necessary because the requirement is covered under paragraph (a)(4).

Comment: The JAA comments that the JAA does not agree with limiting the inflight engine restart requirements of proposed paragraph (a)(4) to turbine engines only.

FAA Response: The JAA comment addresses a known disharmony between the regulations.

No substantive comment was received, and the proposals are adopted as proposed.

Section 23.1587 Performance information.

The FAA proposed to revise § 23.1587 to rearrange existing material, to remove ski plane performance exceptions, to remove the option of calculating approximate performance, to remove stall altitude loss data, and to require overweight landing performance in § 23.1587. Stalling speed requirements of paragraph (c)(2) and (3) are combined and moved to final paragraph (a)(1) and reference the stalling speed requirement of § 23.49. Information on the steady rate and gradient of climb with all engines operating is required by paragraph (a)(2). This is revised from paragraph (a)(2). The climb section referenced in existing § 23.1587(a)(2) is removed and replaced with § 23.69(a).

The FAA proposed to revise paragraph (a)(3) to add that landing distance determined under § 23.75 must be provided for each airport altitude, standard temperature, and type of surface for which it is valid. The FAA proposed to revise paragraph (a)(4) to require information on the effect on landing distance when landing on other than hard surface, as determined under § 23.45(g). The FAA proposed to revise paragraph (a)(5) to cover information on the effects on landing distance of runway slope and wind. This provides the pilot with data with which to account for these factors in his or her takeoff calculations.

The FAA proposed to remove requirements on ski planes from § 23.1587(b) and to add a requirement for a steady angle of climb/descent, as determined under § 23.77(a), in its place. This requirement applies to all non-WAT airplanes.

The FAA proposed to revise paragraph (c) to apply to normal, utility, and acrobatic category airplanes, rather than all airplanes. The FAA proposed to remove the stall altitude loss requirements from paragraph (c)(1). As mentioned, the FAA proposed to remove the stalling speed requirements from paragraphs (c)(2) and (c)(3) and to place them in paragraph (a)(1). The FAA also proposed to remove paragraph (c)(4) on cooling climb speed data since most airplanes cool at scheduled speeds.

The FAA proposed to revise paragraph (c)(1) to pertain to the takeoff distance determined under § 23.53 and to the type of surface. Proposed paragraphs (c)(2) and (c)(3) pertain to the effect on takeoff distance of the runway surface, slope, and headwind and tailwind component.

The FAA proposed to revise paragraph (c)(4) to add a new requirement pertaining to the one-engine inoperative takeoff climb/descent performance for WAT-limited airplanes. This pertains only to reciprocating engine-powered airplanes. It provides the pilot with the information determined under final § 23.66.

The FAA proposed a new paragraph (c)(5), which pertains to enroute rate and gradient of climb/descent determined under § 23.69(b), for multiengine airplanes.

The FAA proposed to revised § 23.1587(d) to incorporate into commuter category airplanes the present data and accelerate-stop data, overweight landing performance, and the effect of operation on other than smooth hard surfaces. In addition, in order to consolidate all of the requirements for what must appear in the AFM in subpart G, the FAA proposed that § 23.1587(d)(10) contain the requirement, found in former § 23.1323(d), to show the relationship between IAS and CAS in the AFM.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1589 Loading information.

The FAA proposed to make editorial changes in § 23.1589(b) to simplify the text, with no change in requirements.

No comments were received on the proposal for this section, and it is adopted as proposed.

Appendix E.

The FAA proposed to remove Appendix E and to reserve it for the reasons given in the change to § 23.25.

No comments were received on the proposal, and Appendix E is removed and reserved as proposed.

Regulatory Evaluation, Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: 1) will generate benefits exceeding its costs and is not "significant" as defined in the Executive Order; 2) is not "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and 4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

One comment was received regarding the economics, § 23.143 Controllability and Maneuverability. This comment, as well as the FAA's response, are included in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has identified 15 sections that will result in additional compliance costs to one or more airplane categories. Amendments to five sections will result in cost savings. The greatest costs will be incurred by manufacturers of WAT limited airplanes (e.g., multiengine airplanes with maximum weights of more than 6,000 pounds). When amortized over a production run, the incremental costs will have a negligible impact on airplane prices, less than $100 per airplane.

The primary benefit of the rule will be the cost efficiencies of harmonization with the JAR for those manufacturers that choose to market airplanes in JAA countries as well as to manufacturers in JAA countries that market airplanes in the United States. Other benefits of the rule will be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

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 Federal 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. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The rule will not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the flight certification procedures have been harmonized with those of the JAA and will lessen restraints on trade.

FEDERALISM IMPLICATIONS

The regulations 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 rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

CONCLUSION

The FAA is revising the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards of the Joint Aviation Authorities in Europe for the same category airplanes. The revisions will reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is not significant under Executive Order 12866. In addition, the FAA certifies that this rule 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 rule is not considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule has been placed in the docket. A copy may be obtained by contacting the person identified under "FOR FURTHER INFORMATION CONTACT."

List of Subjects

14 CFR Part 1

Air transportation.

14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

THE AMENDMENTS

In consideration of the foregoing, the Federal Aviation Administration amends 14 CFR parts 1 and 23 to read as follows:

PART 1--DEFINITIONS AND ABBREVIATIONS

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

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

2. A new definition is added in alphabetical order to § 1.1 to read as follows:

§ 1.1 General definitions.

* * * * *

<u>Maximum speed for stability characteristics, V_{FC}/M_{FC}</u> means a speed that may not be less than a speed midway between maximum operating limit speed (V_{MO}/M_{MO}) and demonstrated flight diving speed (V_{DF}/M_{DF}), except that, for altitudes where the Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

* * * * *

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

3. The authority citation for part 23 is revised to read as follows:

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

4. Section 23.3 is amended by revising paragraphs (b)(2), (d), and (e) to read as follows:

§ 23.3 Airplane categories.

* * * * *

(b) * * *

(2) Lazy eights, chandelles, and steep turns, or similar maneuvers, in which the angle of bank is more than 60 degrees but not more than 90 degrees.

* * * * *

(d) The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, of 19 or less, and a maximum certificated takeoff weight of 19,000 pounds or less. The commuter category operation is limited to any maneuver incident to normal flying, stalls (except whip stalls), and steep turns, in which the angle of bank is not more than 60 degrees.

(e) Except for commuter category, airplanes may be type certificated in more than one category if the requirements of each requested category are met.

5. Section 23.25 is amended by revising paragraphs (a) introductory text and (a)(1) introductory text, and paragraphs (a)(1)(i) and (a)(1)(iii) to read as follows:

§ 23.25 Weight limits.

(a) Maximum weight. The maximum weight is the highest weight at which compliance with each applicable requirement of this part (other than those complied with at the design landing weight) is shown. The maximum weight must be established so that it is--

(1) Not more than the least of--

(i) The highest weight selected by the applicant; or

* * * * *

(iii) The highest weight at which compliance with each applicable flight requirement is shown, and

* * * * *

6. Section 23.33 is amended by revising paragraphs (b)(1) and (2) to read as follows:

§ 23.33 Propeller speed and pitch limits.

(b) * * *

(1) During takeoff and initial climb at the all engine(s) operating climb speed specified in § 23.65, the propeller must limit the engine r.p.m., at full throttle or at maximum allowable takeoff manifold pressure, to a speed not greater than the maximum allowable takeoff r.p.m.; and

(2) During a closed throttle glide, at V_{NE}, the propeller may not cause an engine speed above 110 percent of maximum continuous speed.

* * * * *

7. Section 23.45 is revised to read as follows:

§ 23.45 General.

(a) Unless otherwise prescribed, the performance requirements of this part must be met for--

(1) Still air and standard atmosphere; and

(2) Ambient atmospheric conditions, for commuter category airplanes, for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and for turbine engine-powered airplanes.

(b) Performance data must be determined over not less than the following ranges of conditions--

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

(2) For reciprocating engine-powered airplanes of 6,000 pounds, or less, maximum weight, temperature from standard to 30°C above standard; or

(3) For reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes, temperature from standard to 30°C above standard, or the maximum ambient atmospheric temperature at which compliance with the cooling provisions of § 23.1041 to § 23.1047 is shown, if lower.

(c) Performance data must be determined with the cowl flaps or other means for controlling the engine cooling air supply in the position used in the cooling tests required by § 23.1041 to § 23.1047.

(d) The available propulsive thrust must correspond to engine power, not exceeding the approved power, less--

(1) Installation losses; and

(2) The power absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

(e) The performance, as affected by engine power or thrust, must be based on a relative humidity:

(1) Of 80 percent, at and below standard temperature; and

(2) From 80 percent at the standard temperature, varying linearly down to 34 percent at the standard temperature plus 50°F.

(f) Unless otherwise prescribed, in determining the takeoff and landing distances, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service. These procedures must be able to be executed consistently by pilots of average skill in atmospheric conditions reasonably expected to be encountered in service.

(g) The following, as applicable, must be determined on a smooth, dry, hard-surfaced runway--

(1) Takeoff distance of § 23.53(b);

(2) Accelerate-stop distance of § 23.55;

(3) Takeoff distance and takeoff run of § 23.59; and

(4) Landing distance of § 23.75.

Note: The effect on these distances of operation on other types of surfaces (for example, grass, gravel) when dry, may be determined or derived and these surfaces listed in the Airplane Flight Manual in accordance with § 23.1583(p).

(h) For commuter category airplanes, the following also apply:

(1) Unless otherwise prescribed, the applicant must select the takeoff, enroute, approach, and landing configurations for the airplane.

(2) The airplane configuration may vary with weight, altitude, and temperature, to the extent that they are compatible with the operating procedures required by paragraph (h)(3) of this section.

(3) Unless otherwise prescribed, in determining the critical-engine-inoperative takeoff performance, takeoff flight path, and accelerate-stop distance, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service.

(4) Procedures for the execution of discontinued approaches and balked landings associated with the conditions prescribed in § 23.67(c)(4) and § 23.77(c) must be established.

(5) The procedures established under paragraphs (h)(3) and (h)(4) of this section must--

(i) Be able to be consistently executed by a crew of average skill in atmospheric conditions reasonably expected to be encountered in service;

(ii) Use methods or devices that are safe and reliable; and

(iii) Include allowances for any reasonably expected time delays in the execution of the procedures.

8. Section 23.49 is revised to read as follows:

§ 23.49 Stalling speed.

(a) V_{SO} and V_{S1} are the stalling speeds or the minimum steady flight speeds, in knots (CAS), at which the airplane is controllable with--

(1) For reciprocating engine-powered airplanes, the engine(s) idling, the throttle(s) closed or at not more than the power necessary for zero thrust at a speed not more than 110 percent of the stalling speed;

(2) For turbine engine-powered airplanes, the propulsive thrust not greater than zero at the stalling speed, or, if the resultant thrust has no appreciable effect on the stalling speed, with engine(s) idling and throttle(s) closed;

(3) The propeller(s) in the takeoff position;

(4) The airplane in the condition existing in the test, in which V_{SO} and V_{S1} are being used;

(5) The center of gravity in the position that results in the highest value of V_{SO} and V_{S1}; and

(6) The weight used when V_{SO} or V_{S1} are being used as a factor to determine compliance with a required performance standard.

(b) V_{SO} and V_{S1} must be determined by flight tests, using the procedure and meeting the flight characteristics specified in § 23.201.

(c) Except as provided in paragraph (d) of this section, V_{SO} at maximum weight must not exceed 61 knots for--

(1) Single-engine airplanes; and

(2) Multiengine airplanes of 6,000 pounds or less maximum weight that cannot meet the minimum rate of climb specified in § 23.67(a)(1) with the critical engine inoperative.

(d) 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(a)(1), must comply with § 23.562(d).

9. Section 23.51 is revised to read as follows:

§ 23.51 Takeoff speeds.

(a) For normal, utility, and acrobatic category airplanes, rotation speed, V_R, is the speed at which the pilot makes a control input, with the intention of lifting the airplane out of contact with the runway or water surface.

(1) For multiengine landplanes, V_R must not be less than the greater of 1.05 V_{MC} or 1.10 V_{S1};

(2) For single-engine landplanes, V_R, must not be less than V_{S1}; and

(3) For seaplanes and amphibians taking off from water, V_R, may be any speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete failure of the critical engine.

(b) For normal, utility, and acrobatic category airplanes, the speed at 50 feet above the takeoff surface level must not be less than:

(1) For multiengine airplanes, the highest of--

(i) A speed that is shown to be safe for continued flight (or emergency landing, if applicable) under all reasonably expected conditions, including turbulence and complete failure of the critical engine;

(ii) 1.10 V_{MC}; or

(iii) 1.20 V_{S1}.

(2) For single-engine airplanes, the higher of--

(i) A speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete engine failure; or

(ii) 1.20 V_{S1}.

(c) For commuter category airplanes, the following apply:

(1) V_1 must be established in relation to V_{EF} as follows:

(i) V_{EF} is the calibrated airspeed at which the critical engine is assumed to fail. V_{EF} must be selected by the applicant but must not be less than 1.05 V_{MC} determined under § 23.149(b) or, at the option of the applicant, not less than V_{MCG} determined under § 23.149(f).

(ii) The takeoff decision speed, V_1, is the calibrated airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to continue or discontinue the takeoff. The takeoff decision speed, V_1, must be selected by the applicant but must not be less than V_{EF} plus the speed gained with the critical engine inoperative during the time interval between the instant at which the critical engine is failed and the instant at which the pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during the accelerate-stop determination of § 23.55.

(2) The rotation speed, V_R, in terms of calibrated airspeed, must be selected by the applicant and must not be less than the greatest of the following:

(i) V_1;

(ii) 1.05 V_{MC} determined under § 23.149(b);

(iii) 1.10 V_{S1}; or

(iv) The speed that allows attaining the initial climb-out speed, V_2, before reaching a height of 35 feet above the takeoff surface in accordance with § 23.57(c)(2).

(3) For any given set of conditions, such as weight, altitude, temperature, and configuration, a single value of V_R must be used to show compliance with both the one-engine-

inoperative takeoff and all-engines-operating takeoff requirements.

(4) The takeoff safety speed, V_2, in terms of calibrated airspeed, must be selected by the applicant so as to allow the gradient of climb required in § 23.67(c)(1) and (c)(2) but must not be less than 1.10 V_{MC} or less than 1.20 V_{S1}.

(5) The one-engine-inoperative takeoff distance, using a normal rotation rate at a speed 5 knots less than V_R, established in accordance with paragraph (c)(2) of this section, must be shown not to exceed the corresponding one-engine-inoperative takeoff distance, determined in accordance with § 23.57 and § 23.59(a)(1), using the established V_R. The takeoff, otherwise performed in accordance with § 23.57, must be continued safely from the point at which the airplane is 35 feet above the takeoff surface and at a speed not less than the established V_2 minus 5 knots.

(6) The applicant must show, with all engines operating, that marked increases in the scheduled takeoff distances, determined in accordance with § 23.59(a)(2), do not result from over-rotation of the airplane or out-of-trim conditions.

10. Section 23.53 is revised to read as follows:

§ 23.53 Takeoff performance.

(a) For normal, utility, and acrobatic category airplanes, the takeoff distance must be determined in accordance with paragraph (b) of this section, using speeds determined in accordance with § 23.51(a) and (b).

(b) For normal, utility, and acrobatic category airplanes, the distance required to takeoff and climb to a height of 50 feet above the takeoff surface must be determined for each weight, altitude, and temperature within the operational limits established for takeoff with--

(1) Takeoff power on each engine;

(2) Wing flaps in the takeoff position(s); and

(3) Landing gear extended.

(c) For commuter category airplanes, takeoff performance, as required by §§ 23.55 through 23.59, must be determined with the operating engine(s) within approved operating limitations.

11\. Section 23.55 is amended by revising paragraph (a) and the introductory text of paragraph (b) to read as follows:

§ 23.55 Accelerate-stop distance.

* * * * *

(a) The accelerate-stop distance is the sum of the distances necessary to--

(1) Accelerate the airplane from a standing start to V_{EF} with all engines operating;

(2) Accelerate the airplane from V_{EF} to V_1, assuming the critical engine fails at V_{EF}; and

(3) Come to a full stop from the point at which V_1 is reached.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distances if that means--

* * * * *

12. Section 23.57 is amended by revising paragraphs (a) introductory text, (b), (c)(1), (c)(3) introductory text, (c)(4), and (d); and by adding a new paragraph (e) to read as follows:

§ 23.57 Takeoff path.

* * * * *

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1500 feet above the takeoff surface at or below which height the transition from the takeoff to the enroute configuration must be completed; and

* * * * *

(b) During the acceleration to speed V_2, the nose gear may be raised off the ground at a speed not less than V_R. However, landing gear retraction must not be initiated until the airplane is airborne.

(c) * * *

(1) The slope of the airborne part of the takeoff path must not be negative at any point;

* * * * *

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb must not be less than--

* * * * *

(4) Except for gear retraction and automatic propeller feathering, the airplane configuration must not be changed, and no change in power that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path to 35 feet above the takeoff surface must be determined by a continuous demonstrated takeoff.

(e) The takeoff flight path from 35 feet above the takeoff surface must be determined by synthesis from segments; and

(1) The segments must be clearly defined and must be related to distinct changes in configuration, power, and speed;

(2) The weight of the airplane, the configuration, and the power must be assumed constant throughout each segment and must correspond to the most critical condition prevailing in the segment; and

(3) The takeoff flight path must be based on the airplane's performance without utilizing ground effect.

13. Section 23.59 is amended by revising the introductory text for this section, paragraph (a)(2), and paragraph (b) to read as follows:

§ 23.59 Takeoff distance and takeoff run.

For each commuter category airplane, the takeoff distance and, at the option of the applicant, the takeoff run, must be determined.

(a) * * *

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

(b) If the takeoff distance includes a clearway, the takeoff run is the greater of--

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

14. A new § 23.63 is added to read as follows:

§ 23.63 Climb: general.

(a) Compliance with the requirements of §§ 23.65, 23.66, 23.67, 23.69, and 23.77 must be shown--

(1) Out of ground effect; and

(2) At speeds that are not less than those at which compliance with the powerplant cooling requirements of §§ 23.1041 to 23.1047 has been demonstrated; and

(3) Unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, compliance must be shown with § 23.65(a), § 23.67(a), where appropriate, and § 23.77(a) at maximum takeoff or landing weight, as appropriate, in a standard atmosphere.

(c) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, compliance must be shown at weights as a function of airport altitude and ambient temperature, within the operational limits established for takeoff and landing, respectively, with--

(1) Sections 23.65(b) and 23.67(b)(1) and (2), where appropriate, for takeoff, and

(2) Section 23.67(b)(2), where appropriate, and § 23.77(b), for landing.

(d) For commuter category airplanes, compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with--

(1) Sections 23.67(c)(1), 23.67(c)(2), and 23.67(c)(3) for takeoff; and

(2) Sections 23.67(c)(3), 23.67(c)(4), and 23.77(c) for landing.

15. Section 23.65 is revised to read as follows:

§ 23.65 Climb: all engines operating.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must have a steady climb gradient at sea level of at least 8.3 percent for landplanes or 6.7 percent for seaplanes and amphibians with--

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed not less than the greater of 1.1 V_{MC} and 1.2 V_{S1} for multiengine airplanes and not less than 1.2 V_{S1} for single-engine airplanes.

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and turbine engine-powered airplanes in the normal, utility, and acrobatic category must have a steady gradient of climb after takeoff of at least 4 percent with--

(1) Takeoff power on each engine;

(2) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed as specified in § 23.65(a)(4).

16. A new § 23.66 is added to read as follows:

§ 23.66 Takeoff climb: one-engine inoperative.

For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the steady gradient of climb or descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with--

(a) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(b) The remaining engine(s) at takeoff power;

(c) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;

(d) The wing flaps in the takeoff position(s);

(e) The wings level; and

(f) A climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

17. Section 23.67 is revised to read as follows:

§ 23.67 Climb: one engine inoperative.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the following apply:

(1) 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 a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(2) For each airplane that meets the requirements prescribed in § 23.562(d), or that has a V_{SO} of 61 knots or less, the steady gradient of climb or descent at a pressure altitude of 5,000 feet must be determined with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category--

(1) The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be measurably positive with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the takeoff position(s); and

(v) Climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

(2) The steady gradient of climb must not be less than 0.75 percent at an altitude of 1,500 feet above the takeoff surface, or landing surface, as appropriate, with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(c) For commuter category airplanes, the following apply:

(I) Takeoff; landing gear extended. The steady gradient of climb at the altitude of the takeoff surface must be measurably positive for two-engine airplanes, not less than 0.3 percent for three-engine airplanes, or 0.5 percent for four-engine airplanes with--

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear extended, and all landing gear doors open;

(iv) The wing flaps in the takeoff position(s);

(v) The wings level; and

(vi) A climb speed equal to V_2.

(2) Takeoff; landing gear retracted. The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be not less than 2.0 percent for two-engine airplanes, 2.3 percent for three-engine airplanes, and 2.6 percent for four-engine airplanes with--

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear retracted;

(iv) The wing flaps in the takeoff position(s);

(v) A climb speed equal to V_2.

(3) Enroute. The steady gradient of climb at an altitude of 1,500 feet above the takeoff or landing surface, as appropriate, must be not less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes, and 1.7 percent for four-engine airplanes with--

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at not more than maximum continuous power;

(iii) The landing gear retracted;

(iv) The wing flaps retracted; and

(v) A climb speed not less than 1.2 V_{S1}.

(4) Discontinued approach. The steady gradient of climb at an altitude of 400 feet above the landing surface must be not less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes, and 2.7 percent for four-engine airplanes, with--

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the approach position(s) in which V_{S1} for these position(s) does not exceed 110 percent of the V_{S1} for the related all-engines-operating landing position(s); and

(v) A climb speed established in connection with normal landing procedures but not exceeding 1.5 V_{S1}.

18. A new § 23.69 is added to read as follows:

§ 23.69 Enroute climb/descent.

(a) All engines operating. The steady gradient and rate of climb must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with--

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps retracted; and

(4) A climb speed not less than 1.3 V_{S1}.

(b) One engine inoperative. The steady gradient and rate of climb/descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with--

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at not more than maximum continuous power;

(3) The landing gear retracted;

(4) The wing flaps retracted; and

(5) A climb speed not less than 1.2 V_{S1}.

19. A new § 23.71 is added to read as follows:

§ 23.71 Glide: Single-engine airplanes.

The maximum horizontal distance traveled in still air, in nautical miles, per 1,000 feet of altitude lost in a glide, and the speed necessary to achieve this must be determined with the engine inoperative, its propeller in the minimum drag position, and landing gear and wing flaps in the most favorable available position.

20. A new § 23.73 is added to read as follows:

§ 23.73 Reference landing approach speed.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(b) with the wing flaps in the most extended takeoff position, and 1.3 V_{SO}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

(c) For commuter category airplanes, the reference landing approach speed, V_{REF}, must not be less than the greater of 1.05 V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

21. Section 23.75 is amended by revising the section heading, introductory text for the section, the introductory text of paragraph (a), and paragraphs (b), (d), (e), and (f); and by removing paragraph (h), to read as follows:

§ 23.75 Landing distance.

The horizontal distance necessary to land and come to a complete stop from a point 50 feet above the landing surface must be determined, for standard temperatures at each weight and altitude within the operational limits established for landing, as follows:

(a) A steady approach at not less than V_{REF}, determined in accordance with § 23.73(a), (b), or (c), as appropriate, must be maintained down to the 50 foot height and--

* * * * *

(b) A constant configuration must be maintained throughout the maneuver.

* * * * *

(d) It must be shown that a safe transition to the balked landing conditions of § 23.77 can be made from the conditions that exist at the 50 foot height, at maximum landing weight, or at the maximum landing weight for altitude and temperature of § 23.63(c)(2) or (d)(2), as appropriate.

(e) The brakes must be used so as to not cause excessive wear of brakes or tires.

(f) Retardation means other than wheel brakes may be used if that means--

(1) Is safe and reliable; and

(2) Is used so that consistent results can be expected in service.

* * * * *

22. Section 23.77 is revised to read as follows:

§ 23.77 Balked landing.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must be able to maintain a steady gradient of climb at sea level of at least 3.3 percent with--

(1) Takeoff power on each engine;

(2) The landing gear extended;

(3) The wing flaps in the landing position, except that if the flaps may safely be retracted in two seconds or less without loss of altitude and without sudden changes of angle of attack, they may be retracted; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(a).

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and each normal, utility, and acrobatic category turbine engine-powered airplane must be able to maintain a steady gradient of climb of at least 2.5 percent with--

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from minimum flight-idle position;

(2) The landing gear extended;

(3) The wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(b).

(c) Each commuter category airplane must be able to maintain a steady gradient of climb of at least 3.2 percent with--

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from the minimum flight idle position;

(2) Landing gear extended;

(3) Wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(c).

23. Section 23.143 is amended by revising paragraphs (a) and (c) to read as follows:

§ 23.143 General.

(a) The airplane must be safely controllable and maneuverable during all flight phases including--

(1) Takeoff;

(2) Climb;

(3) Level flight;

(4) Descent;

(5) Go-around; and

(6) Landing (power on and power off) with the wing flaps extended and retracted.

* * * * *

(c) If marginal conditions exist with regard to required pilot strength, the control forces necessary must be determined by quantitative tests. In no case may the control forces under the conditions specified in paragraphs (a) and (b) of this section exceed those prescribed in the following table:

Values in pounds force applied to the relevant control	Pitch	Roll	Yaw
(a) For temporary application			
Stick--------------------	60	30	
Wheel (Two hands on rim)-	75	50	
Wheel (One hand on rim)--	50	25	
Rudder Pedal-------------	-----	-----	150
(b) For prolonged application	10	5	20

24. Section 23.145 is amended by revising paragraph (b) introductory text, paragraphs (b)(2) through (b)(5); adding a new paragraph (b)(6); and revising paragraphs (c) and (d) to read as follows:

§ 23.145 Longitudinal control.

* * * * *

(b) Unless otherwise required, it must be possible to carry out the following maneuvers without requiring the application of single-handed control forces exceeding those specified in § 23.143(c). The trimming controls must not be adjusted during the maneuvers:

* * * * *

(2) With landing gear and flaps extended, power off, and the airplane as nearly as possible in trim at 1.3 V_{SO}, quickly

apply takeoff power and retract the flaps as rapidly as possible to the recommended go around setting and allow the airspeed to transition from 1.3 V_{SO} to 1.3 V_{S1}. Retract the gear when a positive rate of climb is established.

(3) With landing gear and flaps extended, in level flight, power necessary to attain level flight at 1.1 V_{SO}, and the airplane as nearly as possible in trim, it must be possible to maintain approximately level flight while retracting the flaps as rapidly as possible with simultaneous application of not more than maximum continuous power. If gated flap positions are provided, the flap retraction may be demonstrated in stages with power and trim reset for level flight at 1.1 V_{S1} in the initial configuration for each stage--

(i) From the fully extended position to the most extended gated position;

(ii) Between intermediate gated positions, if applicable; and

(iii) From the least extended gated position to the fully retracted position.

(4) With power off, flaps and landing gear retracted and the airplane as nearly as possible in trim at 1.4 V_{S1}, apply takeoff power rapidly while maintaining the same airspeed.

(5) With power off, landing gear and flaps extended, and the airplane as nearly as possible in trim at V_{REF}, obtain and maintain airspeeds between 1.1 V_{SO} and either 1.7 V_{SO} or V_{FE},

whichever is lower without requiring the application of two-handed control forces exceeding those specified in § 23.143(c).

(6) With maximum takeoff power, landing gear retracted, flaps in the takeoff position, and the airplane as nearly as possible in trim at V_{FE} appropriate to the takeoff flap position, retract the flaps as rapidly as possible while maintaining constant speed.

(c) At speeds above V_{MO}/M_{MO}, and up to the maximum speed shown under § 23.251, a maneuvering capability of 1.5 g must be demonstrated to provide a margin to recover from upset or inadvertent speed increase.

(d) It must be possible, with a pilot control force of not more than 10 pounds, to maintain a speed of not more than V_{REF} during a power-off glide with landing gear and wing flaps extended, for any weight of the airplane, up to and including the maximum weight.

* * * * *

25. Section 23.147 is revised to read as follows:

§ 23.147 Directional and lateral control.

(a) For each multiengine airplane, it must be possible, while holding the wings level within five degrees, to make sudden changes in heading safely in both directions. This ability must be shown at 1.4 V_{S1} with heading changes up to 15 degrees, except that the heading change at which the rudder force corresponds to the limits specified in § 23.143 need not be exceeded, with the--

(1) Critical engine inoperative and its propeller in the minimum drag position;

(2) Remaining engines at maximum continuous power;

(3) Landing gear--

(i) Retracted; and

(ii) Extended; and

(4) Flaps retracted.

(b) For each multiengine airplane, it must be possible to regain full control of the airplane without exceeding a bank angle of 45 degrees, reaching a dangerous attitude or encountering dangerous characteristics, in the event of a sudden and complete failure of the critical engine, making allowance for a delay of two seconds in the initiation of recovery action appropriate to the situation, with the airplane initially in trim, in the following conditions:

(1) Maximum continuous power on each engine;

(2) The wing flaps retracted;

(3) The landing gear retracted;

(4) A speed equal to that at which compliance with § 23.69(a) has been shown; and

(5) All propeller controls in the position at which compliance with § 23.69(a) has been shown.

(c) For all airplanes, it must be shown that the airplane is safely controllable without the use of the primary lateral control system in any all-engine configuration(s) and at any speed or altitude within the approved operating envelope. It must also be shown that the airplane's flight characteristics are not impaired below a level needed to permit continued safe flight and the ability to maintain attitudes suitable for a controlled landing without exceeding the operational and structural limitations of the airplane. If a single failure of any one connecting or transmitting link in the lateral control system would also cause the loss of additional control system(s), compliance with the above requirement must be shown with those additional systems also assumed to be inoperative.

26. Section 23.149 is revised to read as follows:

§ 23.149 Minimum control speed.

(a) V_{MC} is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane with that engine still inoperative, and thereafter maintain straight flight at the same speed with an angle of bank of not more than 5 degrees. The method used to simulate critical engine failure must represent the most critical mode of powerplant failure expected in service with respect to controllability.

(b) V_{MC} for takeoff must not exceed 1.2 V_{S1}, where V_{S1} is determined at the maximum takeoff weight. V_{MC} must be determined with the most unfavorable weight and center of gravity position and with the airplane airborne and the ground effect negligible, for the takeoff configuration(s) with--

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for takeoff;

(3) Flaps in the takeoff position(s);

(4) Landing gear retracted; and

(5) All propeller controls in the recommended takeoff position throughout.

(c) For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the conditions of paragraph (a) must also be met for the landing configuration with--

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for an approach, with all engines operating, at V_{REF}, at an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75;

(3) Flaps in the landing position;

(4) Landing gear extended; and

(5) All propeller controls in the position recommended for approach with all engines operating.

(d) A minimum speed to intentionally render the critical engine inoperative must be established and designated as the safe, intentional, one-engine-inoperative speed, V_{SSE}.

(e) At V_{MC}, the rudder pedal force required to maintain control must not exceed 150 pounds and it must not be necessary to reduce power of the operative engine(s). During the maneuver, the airplane must not assume any dangerous attitude and it must be possible to prevent a heading change of more than 20 degrees.

(f) At the option of the applicant, to comply with the requirements of § 23.51(c)(1), V_{MCG} may be determined. V_{MCG} is the minimum control speed on the ground, and is the calibrated airspeed during the takeoff run at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane using the rudder control alone (without the use of nosewheel steering), as limited by 150 pounds of force, and using the lateral control to the extent of keeping the wings level to enable the takeoff to be safely continued. In the determination of V_{MCG}, assuming that the path of the airplane accelerating with all engines operating is along the centerline of the runway, its path from the point at which the critical engine is made inoperative to the point at which recovery to a direction parallel to the centerline is completed may not deviate more than 30 feet laterally from the centerline at any point. V_{MCG} must be established with--

(1) The airplane in each takeoff configuration or, at the option of the applicant, in the most critical takeoff configuration;

(2) Maximum available takeoff power on the operating engines;

(3) The most unfavorable center of gravity;

(4) The airplane trimmed for takeoff; and

(5) The most unfavorable weight in the range of takeoff weights.

27. Section 23.153 is revised to read as follows:

§ 23.153 Control during landings.

It must be possible, while in the landing configuration, to safely complete a landing without exceeding the one-hand control force limits specified in § 23.143(c) following an approach to land--

(a) At a speed of V_{REF} minus 5 knots;

(b) With the airplane in trim, or as nearly as possible in trim and without the trimming control being moved throughout the maneuver;

(c) At an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75; and

(d) With only those power changes, if any, that would be made when landing normally from an approach at V_{REF}.

28. Section 23.155 is amended by revising the introductory text of paragraph (b) and paragraph (b)(1), and by adding a new paragraph (c) to read as follows:

§ 23.155 Elevator control force in maneuvers.

* * * * *

(b) The requirement of paragraph (a) of this section must be met at 75 percent of maximum continuous power for reciprocating engines, or the maximum continuous power for turbine engines, and with the wing flaps and landing gear retracted--

(1) In a turn, with the trim setting used for wings level flight at V_O; and

* * * * *

(c) There must be no excessive decrease in the gradient of the curve of stick force versus maneuvering load factor with increasing load factor.

29. Section 23.157 is amended by revising paragraph (d) to read as follows:

§ 23.157 Rate of roll.

* * * * *

(d) The requirement of paragraph (c) of this section must be met when rolling the airplane in each direction in the following conditions--

(1) Flaps in the landing position(s);

(2) Landing gear extended;

(3) All engines operating at the power for a 3 degree approach; and

(4) The airplane trimmed at V_{REF}.

30. Section 23.161 is amended by revising paragraphs (a), (b)(1), (b)(2), (c), the introductory text of paragraph (d), and (d)(4), and by adding a new paragraph (e) to read as follows:

§ 23.161 Trim.

(a) General. Each airplane must meet the trim requirements of this section after being trimmed and without further pressure upon, or movement of, the primary controls or their corresponding trim controls by the pilot or the automatic pilot. In addition, it must be possible, in other conditions of loading, configuration, speed and power to ensure that the pilot will not be unduly fatigued or distracted by the need to apply residual control forces exceeding those for prolonged application of § 23.143(c). This applies in normal operation of the airplane and, if applicable, to those conditions associated with the failure of one engine for which performance characteristics are established.

(b) * * *

(1) For normal, utility, and acrobatic category airplanes, at a speed of 0.9 V_H, V_C, or V_{MO}/M_{MO}, whichever is lowest; and

(2) For commuter category airplanes, at all speeds from 1.4 V_{S1} to the lesser of V_H or V_{MO}/M_{MO}.

(c) Longitudinal trim. The airplane must maintain longitudinal trim under each of the following conditions:

(1) A climb with--

(i) Takeoff power, landing gear retracted, wing flaps in the takeoff position(s), at the speeds used in determining the climb performance required by § 23.65; and

(ii) Maximum continuous power at the speeds and in the configuration used in determining the climb performance required by § 23.69(a).

(2) Level flight at all speeds from the lesser of V_H and either V_{NO} or V_{MO}/M_{MO} (as appropriate), to 1.4 V_{S1}, with the landing gear and flaps retracted.

(3) A descent at V_{NO} or V_{MO}/M_{MO}, whichever is applicable, with power off and with the landing gear and flaps retracted.

(4) Approach with landing gear extended and with--

(i) A 3 degree angle of descent, with flaps retracted and at a speed of 1.4 V_{S1};

(ii) A 3 degree angle of descent, flaps in the landing position(s) at V_{REF}; and

(iii) An approach gradient equal to the steepest used in the landing distance demonstrations of § 23.75, flaps in the landing position(s) at V_{REF}.

(d) In addition, each multiengine airplane must maintain longitudinal and directional trim, and the lateral control force must not exceed 5 pounds at the speed used in complying with § 23.67(a), (b)(2), or (c)(3), as appropriate, with--

* * * * *

(4) Wing flaps retracted; and

* * * * *

(e) In addition, each commuter category airplane for which, in the determination of the takeoff path in accordance with § 23.57, the climb in the takeoff configuration at V_2 extends beyond 400 feet above the takeoff surface, it must be possible to reduce the longitudinal and lateral control forces to 10 pounds and 5 pounds, respectively, and the directional control force must not exceed 50 pounds at V_2 with--

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at takeoff power;

(3) Landing gear retracted;

(4) Wing flaps in the takeoff position(s); and

(5) An angle of bank not exceeding 5 degrees.

31. Section 23.175 is revised to read as follows:

§ 23.175 Demonstration of static longitudinal stability.

Static longitudinal stability must be shown as follows:

(a) Climb. The stick force curve must have a stable slope at speeds between 85 and 115 percent of the trim speed, with--

(1) Flaps retracted;

(2) Landing gear retracted;

(3) Maximum continuous power; and

(4) The airplane trimmed at the speed used in determining the climb performance required by § 23.69(a).

(b) Cruise. With flaps and landing gear retracted and the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to V_{NO} or V_{MO}/M_{MO}, as appropriate, except that the speed need not exceed V_H--

(1) For normal, utility, and acrobatic category airplanes, the stick force curve must have a stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable--

(i) At speeds less than 1.3 V_{S1}; or

(ii) For airplanes with V_{NE} established under § 23.1505(a), at speeds greater than V_{NE}; or

(iii) For airplanes with V_{MO}/M_{MO} established under § 23.1505(c), at speeds greater than V_{FC}/M_{FC}.

(2) For commuter category airplanes, the stick force curve must have a stable slope at all speeds within a range of 50 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable--

(i) At speeds less than 1.4 V_{S1}; or

(ii) At speeds greater than V_{FC}/M_{FC}; or

(iii) At speeds that require a stick force greater than 50 pounds.

(c) Landing. The stick force curve must have a stable slope at speeds between 1.1 V_{S1} and 1.8 V_{S1} with--

(1) Flaps in the landing position;

(2) Landing gear extended; and

(3) The airplane trimmed at--

(i) V_{REF}, or the minimum trim speed if higher, with power off; and

(ii) V_{REF} with enough power to maintain a 3 degree angle of descent.

32. Section 23.177 is revised to read as follows:

§ 23.177 Static directional and lateral stability.

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from 1.2 V_{S1} up to the maximum allowable speed for the condition being investigated. The angle of sideslip for these tests must be appropriate to the type of airplane. At larger angles of sideslip, up to that at which full rudder is used or a control force limit in § 23.143 is reached, whichever occurs first, and at speeds from 1.2 V_{S1} to V_O, the rudder pedal force must not reverse.

(b) The static lateral stability, as shown by the tendency to raise the low wing in a sideslip, must be positive for all landing gear and flap positions. This must be shown with symmetrical power up to 75 percent of maximum continuous power at speeds above 1.2 V_{S1} in the takeoff configuration(s) and at speeds above 1.3 V_{S1} in other configurations, up to the maximum allowable speed for the configuration being investigated, in the takeoff, climb, cruise, and approach configurations. For the landing configuration, the power must be that necessary to maintain a 3 degree angle of descent in coordinated flight. The static lateral stability must not be negative at 1.2 V_{S1} in the takeoff configuration, or at 1.3 V_{S1} in other configurations. The angle of sideslip for these tests must be appropriate to the type of airplane, but in no case may the constant heading sideslip angle be less than that obtainable with a 10 degree bank, or if less, the maximum bank angle obtainable with full rudder deflection or 150 pound rudder force.

(c) Paragraph (b) of this section does not apply to acrobatic category airplanes certificated for inverted flight.

(d) In straight, steady slips at 1.2 V_{S1} for any landing gear and flap positions, and for any symmetrical power conditions up to 50 percent of maximum continuous power, the aileron and rudder control movements and forces must increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. At larger slip angles, up to the angle at which full rudder or aileron control is used or a control force limit contained in § 23.143 is reached, the aileron and rudder control movements and forces must not reverse as the angle of sideslip is increased. Rapid entry into, and recovery from, a maximum sideslip considered appropriate for the airplane must not result in uncontrollable flight characteristics.

33. Section 23.201 is revised to read as follows:

§ 23.201 Wings level stall.

(a) It must be possible to produce and to correct roll by unreversed use of the rolling control and to produce and to correct yaw by unreversed use of the directional control, up to the time the airplane stalls.

(b) The wings level stall characteristics must be demonstrated in flight as follows. Starting from a speed at least 10 knots above the stall speed, the elevator control must be pulled back so that the rate of speed reduction will not exceed one knot per second until a stall is produced, as shown by either:

(1) An uncontrollable downward pitching motion of the airplane;

(2) A downward pitching motion of the airplane that results from the activation of a stall avoidance device (for example, stick pusher); or

(3) The control reaching the stop.

(c) Normal use of elevator control for recovery is allowed after the downward pitching motion of (b)(1) or (b)(2) has unmistakably been produced, or after the control has been held against the stop for not less than the longer of two seconds or the time employed in the minimum steady flight speed determination of § 23.49.

(d) During the entry into and the recovery from the maneuver, it must be possible to prevent more than 15 degrees of roll or yaw by the normal use of controls.

(e) Compliance with the requirements of this section must be shown under the following conditions:

(1) Wing flaps. Retracted, fully extended, and each intermediate normal operating position.

(2) Landing gear. Retracted and extended.

(3) Cowl flaps. Appropriate to configuration.

(4) Power:

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power results in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{SO}, except that the power may not be less than 50 percent of maximum continuous power.

(5) Trim. The airplane trimmed at a speed as near 1.5 V_{S1} as practicable.

(6) Propeller. Full increase r.p.m. position for the power off condition.

34. Section 23.203 is amended by revising the section heading and introductory text, paragraph (a), the introductory text of paragraph (b), paragraphs (b)(4) and (b)(5), the

introductory text of paragraph (c), and paragraphs (c)(1) and (c)(4), and by adding new paragraphs (b)(6) and (c)(6) to read as follows:

§ 23.203 Turning flight and accelerated turning stalls.

Turning flight and accelerated turning stalls must be demonstrated in tests as follows:

(a) Establish and maintain a coordinated turn in a 30 degree bank. Reduce speed by steadily and progressively tightening the turn with the elevator until the airplane is stalled, as defined in § 23.201(b). The rate of speed reduction must be constant, and--

(1) For a turning flight stall, may not exceed one knot per second; and

(2) For an accelerated turning stall, be 3 to 5 knots per second with steadily increasing normal acceleration.

(b) After the airplane has stalled, as defined in § 23.201(b), it must be possible to regain wings level flight by normal use of the flight controls, but without increasing power and without--

* * * * *

(4) Exceeding a bank angle of 60 degrees in the original direction of the turn or 30 degrees in the opposite direction in the case of turning flight stalls;

(5) Exceeding a bank angle of 90 degrees in the original direction of the turn or 60 degrees in the opposite direction in the case of accelerated turning stalls; and

(6) Exceeding the maximum permissible speed or allowable limit load factor.

(c) Compliance with the requirements of this section must be shown under the following conditions:

(1) Wing flaps: Retracted, fully extended, and each intermediate normal operating position;

* * * * *

(4) Power:

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power results in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{SO}, except that the power may not be less than 50 percent of maximum continuous power.

* * * * *

(6) Propeller. Full increase rpm position for the power off condition.

§ 23.205 [Removed]

35. Section 23.205 is removed.

36. Section 23.207 is amended by revising paragraphs (c) and (d), and by adding new paragraphs (e) and (f) to read as follows:

§ 23.207 Stall warning.

* * * * *

(c) During the stall tests required by § 23.201(b) and § 23.203(a)(1), the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots and must continue until the stall occurs.

(d) When following the procedures furnished in accordance with § 23.1585, the stall warning must not occur during a takeoff with all engines operating, a takeoff continued with one engine inoperative, or during an approach to landing.

(e) During the stall tests required by § 23.203(a)(2), the stall warning must begin sufficiently in advance of the stall for the stall to be averted by pilot action taken after the stall warning first occurs.

(f) For acrobatic category airplanes, an artificial stall warning may be mutable, provided that it is armed automatically during takeoff and rearmed automatically in the approach configuration.

37. Section 23.221 is revised to read as follows:

§ 23.221 Spinning.

(a) Normal category airplanes. A single-engine, normal category airplane must be able to recover from a one-turn spin or a three-second spin, whichever takes longer, in not more than one additional turn after initiation of the first control action for recovery, or demonstrate compliance with the optional spin resistant requirements of this section.

(1) The following apply to one turn or three second spins:

(i) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and positive limit maneuvering load factor must not be exceeded;

(ii) No control forces or characteristic encountered during the spin or recovery may adversely affect prompt recovery;

(iii) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin; and

(iv) For the flaps-extended condition, the flaps may be retracted during the recovery but not before rotation has ceased.

(2) At the applicant's option, the airplane may be demonstrated to be spin resistant by the following:

(i) During the stall maneuver contained in § 23.201, the pitch control must be pulled back and held against the stop. Then, using ailerons and rudders in the proper direction, it must be possible to maintain wings-level flight within 15 degrees of bank and to roll the airplane from a 30 degree bank in one direction to a 30 degree bank in the other direction;

(ii) Reduce the airplane speed using pitch control at a rate of approximately one knot per second until the pitch control reaches the stop; then, with the pitch control pulled back and held against the stop, apply full rudder control in a manner to promote spin entry for a period of seven seconds or through a 360 degree heading change, whichever occurs first. If the 360 degree heading change is reached first, it must have taken no fewer than four seconds. This maneuver must be performed first with the ailerons in the neutral position, and then with the ailerons deflected opposite the direction of turn in the most adverse manner. Power and airplane configuration must be set in accordance with § 23.201(e) without change during the maneuver. At the end of seven seconds or a 360 degree heading change, the airplane must respond immediately and normally to primary flight controls applied to regain coordinated, unstalled flight without reversal of control effect and without exceeding the temporary control forces specified by § 23.143(c); and

(iii) Compliance with §§ 23.201 and 23.203 must be demonstrated with the airplane in uncoordinated flight, corresponding to one ball width displacement on a slip-skid indicator, unless one ball width displacement cannot be obtained with full rudder, in which case the demonstration must be with full rudder applied.

(b) Utility category airplanes. A utility category airplane must meet the requirements of paragraph (a) of this section. In addition, the requirements of paragraph (c) of this section and § 23.807(b)(7) must be met if approval for spinning is requested.

(c) Acrobatic category airplanes. An acrobatic category airplane must meet the spin requirements of paragraph (a) of this section and § 23.807(b)(6). In addition, the following requirements must be met in each configuration for which approval for spinning is requested:

(1) The airplane must recover from any point in a spin up to and including six turns, or any greater number of turns for which certification is requested, in not more than one and one-half additional turns after initiation of the first control action for recovery. However, beyond three turns, the spin may be discontinued if spiral characteristics appear.

(2) The applicable airspeed limits and limit maneuvering load factors must not be exceeded. For flaps-extended configurations for which approval is requested, the flaps must not be retracted during the recovery.

(3) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin.

(4) There must be no characteristics during the spin (such as excessive rates of rotation or extreme oscillatory motion) that might prevent a successful recovery due to disorientation or incapacitation of the pilot.

38. Section 23.233(a) is revised to read as follows:

§ 23.233 Directional stability and control.

(a) A 90 degree cross-component of wind velocity, demonstrated to be safe for taxiing, takeoff, and landing must be established and must be not less than 0.2 V_{SO}.

* * * * *

39. Section 23.235 is revised to read as follows:

§ 23.235 Operation on unpaved surfaces.

The airplane must be demonstrated to have satisfactory characteristics and the shock-absorbing mechanism must not damage the structure of the airplane when the airplane is taxied on the roughest ground that may reasonably be expected in normal operation and when takeoffs and landings are performed on unpaved runways having the roughest surface that may reasonably be expected in normal operation.

40. A new § 23.237 is added to read as follows:

§ 23.237 Operation on water.

A wave height, demonstrated to be safe for operation, and any necessary water handling procedures for seaplanes and amphibians must be established.

§ 23.253 [Amended]

41. Section 23.253 is amended by removing paragraph (b)(1) and by redesignating paragraphs (b)(2) and (b)(3) as paragraphs (b)(1) and (b)(2), respectively.

42. Section 23.562(d) introductory paragaph is revised to read as follows:

§ 23.562 Emergency landing dynamic 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(a)(1);

* * * * *

43. Section 23.1325 is amended by revising paragraph (e), by removing and reserving paragraph (f) to read as follows:

§ 23.1325 Static pressure system.

* * * * *

(e) Each static pressure system must be calibrated in flight to determine the system error. The system error, in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, may not exceed ± 30 feet per 100 knot speed for the appropriate configuration in the speed range between 1.3 V_{SO} with flaps extended, and 1.8 V_{S1} with flaps retracted. However, the error need not be less than 30 feet.

(f) [Reserved]

* * * * *

44. Section 23.1511 is amended by revising paragraphs (a)(1) and (a)(2) to read as follows:

§ 23.1511 Flap extended speed.

(a) * * *

(1) Not less than the minimum value of V_F allowed in § 23.345(b); and

(2) Not more than V_F established under § 23.345(a), (c), and (d).

* * * * *

45. Section 23.1521 is amended by revising paragraphs (b)(5) and (e) to read as follows:

§ 23.1521 Powerplant limitations.

* * * * *

(b) * * *

(5) The maximum allowable cylinder head (as applicable), liquid coolant and oil temperatures.

* * * * *

(e) Ambient temperature. For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, ambient temperature limitations (including limitations for winterization installations if applicable) must be established as the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 23.1041 through 23.1047 is shown.

46. Section 23.1543(c) is added to read as follows:

§ 23.1543 Instrument markings: general.

* * * * *

(c) All related instruments must be calibrated in compatible units.

47. Section 23.1545 is amended by revising paragraphs (b)(5) and (b)(6) to read as follows:

§ 23.1545 Airspeed indicator.

* * * * *

(b) * * *

(5) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the speed at which compliance has been shown with § 23.69(b) relating to rate of climb at maximum weight and at sea level, a blue radial line.

(6) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the maximum value of minimum control speed, V_{MC}, (one-engine-inoperative) determined under § 23.149(b), a red radial line.

* * * * *

48. Section 23.1553 is revised to read as follows:

§ 23.1553 Fuel quantity indicator.

A red radial line must be marked on each indicator at the calibrated zero reading, as specified in § 23.1337(b)(1).

49. Section 23.1555(e)(2) is revised to read as follows:

§ 23.1555 Control markings.

* * * * *

(e) * * *

(2) Each emergency control must be red and must be marked as to method of operation. No control other than an emergency control, or a control that serves an emergency function in addition to its other functions, shall be this color.

50. Section 23.1559 is revised to read as follows:

§ 23.1559 Operating limitations placard.

(a) There must be a placard in clear view of the pilot stating--

(1) That the airplane must be operated in accordance with the Airplane Flight Manual; and

(2) The certification category of the airplane to which the placards apply.

(b) For airplanes certificated in more than one category, there must be a placard in clear view of the pilot stating that other limitations are contained in the Airplane Flight Manual.

(c) There must be a placard in clear view of the pilot that specifies the kind of operations to which the operation of the airplane is limited or from which it is prohibited under § 23.1525.

51. Section 23.1563(c) is added to read as follows:

§ 23.1563 Airspeed placards.

* * * * *

(c) For reciprocating multiengine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes, the maximum value of the minimum control speed, V_{MC}, (one-engine-inoperative) determined under § 23.149(b).

52. Section 23.1567(d) is added to read as follows:

§ 23.1567 Flight maneuver placard.

* * * * *

(d) For acrobatic category airplanes and utility category airplanes approved for spinning, there must be a placard in clear view of the pilot--

(1) Listing the control actions for recovery from spinning maneuvers; and

(2) Stating that recovery must be initiated when spiral characteristics appear, or after not more than six turns or not more than any greater number of turns for which the airplane has been certificated.

53. Section 23.1581 is amended by adding new paragraphs (a)(3) and (c), and by revising the introductory text of paragraph (b)(2) and paragraph (d) to read as follows:

§ 23.1581 General.

(a) * * *

(3) Further information necessary to comply with the relevant operating rules.

(b) * * *

(2) The requirements of paragraph (b)(1) of this section do not apply to reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, if the following is met:

* * * * *

(c) The units used in the Airplane Flight Manual must be the same as those marked on the appropriate instruments and placards.

(d) All Airplane Flight Manual operational airspeeds, unless otherwise specified, must be presented as indicated airspeeds.

* * * * *

54. Section 23.1583 is amended by revising the introductory text for the section, and paragraphs (a)(3) introductory text, (a)(3)(i), (c)(3), (c)(4), (d), (e), (f), and (g); by redesignating paragraphs (k), (l), and (m) as paragraphs (i), (j), and (k), respectively, and revising them; and by adding new paragraphs (c)(5), (c)(6), (l), (m), (n), (o), and (p) to read as follows:

§ 23.1583 Operating limitations.

The Airplane Flight Manual must contain operating limitations determined under part 23, including the following--

(a) * * *

(3) In addition, for turbine powered commuter category airplanes--

(i) The maximum operating limit speed, V_{MO}/M_{MO} and a statement that this speed must not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training;

* * * * *

(c) * * *

(3) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and for turbine engine-powered airplanes in the normal, utility, and acrobatic category, performance operating limitations as follows--

(i) The maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(1).

(ii) The maximum landing weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(2).

(4) For commuter category airplanes, the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which--

(i) The airplane complies with the climb requirements of § 23.63(d)(1); and

(ii) The accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if utilized; and either:

(iii) The takeoff distance determined under § 23.59(a) is equal to the available runway length; or

(iv) At the option of the applicant, the takeoff distance determined under § 23.59(a) is equal to the available runway length plus the length of any clearway and the takeoff run determined under § 23.59(b) is equal to the available runway length.

(5) For commuter category airplanes, the maximum landing weight for each airport altitude within the range selected by the applicant at which--

(i) The airplane complies with the climb requirements of § 23.63(d)(2) for ambient temperatures within the range selected by the applicant; and

(ii) The landing distance determined under § 23.75 for standard temperatures is equal to the available runway length.

(6) The maximum zero wing fuel weight, where relevant, as established in accordance with § 23.343.

(d) Center of gravity. The established center of gravity limits.

(e) Maneuvers. The following authorized maneuvers, appropriate airspeed limitations, and unauthorized maneuvers, as prescribed in this section.

(1) Normal category airplanes. No acrobatic maneuvers, including spins, are authorized.

(2) Utility category airplanes. A list of authorized maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations. No other maneuver is authorized.

(3) Acrobatic category airplanes. A list of approved flight maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations.

(4) Acrobatic category airplanes and utility category airplanes approved for spinning. Spin recovery procedure established to show compliance with § 23.221(c).

(5) Commuter category airplanes. Maneuvers are limited to any maneuver incident to normal flying, stalls (except whip stalls) and steep turns in which the angle of bank is not more than 60 degrees.

(f) Maneuver load factor. The positive limit load factors in g's, and, in addition, the negative limit load factor for acrobatic category airplanes.

(g) Minimum flight crew. The number and functions of the minimum flight crew determined under § 23.1523.

* * * * *

(i) Maximum operating altitude. The maximum altitude established under § 23.1527.

(j) Maximum passenger seating configuration. The maximum passenger seating configuration.

(k) Allowable lateral fuel loading. The maximum allowable lateral fuel loading differential, if less than the maximum possible.

(l) Baggage and cargo loading. The following information for each baggage and cargo compartment or zone--

(1) The maximum allowable load; and

(2) The maximum intensity of loading.

(m) Systems. Any limitations on the use of airplane systems and equipment.

(n) Ambient temperatures. Where appropriate, maximum and minimum ambient air temperatures for operation.

(o) Smoking. Any restrictions on smoking in the airplane.

(p) Types of surface. A statement of the types of surface on which operations may be conducted. (See § 23.45(g) and § 23.1587(a)(4), (c)(2), and (d)(4)).

55. Section 23.1585 is revised to read as follows:

§ 23.1585 Operating procedures.

(a) For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the achievement of the scheduled performance must be furnished, including--

(1) An explanation of significant or unusual flight or ground handling characteristics;

(2) The maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds;

(3) A recommended speed for flight in rough air. This speed must be chosen to protect against the occurrence, as a result of gusts, of structural damage to the airplane and loss of control (for example, stalling);

(4) Procedures for restarting any turbine engine in flight, including the effects of altitude; and

(5) Procedures, speeds, and configuration(s) for making a normal approach and landing, in accordance with §§ 23.73 and 23.75, and a transition to the balked landing condition.

(6) For seaplanes and amphibians, water handling procedures and the demonstrated wave height.

(b) In addition to paragraph (a) of this section, for all single-engine airplanes, the procedures, speeds, and configuration(s) for a glide following engine failure, in accordance with § 23.71 and the subsequent forced landing, must be furnished.

(c) In addition to paragraph (a) of this section, for all multiengine airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making an approach and landing with one engine inoperative;

(2) Procedures, speeds, and configuration(s) for making a balked landing with one engine inoperative and the conditions under which a balked landing can be performed safely, or a warning against attempting a balked landing;

(3) The V_{SSE} determined in § 23.149; and

(4) Procedures for restarting any engine in flight including the effects of altitude.

(d) In addition to paragraphs (a) and either (b) or (c) of this section, as appropriate, for all normal, utility, and acrobatic category airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff, in accordance with § 23.51(a) and (b), and § 23.53(a) and (b), and the subsequent climb, in accordance with § 23.65 and § 23.69(a).

(2) Procedures for abandoning a takeoff due to engine failure or other cause.

(e) In addition to paragraphs (a), (c), and (d) of this section, for all normal, utility, and acrobatic category multiengine airplanes, the information must include the following:

(1) Procedures and speeds for continuing a takeoff following engine failure and the conditions under which takeoff can safely be continued, or a warning against attempting to continue the takeoff.

(2) Procedures, speeds, and configurations for continuing a climb following engine failure, after takeoff, in accordance with § 23.67, or enroute, in accordance with § 23.69(b).

(f) In addition to paragraphs (a) and (c) of this section, for commuter category airplanes, the information must include the following:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff.

(2) Procedures and speeds for carrying out an accelerate-stop in accordance with § 23.55.

(3) Procedures and speeds for continuing a takeoff following engine failure in accordance with § 23.59(a)(1) and for following the flight path determined under § 23.57 and § 23.61(a).

(g) For multiengine airplanes, information identifying each operating condition in which the fuel system independence prescribed in § 23.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(h) For each airplane showing compliance with § 23.1353(g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

(i) Information on the total quantity of usable fuel for each fuel tank, and the effect on the usable fuel quantity, as a result of a failure of any pump, must be furnished.

(j) Procedures for the safe operation of the airplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.

56. Section 23.1587 is revised to read as follows:

§ 23.1587 Performance information.

Unless otherwise prescribed, performance information must be provided over the altitude and temperature ranges required by § 23.45(b).

(a) For all airplanes, the following information must be furnished--

(1) The stalling speeds V_{SO} and V_{S1} with the landing gear and wing flaps retracted, determined at maximum weight under § 23.49, and the effect on these stalling speeds of angles of bank up to 60 degrees;

(2) The steady rate and gradient of climb with all engines operating, determined under § 23.69(a);

(3) The landing distance, determined under § 23.75 for each airport altitude and standard temperature, and the type of surface for which it is valid;

(4) The effect on landing distances of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g); and

(5) The effect on landing distances of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component.

(b) In addition to paragraph (a) of this section, for all normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the steady angle of climb/descent, determined under § 23.77(a), must be furnished.

(c) In addition to paragraphs (a) and (b) of this section, if appropriate, for normal, utility, and acrobatic category airplanes, the following information must be furnished--

(1) The takeoff distance, determined under § 23.53 and the type of surface for which it is valid.

(2) The effect on takeoff distance of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(3) The effect on takeoff distance of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(4) For multiengine reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and multiengine turbine powered airplanes, the one-engine-inoperative takeoff climb/descent gradient, determined under § 23.66;

(5) For multiengine airplanes, the enroute rate and gradient of climb/descent with one engine inoperative, determined under § 23.69(b); and

(6) For single-engine airplanes, the glide performance determined under § 23.71.

(d) In addition to paragraph (a) of this section, for commuter category airplanes, the following information must be furnished--

(1) The accelerate-stop distance determined under § 23.55;

(2) The takeoff distance determined under § 23.59(a);

(3) At the option of the applicant, the takeoff run determined under § 23.59(b);

(4) The effect on accelerate-stop distance, takeoff distance and, if determined, takeoff run, of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(5) The effect on accelerate-stop distance, takeoff distance, and if determined, takeoff run, of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(6) The net takeoff flight path determined under § 23.61(b);

(7) The enroute gradient of climb/descent with one engine inoperative, determined under § 23.69(b);

(8) The effect, on the net takeoff flight path and on the enroute gradient of climb/descent with one engine inoperative, of 50 percent of the headwind component and 150 percent of the tailwind component;

(9) Overweight landing performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights) as follows--

(i) The maximum weight for each airport altitude and ambient temperature at which the airplane complies with the climb requirements of § 23.63(d)(2); and

(ii) The landing distance determined under § 23.75 for each airport altitude and standard temperature.

(10) The relationship between IAS and CAS determined in accordance with § 23.1323(b) and (c).

(11) The altimeter system calibration required by § 23.1325(e).

57. Section 23.1589(b) is revised to read as follows:

§ 23.1589 Loading information.

* * * * *

(b) Appropriate loading instructions for each possible loading condition between the maximum and minimum weights established under § 23.25, to facilitate the center of gravity remaining within the limits established under § 23.23.

Appendix E to Part 23 - [Removed and Reserved]

58. Appendix E to Part 23 is removed and reserved.

Issued in Washington, DC, on

14 CFR Parts 23 and 91

[Docket No. 27806; Amendment No. 23–49, 91–247]

RIN 2120–AE59

Airworthiness Standards; Systems and Equipment Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the systems and equipment airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certified in these categories. This amendment will provide nearly uniform systems and equipment standards for airplanes certificated in the United States under 14 CFR part 23 and in JAA countries under Joint Aviation Requirements 23, simplifying international airworthiness approval.

EFFECTIVE DATE: March 11, 1996.

FOR FURTHER INFORMATION CONTACT: Earsa Tankesley, Aerospace Engineer, Standards Office (ACE–100), Small Airplane Directorate, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106, telephone (816) 426–6932.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94–21 (59 FR 37620, July 22, 1994). All comments received in response to Notice 94–21 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment pertain to systems and equipment airworthiness standards. Three other final rules are being issued in this **Federal Register** that pertain to airworthiness standards for flight, powerplant, and airframe. These related rulemakings are also part of the harmonization effort. Interested persons should review all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the U.S. regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeenne des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice 94–21 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the systems and equipment airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR/part 23 harmonization, which ARAC assigned to the JAR/FAR 23 Harmonization Working Group. The proposals for systems and equipment airworthiness standards contained in Notice 94–21 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before November 21, 1994. Six commenters responded to Notice 94–21. Two of these commenters, the Civil Aviation Authority (CAA) and the Joint Aviation Authorities (JAA), submitted comments that were identical; therefore, the responses to both commenters are the same. Minor technical and editorial changes have been made to the proposed rules based on relevant comments received and after further review by the FAA.

One general comment was received from Transport Canada. It expressed concurrence with the notice. The comment also noted that the proposals (the comment did not identify the specific sections) are applicable to JAR Very Light Aircraft (VLA) standards for night operations and that it will consider adding these proposals to the Canadian standards for VLA approved for night and Instrument Flight Rule (IFR) operations. It suggests that the FAA may wish to consider this as well.

Discussion of Comments to Specific Sections of Parts 23 and 91

Section 23.677 Trim Systems

Proposed § 23.677(a) would clarify the need to mark the lateral and directional trim indicators with the neutral trim position. Since trim indicators on most airplanes are currently marked with the neutral position of the trimming device, this proposal would standardize the cockpit markings for all airplanes.

Revised paragraph (a) would also add a requirement for the pitch trim indicator to be marked with the proper pitch trim range for the takeoff of the airplane. Some takeoff accidents, including some involving fatalities, have occurred because the pitch trim was not set to the proper range needed for the airplane takeoff.

No comments were received on the proposals for this section. On reviewing the published notice, the FAA discovered the phrase "center or gravity" should have read "center of gravity."

The proposals are adopted with the above correction.

Section 23.691 Artificial Stall Barrier System

The requirements of § 23.201(c) provide criteria for the in-flight demonstration of wings level stall. The requirements also specify the means of identifying when a stall has occurred. Amendment No. 23–45 (58 FR 42136, August 6, 1993) revised § 23.201(c) by adding the activation of an artificial stall barrier as an acceptable means of identifying when a stall has occurred. Proposed new § 23.691 would provide standards for artificial stall barrier systems if such a system is used to show compliance with § 23.201(c).

Two comments were received on this proposal in which the JAA and the CAA note that the proposal has not been fully discussed by JAA specialists and recommend that the proposal be withdrawn. The JAA also provides a list of 12 issues to be considered if the FAA proceeds with the adoption of the proposal.

The FAA has reviewed the handling of this proposal from the time that it was identified in the original 1990 FAA comments on an early draft of JAR 23. This item was first presented to the JAA specialists for review in 1991 and since that time it has been thoroughly coordinated with the JAA. The JAA's current JAR 23 Notice of Proposed Amendment list contains an item for the inclusion of 23.691 in JAR 23, based on the text in a draft of this final rule. The FAA understands that the JAA expects to adopt the item following the finalization of this rule. Under these circumstances, the FAA does not find it necessary to defer adoption for further consideration.

Moreover, the FAA has reviewed each of the 12 issues that the JAA provided for FAA's consideration, and prepared a response which has been included in the Rules Docket. Since the issues are beyond the scope of the proposal, the FAA has not included them in this final rule publication.

In the course of the FAA's review, however, the FAA noted that the word "necessary" in the introductory paragraph of § 23.691 should be changed to "used," to make it clear that the equipment requirements of this section are applicable if a stick pusher system is used in the airplane to show compliance with § 23.201(c).

Section 23.691 is adopted with the above change.

Section 23.697 Wing Flap Controls

Proposed new § 23.697(c) would provide safety standards for the wing flap control levers installed in airplanes that use wing flap settings other than fully retracted when showing compliance with § 23.145.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.701 Flap Interconnection

Section 23.701 (a)(1) and (a)(2) would be revised to clarify the requirements for flap systems installed on part 23 airplanes.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.703 Takeoff Warning System

This proposed new section would require a takeoff warning system on some commuter category airplanes. The requirement would be applicable if the certification flight evaluation showed that an unsafe takeoff condition would result if lift devices or longitudinal trim devices are set to any position outside the approved takeoff range. If the evaluation shows that no unsafe condition would result at any setting of these devices, a takeoff warning system would not be required. For those airplanes on which a warning system must be installed, the proposal would provide requirements for the installation of the system.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.723 Shock Absorption Tests

To correct a grammatical error in the rules, paragraph (b) of this section would be revised by changing the word "reserved" in the phrase "reserved energy absorption capacity" to "reserve."

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.729 Landing Gear Extension and Retraction System

This proposal would revise § 23.729(e) to clarify that a landing gear indicator is required for each gear. This proposal would also add a new § 23.729(g) requiring that if the landing gear bay is used as the location for equipment other than landing gear, that equipment must be designed to minimize damage from items such as a tire burst, or rocks, water, and slush that may enter the landing gear bay.

One comment was received on this section, which suggested that the current requirements do not properly include a standard for amphibious operation. The comment specifically identified the warning horn or similar aural device as confusing and a source of pilot error during operations of an amphibian airplane. The commenter provided a suggestion for a landing gear position indicator on an amphibian airplane that would assist in clarifying this confusion.

Although this comment has merit, the proposed rule did not consider such a requirement, and no action has been taken to include the suggested landing gear position indicator for amphibian airplanes in this final rule. This comment will be retained and the suggestion for an amphibian landing gear indicator will be presented at a future harmonization meeting for specialist consideration and possible future inclusion in part 23/JAR 23.

Although not proposed in the notice, the text of paragraph (g) has been revised to identify sources of equipment damage that should be considered in the application of this requirement.

Section 23.729 is adopted with the above changes.

Section 23.735 Brakes

Section 23.735(a) would be revised to state clearly that wheel brakes must be provided. A proposed new § 23.735(c) would require the brake system to be designed so that the brake manufacturer's specified brake pressures are not exceeded during the landing distance determined in accordance with § 23.75. Proposed new § 23.735(e), applicable to commuter category airplanes, would require establishing the minimum rejected takeoff brake kinetic energy capacity rating of each main wheel brake assembly.

One comment was received on the proposal for § 23.735(e), which noted that the factor, "0.0443" is not defined for the kinetic energy formula. The commenter recommends that V be stated in units such as, feet-per-second (or mph, or knots, as required). The commenter notes that the recommended clarification should reduce possible future misunderstanding and confusion, as well as improper brake capacity calculations.

The FAA agrees. The units for "V" in the definition of the kinetic energy formula were inadvertently omitted from the proposal for this section. To correct this omission, the definition is being revised to read: "V=Ground speed, in knots, associated with the maximum value of V_1 selected in accordance with § 23.51(c)(1)."

The proposal is adopted with the above change.

Section 23.745 Nose/Tail Wheel Steering

Proposed new § 23.745 would provide requirements that apply if nose/tail wheel steering is installed.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.775 Windshields and Windows

Section 23.775(a) would be revised to allow internal glass panels of windshields and windows to be constructed of nonsplintering material, as well as nonsplintering glass. Section 23.775(c) would be revised to clarify that the requirement of this section applies to pressurized airplanes if certification for operation up to and including 25,000 feet is requested.

Section 23.775(h), introductory text, and paragraph (h)(1) would be added to require windshield panes of commuter category airplanes that are directly in front of the pilots to withstand the impact of a two-pound bird strike. This requirement is based on a Joint Aviation Authority recommendation to add windshield bird strike protection for commuter category airplanes.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.783 Doors

Proposed paragraph (b) would add a requirement that passenger doors must not be located near any propeller disk or any other potential hazard that could endanger persons using the door. The propeller disk remains the prominent hazard but other items, such as hot deicer surfaces or sharp objects on the airplane structure, are also hazards.

Proposed new paragraph (g) would require lavatory doors, if installed, that would not trap occupants inside a closed and locked lavatory compartment.

No comments were received on the changes proposed for this section, and they are adopted as proposed.

Section 23.785 Seats, Berths, Litters, Safety Belts, and Shoulder Harnesses

Seat requirements of part 23 would be clarified by moving the seat provisions from current § 23.1307(a), which requires a seat or berth for each occupant, to the introductory text of § 23.785. The notice proposed to reference the requirements of § 23.1413, for a metal-to-metal latching device for seat belts and shoulder harnesses, in § 23.785(b). These proposed changes were intended to combine related seat requirements in one section. The JAA and CAA comments note that the phrase "with metal-to-metal latching device" is also reflected in § 23.1413, but with different applicability.

The FAA agrees. The proposed changes to this section were made to clarify the seat requirements by including, or referencing, all of the seat requirements in one section. The notice proposal to add the phrase "with metal-to-metal latching devices as required by § 23.1413" to paragraph (b) would provide this clarification for normal, utility, or acrobatic category airplanes. However, because this paragraph is not applicable to all categories of airplanes, this change, along with the retention of § 23.1413 could be confusing.

To accomplish the originally intended clarification of the seat requirements, and to correct the applicability differences noted by the commenters, § 23.1413 is being removed and the phrase, "with metal-to-metal latching device" is being added to §§ 23.785(b) and 23.785(c). Also, to make § 23.785(c) clearer, it has been divided into two sentences.

Section 23.785 is amended by adopting the introductory text and the revision of paragraphs (b) and (c) as identified above.

Section 23.787 Baggage and Cargo Compartments

Section 23.787 would be revised by extending the present requirements for cargo compartments to baggage compartments. As proposed, future baggage compartments on all airplane categories would be required to: be placarded for their maximum weight capacity; have a means to prevent the baggage from shifting; and have a means to protect controls, wiring, lines, and equipment or accessories that are located in the compartment and whose damage or failure would affect safe operation of the airplane. This revision would result in the commuter category requirements of § 23.787(g) being redundant, and that requirement is being removed.

Proposed revisions to this section would also move the requirements of paragraphs (d) and (f) to a proposed new § 23.855, which would address cargo and baggage compartment fire protection. Proposed new paragraph (c) of this section would require flight crew emergency exits on airplanes that are used only for the carriage of cargo to meet the requirements of § 23.807.

No comments were received on the proposal for this section, and they are adopted as proposed.

Section 23.791 Passenger Information Signs

This proposed new section would require at least one illuminated sign to notify passengers when seat belts should be fastened on those airplanes in whit the flightcrew members cannot observe the other occupants' seats or where the flightcrew members' compartment is separated from the passenger compartment. One comment was received on this proposal, which noted the JAA's support of the proposal to require all airplanes, where the flightcrew members cannot observe the passenger seats, to be equipped with a "fasten seat belt" sign. The JAA also identified its intent to take NPA action to propose the same requirement.

Section 23.791 is adopted as proposed.

Section 23.807 Emergency Exits

Proposed new § 23.807(a)(4) would provide the same protection from any propeller disk and other potential hazard for a person who uses emergency exits as that provided by proposed § 23.783(b) for a person who uses a passenger door.

The proposed revision of § 23.807(b) would provide that the inside handles of emergency exits that open outward must be designed so that the emergency exit is protected against inadvertent operation.

The proposed revisions to § 23.807(b)(5) and new § 23.807(b)(6) would apply to acrobatic and utility category airplanes that are approved for maneuvers, such as spinning. The proposed rule would require that emergency exits for these category airplanes allow the occupants to abandon the airplane at certain speeds related to such maneuvers.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.841 Pressurized Cabins

The proposed revision to § 23.841(a) would extend the cabin pressure requirements of current paragraph (a), which now apply to airplanes certificated for operation above 31,000 feet, to airplanes certificated for operation over 25,000 feet.

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

Section 23.853 Passenger and Crew Compartment Interiors

This proposal would revise the section heading from "Compartment interiors" to "Passenger and crew compartment interiors" to clarify the content of the section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.855 Cargo and Baggage Compartment Fire Protection

This proposed new section would require the following:

Proposed paragraph (a) would require all sources of heat that are capable of igniting the contents of each cargo and baggage compartment to be shielded and insulated to prevent such ignition.

Proposed paragraph (b) would require cargo and baggage compartments to be constructed of materials that meet the appropriate provisions of § 23.853(d)(3). Currently these requirements apply to commuter category airplanes and to the materials used in the compartments of these airplanes. The proposed new requirement would expand this applicability to the cargo and baggage compartments of all part 23 airplanes. In effect, the proposed new requirement would require materials that are self-extinguishing rather than flame resistant as currently required under § 23.787(d).

Proposed new paragraph (c) would add new fire protection requirements for cargo and baggage compartments for commuter category airplanes. The proposed rule would require one of the following alternatives: (1) Either the compartment must be located where pilots seated at their duty station would easily discover the fire or the compartment must be equipped with a smoke or fire detector system to provide a warning at the pilot's station. Access to the compartment with a fire extinguisher must also be provided; (2) If the cargo or baggage compartment is inaccessible to the flightcrew, it must be equipped with a fire detector system that provides a warning at the pilot's station, and the compartment must have ceiling and sidewall floor panels constructed of materials that have been subjected to and meet the vertical self-extinguishing tests of appendix F of part 23; (3) The Compartment must be constructed and sealed to contain any fire.

Two comments were received on this proposal. The JAA and the CAA comment that proposed paragraph (b) would extend the self-extinguishing standards of § 23.853(d)(3) to the baggage and cargo compartments of all airplanes. JAR 23.855 requires this self-extinguishing standard for commuter category only. The commenters noted that the proposed applicability of this standard to all airplanes has not been agreed to for JAR 23.

There were no objections to the proposal or suggestions for changes, and § 23.855 is adopted as proposed.

Section 23.867 Electrical Bonding and Protection Against Lightning and Static Electricity

This proposed revision would change the heading that precedes § 23.867 from "Lightning Evaluation" to "Electrical Bonding and Lightning Protection." It would also revise the section heading from "Lightning protection of structures" to "Electrical bonding and protection against lightning and static electricity." The proposed revisions more accurately clarify the content of the section.

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

Section 23.1303 Flight and Navigation Instruments

The introductory text of § 23.1303 would be revised to clarify that the section contains the minimum required instruments. Also, § 23.1303(d) would add a requirement for those airplanes whose performance must be based on weight, altitude, and temperature to be equipped with a free air temperature indicator. A new sentence added to § 23.1303(e)(2) would state that nuisance overspeed warnings should not occur at lower speeds where pilots might ignore the warning. A new paragraph (f) would propose requirements for attitude instruments that include a means for flightcrew members to adjust the relative position of the attitude reference symbol and the horizon line. Finally, a new paragraph (g) would be added to identify certain specific instruments required for a commuter category airplane.

Two comments were received, which note that the additional instruments proposed for commuter category airplanes are not included in JAR 23. The JAA and the CAA also note that consideration of this proposal is being deferred by the JAA pending the publication of JAR-OPS and a review of the proposal by JAA specialists. (JAR-OPS are the JAR operations requirements issued by JAA.)

The requirement for §23.1303 is adopted as proposed.

Section 23.1307 Miscellaneous Equipment

This proposal would remove § 23.1307(a); these requirements are being added to § 23.785. The discussion of § 23.785 above addresses this change.

Also, the provisions of § 23.1307(b) are being removed from § 23.1307 as proposed. These requirements are stated in §§ 23.1361, 23.1351, and 23.1357, respectively, and are being removed to prevent confusion. The designation of paragraph (c) would be removed since it would no longer be necessary.

Two comments were received on this proposal. In these comments, the JAA and the CAA note that paragraph (c), adopted by Amendment 24–43, is pending a review by the JAA specialist for JAR 23.

The proposal is adopted as proposed.

Section 23.1309 Equipment, Systems, and Installation

Proposed new § 23.1309(a)(4) would correct an omission that occurred when the FAA issued Amendment No. 23–41 (55 FR 43306, October 26, 1990). To correct this oversight, and to continue the single fault provision of this paragraph, § 23.1309(a)(4) was proposed.

Two comments were received on this proposal. The JAA and the CAA note that, although the proposal for § 23.1309(a)(4) is not included in JAR 23, they support it, and will be considered for adoption in JAR 23.

Section 23.1309(a)(4) is adopted as proposed.

Section 23.1311 Electronic Display Instrument Systems

This proposal would revise § 23.1311 to remove redundant requirements and to clarify which secondary instruments are required and the visibility requirements for these instruments.

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

Section 23.1321 Arrangement and Visibility

The proposed revision to § 23.1321(d) would remove the wording that limits the instrument location to airplanes certificated for flight under instrument flight rules or airplanes weighing more than 6,000 pounds. Instruments are for the pilot and should be located near that pilot's vertical plane of vision without regard to what flight rules are approved for the airplane's operation or the maximum weight of the airplane.

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

Section 23.1323 Airspeed Indicating System

The proposed new § 23.1323(c) would add a requirement that each airspeed indicating system design and installation should provide positive drainage of moisture from the system.

To better organize the requirements that are applicable to the airspeed systems on all part 23 airplane categories and those that would be additional requirements for the airspeed systems of commuter category airplanes, the FAA proposed to redesignate existing paragraphs (c) and (e), respectively, as paragraphs (e) and (d). By this redesignation, paragraphs (a), (b), (c), and (d) would apply to all airplanes, and paragraphs (e) and (f) would include additional requirements applicable to commuter category airplanes.

The proposal for redesignated paragraph (e) would also remove the words "in flight and" from the first sentence of that paragraph. Proposed new § 23.1323(f) would provide that, on those commuter airplanes where duplicate airspeed indicators are required, the airspeed pitot tubes must be located far enough apart so that both tubes would not be damaged by a single bird strike.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1325 Static Pressure System

Current § 23.1325(g) exempts from the requirements of § 23.1325(b)(3) airplanes that are prohibited from flight in instrument meteorological conditions in accordance with § 23.1559(b). The notice proposed to revise § 23.1325(g) by adding airplanes that are prohibited from flight in icing conditions to the airplanes that are currently exempted from the requirements of § 23.1325(b)(3).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1326 Pitot Heat Indication Systems

Proposed new § 23.1326 would require the installation of a pitot tube heat indicating system on those airplanes required to be equipped with a heated pitot tube.

The comments received from the JAA and the CAA show that this existing requirement in JAR 23 is applicable to commuter category airplanes only. They state that the FAA proposal would be applicable to all airplanes and would result in a continuous indication of pitot heat non-selection in every case. The JAA and the CAA do not support the applicability of this section to all airplanes.

The FAA does not agree that the proposal would be applicable to all airplanes. The proposal would apply only to these airplanes that are required, by § 23.1323(d), to be equipped with a heated pitot tube. By this applicability, airplanes that are approved for instrument flight, or for flight in icing conditions, would be required to be equipped with a heated pitot tube and a heated pitot tube indicator. These are the flight conditions where the pilot needs to be alerted if the pitot heat has not been turned on or if the heater fails. By this applicability, an airplane owner who has installed a heated pitot tube as optional equipment may continue to operate the airplane without a heated pitot tube indicator.

The preamble of the NPRM discusses the safety benefits that would be provided by this change.

The proposal is adopted as proposed.

Section 23.1329 Automatic Pilot System

Section 23.1329(b), as adopted by Amendment No. 23–24 (58 FR 18958, April 9, 1993), does not state clearly that stick controlled airplanes must be equipped with the same autopilot quick release controls that are required for airplanes with control wheels. The proposed revision of § 23.1329(b) would make it clear that a quick release control must be installed on each control stick of an airplane that can be operated from either pilot seat.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1337 Powerplant Instruments Installation

This proposal would revise the heading of this section to accurately reflect the powerplant instrument installation requirements that it contains. The difference between this section and § 23.1305 is clarified by this change.

Section 23.1337(b) would be revised by removing the wording that authorizes installation of only those fuel indicators marked in gallons and pounds. Section 23.1337(b) would also be revised by adding the word "usable" to the first sentence of this section. Proposed new § 23.1337(b)(4) would require a "means to indicate" the amount of usable fuel in each tank when the airplane is on the ground.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1351 General

The proposal would revise current § 23.1351 by removing portions of paragraphs (b)(2) and (b)(3) and by removing paragraph (b)(4). The requirements proposed for removal are applicable to alternators that depend upon the battery for initial excitation or for stabilization.

Revised § 23.1351(c)(3) would require an automatic means for reverse current protection.

Section 23.1351(f) would be revised by adding a provision that would require the ground power receptacle to be located where its use will not result in a hazard to the airplane or to people on the ground using the receptacle.

No comments were received on the proposals. The proposals are adopted as proposed, except that paragraph (c)(3) has been revised to clarify that protection for any generator/alternator and the airplane electrical system must be provided.

Section 23.1353 Storage Battery Design and Installation

Proposed new § 23.1353(h) would require that, in the event of a complete loss of the primary electrical power generating system, airplane battery capacity must be sufficient to supply at least 30 minutes of electrical power to those loads essential to the continued safe flight and landing of the airplane.

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

Section 23.1359 Electrical System Fire Protection

Proposed new § 23.1359 would require smoke and fire protection for electrical system installations. Proposed § 23.1359(a) would state that electrical systems must meet the applicable requirements of §§ 23.863 and 23.1182.

Proposed § 23.1359(b) would require that the electrical systems components installed in designated fire zones and used during emergency procedures be fire resistant. This provision is needed to clarify the requirements for electrical system components that may be installed in the designated fire zones identified in § 23.1181.

Finally, § 23.1359(c) would provide burn criteria for electrical wire and cables. A revision to appendix F of part 23 that would add appropriate wire testing criteria was also included in this proposal.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.1361 Master Switch Arrangementt

To harmonize with the JAR this proposal would revise § 23.1361(c) by making an editorial change to remove the last two words of the paragraph that read "in flight." This change will not alter the meaning of the requirement.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1365 Electrical Cables and Equipment

This proposal would revise § 23.1365(b) and would add three new paragraphs.

Section 23.1365(b) would be revised in relation to proposed new § 23.1359(c), which would require self-extinguishing insulated electrical wires and cables. The proposed revisions to § 23.1365(b) would remove the reference to electrical cables from the flame resistance requirement since the cables would be required to have self-extinguishing insulation under § 23.1359(c). The proposed revision retains the requirement for electrical cables and associated equipment to not emit dangerous quantities of toxic fumes when they overheat. The phrase "at least flame resistant" in § 23.1365(b) would also be revised by removing the words "at least."

The three paragraphs that would be added by this proposal would require: (1) The identification of electrical cables, terminals, and connectors; (2) the protection of electrical cables from damage by external sources; and (3) installation criteria for cables that cannot be protected by a circuit protection device.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.1383 Taxi and Landing Lights

The landing light requirements of § 23.1383 would be revised by adding taxi lights to this section.

Current § 23.1383(a), which requires the lights to be acceptable, would be deleted because it is unnecessary to state this. The paragraphs would be redesignated accordingly.

Current § 23.1383(b)(3) requires that a landing light must be installed to provide enough light for a night landing. Proposed § 23.1383(c) would revise "night landing" to "night operation" since the requirements would also cover taxiing and parking. Proposed new paragraph (d) would require the lights to be installed so that they do not cause a fire hazard.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1401 Anticollision Light System

This proposal would revise § 23.1401 to require the installation of an anticollision light system on all part 23 airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1413 Safety Belts and Harnesses

The proposals in the notice did not include a revision that would remove this section. However, comments received on the notice proposal for § 23.785 showed that the proposed change, along with the retention of this section could be confusing and, thereby, not accomplish the FAA's intent to clarify the seat requirement.

Section 23.1413 is being removed, and the phrase "with metal-to-metal latching device" is being added to §§ 23.785(b) and 23.785(c) to accomplish the intended clarification identified in this notice. This change will not add a substantive requirement.

Section 23.1431 Electronic Equipment

This proposal would add three new paragraphs to § 23.1431. Proposed new paragraph (c) would provide that airplanes required to be operated by more than one flightcrew member be evaluated to determine if the flightcrew members can converse without difficulty when they are seated at their duty stations. Proposed new paragraph (d) would require installed communication equipment to use "off-on" transmitter switching that will ensure that the transmitter is turned off when it is not being used. Proposed new paragraph (e) would require that, if provisions for communication headsets are provided, the applicant must demonstrate that flightcrew members will receive all warnings when a headset is being used. The demonstration must be made under actual cockpit noise conditions.

The Air Line Pilots Association (ALPA) submitted the only comment on this proposal. ALPA expressed concern over the cockpit noise conditions that would be used in the determination of compliance with proposed paragraphs (c) and (e).

This notice preamble identified an earlier harmonization consideration to include text in JAR 23 and this proposal that would have required compliance under actual cockpit noise conditions. The preamble explained that this text was not included because it may be misinterpreted and result in demonstrations being conducted under more severe noise conditions than are needed. ALPA understood this explanation to mean that the FAA had made a determination that compliance demonstrations should not be conducted under the actual cockpit noise conditions that exist when the airplane is being operated. ALPA recommends that the FAA re-evaluate its position.

The FAA has reviewed the record of earlier harmonization discussions where the concerns about noise conditions were first considered. During these discussions, which included industry representatives, it was decided that any requirement for testing under noise conditions could be interpreted to require testing under conditions that were more severe than needed. Accordingly, it was decided that such text should not be included in either JAR or part 23. The FAA agreed with the position reached in these discussions; therefore, these proposals did not include any requirements for testing under noise conditions, and the explanation was placed in the notice to identify why such requirements were not included.

Earlier harmonization and this comment make it clear that the proposals, with or without the requirements for testing under noise conditions, may be misinterpreted. ALPA's interpretation that the FAA had determined that the demonstrations of compliance with these requirements should not be conducted under actual cockpit noise conditions, is not correct. The test for compliance with the requirements should be done under the actual noise conditions.

To clarify the conditions under which these evaluations should be conducted, not withstanding earlier harmonization agreements, these two paragraphs are being revised to include the phrase, "under actual cockpit noise conditions when the airplane is being operated."

The proposals for § 23.1431 are adopted with the above-identified revision of paragraphs (c) and (e).

Section 23.1435 Hydraulic Systems

Since the adoption of Amendment No. 23–43 (58 FR 18958, April 9, 1993), the FAA has received questions about the installation of hydraulic accumulators that are permitted by § 23.1435(c). These questions have shown that applicants find § 23.1435(c) difficult to understand. The notice proposed a revision of § 23.1435(c) to clarify the type and size of a hydraulic accumulator or reservoir that may be installed on the engine side of any firewall.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1447 Equipment Standards for Oxygen Dispensing Units

If radio equipment is installed, proposed new § 23.1447(a)(4) would require that flightcrew oxygen dispensing units be designed to allow the use of communication equipment when oxygen is being used.

Revisions to § 23.1447(d) would require the flightcrew oxygen dispensing units to either be the quick donning type or be automatically presented before the cabin pressure altitude exceeds 15,000 feet, if the airplane is certificated for operation above 25,000 feet. The passenger oxygen requirements of former paragraph (e) and (e)(1) have not been revised, but are now contained in new paragraph (e). Proposed paragraph (d) would be revised to provide the flightcrew and the airplane passengers the same level of safety as required by other airworthiness standards (14 CFR part 25). This proposed revision is also consistent with the proposed revision of § 23.841.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1451 Fire Protection for Oxygen Equipment

This proposed new section would specify fire protection for oxygen equipment installations. Section 23.1451(a) and (b) would, respectively, prohibit the installation of oxygen equipment in designated fire zones and require that oxygen system components be protected from the heat from designated fire zones. Proposed § 23.1451(c) would require oxygen equipment and lines to be installed so that escaping oxygen cannot come in contact with grease, fluids, or vapors that may be present.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1453 Protection of Oxygen Equipment From Rupture

Proposed new § 23.1453 would clarify the rupture protection needed for oxygen system installation. Rupture protection for oxygen systems is currently required by the application of the structure load requirements of part 23. The addition of § 23.1453(a) would clarify the application of these load requirements and would identify the need to consider maximum temperatures and pressures that may be present. Section 23.1453(b) would identify the protection to be provided for high pressure oxygen sources and the pressure lines that connect such sources to the oxygen system shutoff valves.

The comments received on this proposal from the JAA and the CAA noted that the word "high" in paragraph (b) could lead to confusion and require interpretation. Accordingly, they suggested that the words "High pressure oxygen sources" be revised to read as follows: "Oxygen pressure sources." This is the same text that is used in JAR 23.

The FAA agrees with the suggested wording change. When the proposal was originally drafted, the FAA was considering the oxygen source side of the oxygen regulator, the high pressure side, and the passenger dispensing side of the regulator, the low pressure side; thus, the word "high" was used.

The suggested change will not alter the requirement's applicability and will be more clearly understood. It is also noted that the suggested text change will more closely align with the same requirement in § 25.1453. Section 23.1453 is changed by revising the first four words of proposed paragraph (b) to read, "Oxygen pressure sources."

This section is adopted with the above change.

Section 23.1461 Equipment Containing High Energy Rotors

This proposal would revise paragraph (a) of this section to clarify that the requirements apply to high energy rotors included in an auxiliary power unit (APU).

One comment was received on this proposal. The JAA and the CAA noted that the JAA does not agree that the requirements of this section are applicable to APU's. They suggest that the proposed changes to paragraph (a) not be adopted.

In the preamble of the notice, the FAA identified policy issued after this section was adopted. That policy indicated that the section was applicable to "equipment such as APU's and constant speed drives," but this policy was not widely distributed to all FAA offices. The proposal in the notice does not alter the policy applicability, but it does clarify the policy.

Removing the proposed change would not alter the situation. The FAA defines "Equipment containing high energy rotors" to include APU's and constant speed drives. In cases where rotor containment has been demonstrated by complying with JAA-APU or FAA TSO C77a, this compliance will be examined by the FAA office responsible for the airplane certification. If it is found that this demonstration also meets the requirements of § 23.1461, it will be accepted for the airplane's compliance.

The proposal for § 23.1461 is adopted as proposed.

Appendix F to Part 23—Test Procedure

This proposal would revise appendix F to provide the procedures needed to test electrical wire to ensure that the wire meets the burn requirements of § 23.1359. It would also add procedures for meeting the 45 degree and 60 degree angle burn test requirement proposed in §§ 23.855(c)(2) and 23.1359(c), respectively. Paragraph (b) would clarify the specimen configuration to be used in the proposed testing procedures.

No comments were received on the proposals, and they are adopted as proposed.

Section 91.205 Powered Civil Aircraft With Standard Category U.S. Airworthiness Certificates: Instrument and Equipment Requirements

Proposed new § 91.205(b)(11) would require that airplanes certificated under § 23.1401 be equipped with an anticollision light system for day visual flight rule (VFR) operations. Day VFR operations are discussed under § 23.1401 of the notice.

No comments were received on the proposed addition to this section, and that addition is adopted as proposed.

Section 91.209 Aircraft Lights

Proposed new § 91.209(b) would require that airplanes equipped with an anticollision light system be operated with the anticollision light system lighted during all types of operations, except when the pilot determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.

One commenter believes that the proposal is unacceptable to aircraft operators. This commenter contends that the midair collision statistics are purely conjectural and that any safety benefits are merely guesswork. The commenter also notes that this change would affect an aircraft's dispatch capability, and questions why an airplane that is perfectly capable of being flown should be grounded from daytime flight because something, such as a lamp, is defective.

The FAA agrees that there will be incidents where an airplane will be temporarily grounded from daylight operations until a failure in the light system can be repaired. However, the additional safety cue provided to pilots by operating anticollision light systems will outweigh the cost of maintaining the light system.

The proposed revision of § 91.209 is adopted as proposed.

Regulatory Evaluation, Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that Federal agencies promulgate new regulations or modify existing regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: (1) Will generate benefits exceeding its costs and is "significant" as defined in the Executive Order 12866; (2) is "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Regulatory Evaluation Summary

This section summarizes the costs and benefits of each provision of the final rule. Many of the provisions in the final rule will impose either no cost or a negligible cost. Such provisions are typically administrative, editorial, clarifying, relieving, or conforming in nature. In addition, the FAA holds that certain provisions have a potential safety benefit that can be achieved with no incremental cost, due primarily to the fact that this rule will apply to future certificated airplanes and retrofitting will not be required. All provisions of the final rule, including those with no or negligible costs, are summarized below. Only those provisions with non-negligible costs are further evaluated in the section that follows. It should be noted that the various cost impacts are not additive since the individual provisions often apply to different airplane types included under part 23. The reader is directed to the full regulatory evaluation in the docket for additional information.

Section	Incremental cost	Benefit
Section 23.677 Trim systems	Negligible	Safety.
Section 23.691 Artificial stall barrier system	None	Administrative.
Section 23.697 Wing flap controls	$480 per certification and $100 per airplane for affected airplanes.	Nominal safety and relief.
Section 23.701 Flap interconnection	None	Clarification.
Section 23.703 Takeoff warning system	$240 per certification for evaluation. Where necessary, $5,120 per certification, $1,000 per airplane and $100 per year.	Nominal safety and relief.
Section 23.723 Shock absorption tests	None	Editorial.
Section 23.729 Landing gear extension and retraction system.	¶ (e). None	Clarification.
	¶ (g). Negligible, general practice	Minor; general practice.
Section 23.735 Brakes	¶ (a). None	Editorial clarification.
	¶ (c). None	Administrative.
	¶ (e). $240 per certification	Minor safety.
Section 23.745 Nose/Tail wheel steering	None	Minor. Avoids special conditions.
Section 23.775 Windshields and windows	¶ (a). None	Relieving.
	¶ (c). None	Clarification.

Section	Incremental cost	Benefit
	¶ (h). Up to $350,000 per certification	Safety.
Section 23.783 Doors	¶ (b). None	Minor safety.
	¶ (g). $25 per airplane	Safety.
Section 23.785 Seats, births, litters, safety belts and shoulder harnesses.	None	Editorial organization.
Section 23.787 Baggage and cargo compartments.	¶ (a)$1 per airplane	Minor safety.
	¶ (b). $60 per certification and up to $100 per airplane.	Safety.
	¶ (c). None	Clarification.
Section 23.791 Passenger information signs	$60 per clarification, up to $200 per airplane, and a negligible effect on operating costs.	Safety.
Section 23.807 Emergency exists	¶ (a)(4). Expected negligible	Minor safety.
	¶ (b) and (b)(5). None	Clarification and editorial.
	¶ (b)(6). Where chosen, $10,000 per certification and $500 per airplane.	Safety.
Section 23.841 Pressurized cabins	$1,000 per certification and $2,000 per airplane.	Safety.
Section 23.853 Passenger and crew compartment interiors.	None	Editorial.
Section 23.855 Cargo and baggage compartment fire protection.	¶ (a). Less than $40 per airplane	Minor safety.
	¶ (b). Less than $200 per airplane	Safety.
	¶ (c). Potentially as high as $1,800 per certification, $4,550 per airplane, and $100 per year.	Safety.
Section 23.867 Electrical bonding and protection against lightning and static electricity.	None	Editorial.
Section 23.1303 Flight and navigation instruments.	Introduction. None	Clarification.
	¶ (d). Negligible	Safety.
	¶ (e)(2). None	Minor safety.
	¶ (f). None	Minor safety.
	¶ (g)(1). Up to $2,000 per airplane	Safety.
	¶ (g)(2). None	Minor safety.
	¶ (g)(3). Up to $3,600 per certification and $7,000 per airplane.	Safety.
Section 23.1307 Miscellaneous equipment	None	Editorial and conforming.
Section 23.1309 Equipment, systems, and installations.	None	Minor safety.
Section 23.1311 Electronic display instrument systems.	None	Clarifying, editorial, and relieving.
Section 23.1321 Arrangement and visibility	None	Minor safety.
Section 23.1323 Airspeed indicating system	None	Minor safety.
Section 23.1325 Static pressure system	None	Relieving.
Section 23.1326 Pitot heat indication system	$2,800 per certification, $1,600 per airplane	Safety.
Section 23.1329 Automatic pilot system	None	Clarifying.
Section 23.1337 Powerplant instruments installation.	Heading and ¶ (b). None	Clarifying, relieving.
	¶ (b)(4). Negligible	Safety.
Section 23.1351 General	¶ (b). None	Administrative.
	¶ (c)(3). None	Clarifying.
	¶ (f). None	Minor safety.
Section 23.1353 Storage battery design and installation.	Where necessary, up to $30 per five years capital, up to $10 per year operating, and $600 per certification.	Safety.
Section 23.1359 Electrical system fire protection.	¶ (a). None	Clarifying emphasis.
	¶ (b). Negligible	Clarifying.
	¶ (c). $240 per certification	Safety.
Section 23.1361 Master switch arrangement	None	Editorial.
Section 23.1365 Electrical cables and equipment.	¶ (b). None	Conforming editorial.
	¶ (d). $4,400 per certification and $100 per airplane.	Safety.
	¶ (e). None	Minor safety.
	¶ (f). Negligible	Minor safety.
Section 23.1383 Taxi and landing lights	None	Editorial update.
Section 23.1401 Anticollision light system	Where necessary, $2,400 per certification and $1,600 per airplane.	Safety.
Section 23.1431 Electronic equipment	¶ (c). Where necessary, up to $1,200 per certification and $1,600 per airplane.	Safety.
	¶ (d). Negligible. Included above	Minor safety.
	¶ (e). None or negligible	Safety.

Section	Incremental cost	Benefit
Section 23.1435 Hydraulic systems	None	Clarifying.
Section 23.1447 Equipment standards for oxygen dispensing units.	¶ (a)(4). Up to $2,000 per airplane	Safety.
	¶'s (d) and (e). None	Minor safety.
Section 23.1451 Fire protection for oxygen equipment.	None	Safety.
Section 23.1453 Protection of oxygen equipment from rupture.	$960 per certification	Safety.
Section 23.1461 Equipment containing high energy rotors.	None	Clarifying.
Appendix F to Part 23—Test Procedure	None. Considered above	Minor safety.
Section 91.205 Powered civil aircraft with standard category U.S. airworthiness certificates: Instrument and equipment requirements.	None	Safety, considered above.
Section 91.209 Aircraft lights	$25 per year per airplane	Safety, considered above.

Evaluation of Provisions With Non-Negligible Projected Costs

This section describes and evaluates those provisions of the rule that are expected to impose costs that are not negligible.

Section 23.697 Wing Flap Controls

New § 23.697(c) provides safety standards for the wing flap control lever installed in airplanes that use wing flap settings other than fully retracted when showing compliance with § 23.145. The FAA estimates that an aerospace engineer could design the flap control lever to meet the requirement in 8 hours at a burdened rate of $60 per hour, totalling $480 per certification. The control lever itself would impose an incremental cost, including installation, of approximately $100 per airplane.

The nominal benefits of this provision will derive from the increased safety afforded the pilot in positively selecting the proper flap setting to maintain longitudinal control. In fact, if a flap position other than fully retracted were needed to maintain longitudinal control: (1) That position would be necessary to prevent an unsafe condition, (2) the airplane would not be certificated under that design, and (3) the airplane would have to be redesigned so that intermediate flap positions would not be needed for control. Paragraph (c) will allow the identification of an intermediate flap position and the positive means of selecting that position. This alternative would rectify the unsafe condition without requiring the manufacturer to redesign the airplane.

Section 23.703 Takeoff Warning System

This new section requires that a takeoff warning system on some commuter category airplanes. The requirement will apply if a flight evaluation shows that an unsafe takeoff condition would result when lift devices on longitudinal trim devices are set to any position outside the approved takeoff range. If the evaluation shows that no unsafe condition could result at any setting of these devices, a takeoff warning system will not be required. For those airplanes on which a warning system must be installed, the rule will provide requirements for the installation of the system.

The FAA estimates that an evaluation to determine whether a takeoff warning system is needed will cost $240 (4 hours of engineering at a burdened rate of $60 per hour). Where needed, the integration design of a warning system will cost $2,400 (40 hours at $60 per hour). In addition, an incremental 4 hours of flight testing at a cost of $2,720 ($500 per hour for two test pilots and $180 per hour for fuel) will be needed to demonstrate the system's performance. The FAA estimates that the system, including acquisition, wiring, micro switches, and labor, will add approximately $1,000 to the cost of each airplane required to have one. Maintenance of such a system will cost approximately $100 per year.

The nominal benefit of this provision derive from the increased safety provided by the takeoff warning system that would activate whenever lift or longitudinal trim devices are not set within their approved takeoff ranges. If an evaluation showed that positions of the lift or longitudinal trim devices could create an unsafe condition on takeoff, the manufacturer is required, under existing regulations, to redesign the devices so that the unsafe positions could not be obtained. The new section will provide relief by allowing the applicant to install a warning system rather than redesigning the trim device(s).

Section 23.735 Brakes

New § 23.735(e), applicable to commuter category airplanes, requires establishing the minimum rejected takeoff brake kinetic energy capacity rating of each main wheel brake assembly. Based on the operating experience of airplanes used in passenger-carrying operations, existing § 23.45 requires the determination of the accelerate-stop distance for commuter category airplanes. New § 23.735 is needed to ensure that the brakes will perform safely under accelerate-stop conditions.

Under the final rule, manufacturers of commuter airplanes may determine the kinetic energy absorption requirements either through a conservation, rational analysis of the sequence of events expected during a rejected takeoff, or by using the formula in new § 23.735(e)(2). The FAA estimates that the determination will cost $240, based on four hours of engineering at a burdened rate of $60 per hour. The potential benefits of the requirement derive from the added safety that will be provided by establishing beforehand the minimum necessity kinetic energy capacity rating of each main wheel brake assembly under rejected takeoff conditions.

Section 23.775 Windshields and Windows

Introductory text and paragraph (h)(1) are added to require that commuter category windshield panes that are directly in front of the pilots be able to withstand the impact of a two pound bird at maximum approach flap speed. By requiring full protection against the strike of a two-pound bird at approach speed, additional protection will also be provided if the airplane strikes a larger bird or strikes a bird at a higher speed.

New § 23.775(h)(2) further requires the panels of the windshield to be so arranged that, if one is damaged, other panels will remain to provide visibility for continuous safe flight and landing.

The potential cost of § 23.775(h) will vary depending on circumstances of the affected manufacturer. Industry sources estimate that the total nonrecurring cost per certification will range from $250,000 to $350,000, consisting of: (1) Up to $200,000 for a bird strike test article ("bird gun") if the manufacturer does not have one; and (2) up to $150,000 of time and materials cost for the actual testing.

A manufacturer that has a bird strike test article will not incur additional capital test costs. Most manufacturers will incur up to $150,000 in time and materials costs for the actual testing, but even these costs could be mitigated by the existing need of most manufacturers to perform such tests for export sales to JAA member countries.

Industry sources estimate that there will be no identifiable increment in design or tooling costs since the windshield is an integral part of the initial design. Similarly, little or no recurring costs per airplane (incremental materials, installation, or weight) are projected since it is reasonable to assume that the pressure load, as compared to bird strike resistance, will be the controlling factor in windshield design strength.

The benefit of the revision is the incremental protection against bird strikes that would be afforded to commuter category airplanes. The FAA has reviewed International Civil Aviation Organization (ICAO) data on bird strikes that occurred on member country airplanes weighing 19,000 or fewer pounds from 1981 through 1989. These data shows that approximately 550 strikes occurred and that one out of seven hits the windshield. The data show that:

1. Almost 52 percent of the strikes occurred at altitudes of less than 100 feet, and 26.7 percent occurred between 101 and 1000 feet.
2. Eighty-five percent of the strikes occurred at airspeeds of 150 knots or less.
3. Where bird types were reported, 27.6 percent of strikes involved small birds and 58.6 involved medium size birds (2 pounds or less).
4. Incidents where the airplane was damaged showed that 16.9 percent resulted from small bird strikes and 64 percent resulted from medium size bird strikes.

These data show that most bird strikes occur at takeoff and landing airspeeds, and that birds weighing two pounds or less are struck most often. The standards of the final rule are based on these statistics. Few fatalities and injuries resulted from the bird strikes reported in the ICAO data. Similarly, a review of NTSB accident records between 1982 and 1992 revealed no U.S. accidents resulting from bird strikes to the windshields of commuter category airplanes. As a result, the FAA cannot justify this provision solely on the basis of historical accidents. Instead, the standards are based on the expert recommendations of the ARAC. It is also noted that this standard will be applied to JAA certifications and that U.S. manufacturers wishing to export to JAA countries will be required to meet the standard.

Section 23.783 Doors

New paragraph (g) requires that the locks on lavatory doors, if installed, be designed so that they will not trap occupants. Lavatory door locks used in transport category airplanes (see § 25.783) meet the requirements of this rule. The FAA estimates that the incremental cost of this provision would be no more than $25 per lock. The rule will reduce the likelihood that occupants would be trapped in a locked lavatory, both in emergency and non-emergency situations.

Section 23.787 Baggage and Cargo Compartments

The final rule extends to normal, utility, and acrobatic airplanes the existing commuter requirement to prevent baggage from hazardous shifting. The FAA estimates that an aerospace engineer can analyze the subject loads that would need to be constrained in 1 hour, at a burdened cost of $60 per hour. Tiedowns will cost approximately $50 per baggage compartment, or no more than $100 per airplane. These additional costs apply to normal, utility, and acrobatic airplanes since commuter category airplanes are already subject to the requirement under the existing rule.

The potential benefits of the provision include the reduced likelihood: (1) That baggage compartments would be overloaded, (2) that stowed baggage would shift dangerously, and (3) that essential co-located equipment or wiring would be damaged.

Section 23.791 Passenger Information Signs

This new section requires at least one illuminated sign notifying all passengers when seat belts should be fastened. The requirement will apply only to airplanes where flightcrew members cannot observe occupant seats or where the flightcrew compartment is separated from the passenger compartment. The signs will have to be legible to all seated passengers and to be operable from a crewmember station.

The FAA estimates that an aerospace engineer could design the required sign in 1 hour, at a burdened rate of $60 per hour. The sign would cost approximately $200 per airplane, including parts and installation. Maintenance costs for bulb replacement will be negligible. The weight penalty associated with the light system would also be minor (no more than 2 pounds).

The safety benefits of the change will derive from the increased likelihood that passengers will know when their seat belts should be fastened.

Section 23.807 Emergency Exits

New § 23.807(a)(4) provides the same hazard protection for a person using an emergency exit as that provided by revised § 23.783(b) for a person who uses a passenger door. Emergency exits will not be allowed to be located with respect to a propeller disk or any other hazard in a manner that will endanger persons using that exit.

The FAA holds that no incremental cost will be incurred to meet the standards of the provision for newly certificated airplanes. No comments to the NPRM were received on the potential costs and methods of compliance that manufacturers would choose to comply with this requirement.

Section 23.807(b)(5) revises the current egress requirements for acrobatic airplanes. Section 23.807(b)(6) establishes similar egress standards for utility category airplanes that are certificated for spinning. Industry sources estimate that an aerobatic, quick-release door will cost an incremental $10,000 in engineering design per affected airplane model and an additional $500 per production airplane. Little or no additional weight is expected. These costs will apply only in cases where the manufacturer determines that the marketplace return of a combination type certificate would outweigh the additional costs of design and production.

Section 23.841 Pressurized Cabins

The revision to § 23.841(a) extends the cabin pressure requirements of current paragraph (a), which apply to airplanes certificated for operation above 31,000 feet, to airplanes certificated for operation above 25,000 feet. Current part 25, JAR 25, and proposed JAR 23 include the same requirement. This revision is intended to protect airplane occupants if a malfunction occurs at altitudes where symptoms of hypoxia occur, usually above 25,000 feet.

For airplanes that will be certificated for maximum altitude operation between 25,000 feet and 31,000 feet, the provision requires two additional pressure altitude regulators and associated plumbing. Industry sources estimate that the requirement will cost an incremental $1,000 in engineering design per affected airplane model and $2,000 per production airplane. Any additional weight will be negligible.

The benefits of the proposal derive from the incremental protection against hypoxia afforded to occupants of airplanes certificated for maximum altitudes between 25,000 and 31,000 feet. Due to the increasing use of turbine engines, more part 23 airplanes are likely to be approved for operation above 25,000 feet. In the absence of this rule, an increasing number of occupants would be exposed to the potential for harm in the event of a failure or malfunction of the pressure system on these airplanes.

Section 23.855 Cargo and Baggage Compartment Fire Protection

Paragraph (a) requires all sources of heat within each cargo and baggage compartment that are capable of igniting the compartment contents to be shielded and insulated to prevent such ignition. Existing § 23.787(f) requires that cargo compartment lamps be installed so as to prevent contact between the lamp bulb and cargo. The final rule will clarify and extend this provision to include all sources of heat for baggage as well as cargo compartments.

Lights and (rarely) heaters for pets are typically the only sources of heat located in a baggage or cargo compartment. A wire cage, costing no more than $20, around the heat source would meet these requirements. The FAA estimates that the total cost of compliance per airplane will be no more than $40 in those rare cases where such protection would not have been provided anyway. The benefit of the proposed provision is a reduction in the possibility of fire caused by the ignition of compartment contents by lights or heaters.

Paragraph (b) requires cargo and baggage compartments to be constructed of materials that meet the appropriate provisions of § 23.853(d)(3). Currently these requirements apply to commuter category airplanes and to the materials used in the compartments of these airplanes. The new requirement extends this applicability to the cargo and baggage compartments of all part 23 airplanes. In effect, the new requirement requires materials that are self-extinguishing, rather than flame resistant, as currently required under § 23.787(d).

Information provided by manufacturers shows that materials that meet self-extinguishing flame requirements are available at a slightly higher cost than materials that meet only flame resistant requirements. The FAA conservatively estimates that the incremental costs of complying with § 23.855(b) will be less than $200 per airplane. The safety benefits of this provision will be an increase in cargo and baggage compartment fire protection.

New paragraph (c) adds new fire protection requirements for cargo and baggage compartments for commuter category airplanes. The rule requires one of the following three alternatives:

(1) The compartment must be located where pilots seated at their duty station would easily discover the fire, or the compartment must be equipped with a smoke or fire detector system to provide a warning at the pilot's station. The compartment must also be accessible for fire extinguisher application.

(2) The compartment may be inaccessible, but must be equipped with a fire detector system that provides a warning at the pilot's station, and the compartment must have ceiling and sidewall floor panels constructed of materials that have been subjected to and meet the vertical self-extinguishing tests of appendix F to part 23.

(3) The compartment must be constructed and sealed to contain any fire.

The FAA cannot predict the designs of cargo and baggage compartments for future airplanes. If manufacturers choose to use smoke detectors, however, no more than 2 smoke detectors would be required per airplane. An aerospace engineer can design the smoke detector system in approximately 30 hours at a burdened rate of $60 per hour, for a total cost of $1,800 per certification. Two detectors, including wiring and installation, are estimated to cost about $4,550. Maintenance costs for the smoke detectors will cost approximately $100 per year.

Materials that meet the vertical self-extinguishing tests of appendix F (alternative 2 in the discussion above) will result in incremental costs of less than $200 per airplane. For alternative 3, the FAA estimates that it will cost $500 to construct a sealed compartment, or a total of $1,000 for 2 compartments, if the manufacturer chooses that method of complying with the proposed requirement.

Irrespective of the individual compliance method, the benefits of the provision will come from the increased likelihood that a cargo or baggage compartment fire could either be extinguished or contained.

Section 23.1303 Flight and Navigation Instruments

Revised § 23.1303(d) adds the requirement for a free air temperature indicator for those airplanes whose performance must be based on weight, altitude, and temperature. This requirement already applies to turbine-powered airplanes. The final rule extends the requirement to reciprocating engine-powered airplanes of more than 6,000 pounds. Manufacturers currently include free air temperature indicators as standard equipment on all part 23 airplanes, and would continue to do so in future designs in the absence of the requirement. Since the provision formalizes current practice, any costs would be negligible. Benefits will accrue from the requirement that the information necessary to determine the performance envelope of the airplane be available to the pilot.

New § 23.1303(g) identifies specific instruments, and the limits of those instruments, required for commuter category airplanes. New § 23.1303(g)(1) states that if airspeed limitations vary with altitude, the airspeed indicators must show the variation of the maximum operating limit speed (V_{MO}) with altitude. Industry sources indicate that an airspeed indicator with a V_{MO} "pointer" would cost $1,000 more than one without. Since two airspeed indicators are required on commuter airplanes, the incremental cost of this requirement will be $2,000 per commuter category airplane produced. The potential safety benefit of the requirement derives from the requirement that the information necessary to determine the maximum operating limit speed be available at all altitudes.

New § 23.1303(g)(3) requires (for commuter category IFR-approved airplanes with passenger seating configurations of 10 or more) a third, independent, attitude indicator (AI). Industry sources estimate that an aerospace engineer can design and document a third attitude instrument system in 100 hours at a burdened rate of $60 per hour, totalling $6,000 per certification. It is estimated that an AI will cost approximately $8,000, including a standby battery, and that the installation will cost $2,200 for 40 hours of a mechanic's time at a burdened rate of $55 per hour. However, § 23.1311(a)(5), discussed below, deletes the requirement for a rate-of-turn indicator when an independent attitude indicator is installed. The costs associated with a rate-of-turn indicator include: 40 hours of design and documentation costs, $1,000 per indicator, and 40 hours of installation. Therefore, the *incremental* cost for an IFR-approved airplane with a passenger seating capacity of 10 or more will be $3,600 per certification for 60 hours of engineering (100 hours for the AI, minus 40 hours for the rate-of-turn indicator); and $7,000 per airplane for the instrument ($8,000 for the AI, minus $1,000 for the rate-of-turn indicator); and no additional cost for the installation (40 hours for the AI, minus 40 hours for the rate-of-turn indicator).

The potential safety benefits of a third, independent attitude indicator derive from the reduced potential for erroneous attitude information. Currently, two attitude instruments are required for a ten passenger, IFR-approved commuter category airplane. Service experience has shown that a failure can occur whereby an attitude indicator can appear to be working when it is actually providing incorrect information. During such a failure, pilots may have difficulty determining which instrument to follow, and hazardous flight attitudes may result. A third attitude indicator will allow the crew to retain reliable attitude information even in cases where one instrument is not operating correctly.

Section 23.1326 Pitot Heat Indication System

New § 23.1326 requires the installation of a pitot tube heat indicating system on those airplanes required to be equipped with a heated pitot tube. Heated pitot tubes ensure that moisture will not freeze in the tube and block or partially block the airspeed system.

A pitot heat indicating system, including an in-line current sensor, panel light, and associated wiring, costs approximately $500. According to industry sources, an aerospace engineer can design and document such a system in 20 hours at a burdened rate of $60 per hour, totalling $1,200. A mechanic can install the system in 20 hours at a burdened rate of $55 per hour, totalling $1,100. The estimated non-recurring cost per certification, therefore, will total $2,800 ($1,200 for design, $500 for the certification airplane's indicator, and $1,100 for installation of that indicator). The estimated cost per production airplane will be $1,600 ($500 for the system and $1,100 for installation).

A pitot heat indicating system can advise the pilots of any inoperative heating element in the pitot tube and that subsequent inaccuracies could result. The provision will reduce the likelihood that pilots would rely on inaccurate airspeed information resulting from a blocked or partially blocked pitot tube.

Section 23.1353 Storage Battery Design and Installation

New § 23.1353(h) requires that, in the event of a complete loss of the primary electrical power generating system, airplane battery capacity must be sufficient to supply at least 30 minutes of electrical power to those loads essential to the continued safe flight and landing of the airplane.

In some cases, manufacturers may need to install larger batteries with greater capacities to comply with the requirements. The FAA estimates that the size and capacity of a larger battery will add no more than a few pounds (incremental operating costs of less than $10 per year) and $20 to $30 of additional cost for the battery.

On some airplanes, a "load shedding" procedure, where the pilot would sequentially turn off certain equipment, could be required either in place of or in addition to a larger battery. The procedure would be provided in the pilot's operating handbook (POH). The FAA estimates that an aerospace engineer can establish a load shedding procedure in 10 hours at a burdened rate of $60 per hour, for a total cost of $600 per affected certification.

Irrespective of the method of compliance, the provision will increase the likelihood that sufficient electrical power will be available to safely land the airplane in the event of an electrical generating system failure.

Section 23.1359 Electrical System Fire Protection

Revised § 23.1359(c) provides burn criteria for electrical wire and cables. A revision to appendix F to part 23 adds appropriate wire testing criteria. Demonstrating and documenting that electrical wires and cables meet the requirements of this provision will take an aerospace engineer approximately 4 hours at a burdened rate of $60 per hour, for a total cost of $240 per certification. The requirement and testing criteria increase the likelihood that necessary wires and cables will continue to function in the event of a fire.

Section 23.1365 Electrical Cables and Equipment

Section 23.1365(d) adds a requirement for the identification of electrical cables, terminals, and connectors. Different colored wires and/or tags could be used in conjunction with a wiring diagram to identify the cables, terminals, and connectors. The FAA estimates that a draftsman can design and document this identification system in 80 hours at a burdened rate of $55 per hour, a total of $4,400 per certification. Incremental installation costs will be approximately $100 per airplane.

The increasing use of electrical systems in part 23 airplanes has added to the difficulty of wiring installation. The requirement for cable identification will increase the likelihood that cables are correctly installed initially and will be correctly reinstalled as part of later maintenance or modification.

Section 23.1401 Anticollision Light System

The final rule revises § 13.1401 to require the installation of an anticollision light system on all part 23 airplanes. Existing § 23.1401 requires an anticollision light system only if certification for night operations is requested. Many manufacturers currently install anticollision light systems on all airplanes they produce.

Industry sources estimate that an aerospace engineer can design and document an anticollision light system in 40 hours at a burdened rate of $60 per hour, for a total of $2,400 per affected certification. The system will cost $500 and will take a mechanic approximately 20 hours to install at a burdened rate of $55 per hour, a total of $1,600 per affected airplane ($500 + (20 hours × $55 per hour) = $1,600). The weight penalty will be negligible. Only those future models that would not otherwise have anticollision light systems will actually incur incremental costs as a result of this provision.

The increasing speeds resulting from improved technology, especially turbine engines, warrant the use of anticollision lights for day operations as well as night. The reports of midair collisions for 1984 through 1990 document that 269 aircraft were involved in midair collisions in which 108 fatalities occurred. After data were filtered (to account for night operations, IFR conditions, and aircraft not affected by this rule), 167 airplanes were involved in collisions that occurred in daytime VFR conditions. The reports do not reveal whether the airplanes were using anticollision lights at the time of the accidents.

The FAA holds that requiring the installation of anticollision lights on all newly certificated airplanes, and requiring their use during day operations (revised § 91.209), will reduce the number of daylight midair accidents. Even if the requirement were only 25 percent effective, the accident history indicates that approximately 17 fatalities could be avoided during a similar 6-year period.

Section 23.1431 Electronic Equipment

The final rule adds three new paragraphs to § 23.1431. New paragraph (c) states that airplanes required to be operated by more than one flightcrew member must be evaluated to determine if the flightcrew members, when they are seated at their duty stations, can converse without difficulty under the actual cockpit noise conditions when the airplane is being operated. If the required evaluation shows that the noise level does not impair conversation, no further action would be required. If the evaluation shows that conversation would be difficult, however, an intercommunication system will be required.

The FAA estimates that an evaluation of cockpit noise could be conducted in conjunction with other certification testing, therefore, no incremental costs are associated with the evaluation. An aerospace engineer could design an intercom system in 20 hours at a burdened rate of $60 per hour, for a total of $1,200 per affected certification. The FAA estimates that the addition of an intercom system will cost approximately $500 per airplane. A mechanic could install the system in approximately 20 hours at a burdened rate of $55 per hour. The total incremental production cost for an affected airplane, therefore, will be $1,600 ($500 + (20 hours × $55 per hour)).

New paragraph (d) requires that, if the communication equipment that is installed includes any means of switching from the receive mode to the transmit mode, the equipment must use "off-on" transmitter switching that turns the transmitter off when it is not being used. The cost of this feature is included in the $500 cost of the intercom, described above.

NTSB investigations of at least two commuter accidents determined that excessive cockpit noise levels probably adversely affected the ability of the flight crews to communicate. (Bar Harbor Airlines, Flight 1808, August 25, 1985, 8 fatalities; and Henson Airlines, Flight 1517, September 23, 1985, 14 fatalities.) As a result, the Board recommended (Recommendation No. A–86–113) that the FAA require the installation and use of crew interphone systems in the cockpit of airplanes operating under part 135. The benefit of the new requirement derives from the increased likelihood that flightcrew members will be able to converse without difficulty and that the safety hazard of miscommunication will be reduced.

Section 23.1447 Equipment Standards for Oxygen Dispensing Units

New § 23.1447(a)(4) requires that if radio equipment is installed in an airplane, flightcrew oxygen dispensing units must be designed to allow use of the communication equipment when oxygen is being used.

Industry sources estimate that an oxygen mask with an integral microphone costs $1,000 more than an oxygen mask without a microphone. The costs per affected airplane, therefore, will be $2,000 for two masks. The benefit of the requirement is that it will allow flightcrew communication under all operating conditions, including operations when oxygen is required.

Section 23.1453 Protection of Oxygen Equipment From Rupture

This new section clarifies the rupture protection needed for oxygen system installation. Rupture protection for oxygen systems is currently required by the application of the structures load requirements of part 23. The addition of § 23.1453(a) clarifies the application of these load requirements and identifies the need to consider maximum temperatures and pressures that may be present. Section 23.1453(b) identifies the protection to be provided for oxygen pressure sources and the lines that connect these sources to the oxygen system shutoff valves.

Industry sources estimate that an aerospace engineer could analyze and document the loads on each element of the oxygen system in 16 hours at a burdened rate of $60 per hour, for a total cost of $960. The routing of oxygen pressure sources and lines to protect them from unsafe temperatures and crash landings would be part of an airplane's basic design and will not impose incremental costs.

Section 91.209 Aircraft Lights

New § 91.209(b) requires airplanes equipped with an anticollision light system to operate those lights during all operations, including daytime VFR.

The incremental cost of this provision consists of light bulb replacement. The FAA estimates that a light bulb for an anticollision light system costs approximately $50 and that this provision would necessitate an incremental bulb replacement every two years. Accordingly, the cost is projected to equal $25 per year, per affected operating airplane. The FAA holds that any grounding of an airplane due to a faulty bulb or light system will be rare and quickly corrected. The cost of such grounding will be negligible, when compared with the safety benefits of operating anticollision light systems.

In summary, the FAA holds that the benefits of the rule, though not directly quantifiable, will exceed the expected costs. Each of the provisions, as well as the entire final rule, will be cost beneficial.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) 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 proposed or final rule would 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 Order defines "small entities" in terms of thresholds, "significant economic impact" in terms of annualized costs thresholds, and "substantial number" as a number which is not less than eleven and which is more than one-third of the small entities subject to the proposed or final rule.

Order 2100.14A specifies a size threshold for classification as a small manufacturer as 75 or fewer employees. There are approximately 8 small part 23 airplane manufacturers. The annualized cost threshold for significant impact, expressed in 1995 dollars, is $18,700. No part 23 airplane manufacturer's annualized cost will exceed this cost threshold.

Order 2100.14A specifies a size threshold for classification as a small operator as 9 aircraft owned. The annualized cost threshold for significant impact, expressed in 1995 dollars, are $67,000 for air carriers whose fleet has a seating capacity of fewer than 60 and $4,700 for an unscheduled operator. No part 23 airplane operator's annualized cost will exceed this cost threshold.

The amendments in the final rule, therefore, will not have a significant economic impact on a substantial number of small entities.

Trade Impact Assessment

The rule will not constitute a barrier to international trade, including the export of U.S. airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the systems airworthiness standards have been harmonized with those of the Joint Aviation Authorities and will result in cost savings to manufacturers in the United States and in JAA member countries.

Federalism Implications

The regulations adopted herein do 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 provide systems and equipment standards for normal, utility, acrobatic, and commuter category airplanes that are substantively the same as the standards that will be proposed for the same category airplanes by the Joint Aviation Authorities in Europe. The revision will reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this regulation is significant under Executive Order 12866. 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 final rule is considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule has been placed in the docket. A copy may be obtained by contacting the person identified under **FOR FURTHER INFORMATION CONTACT.**

List of Subjects

14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

14 CFR Part 91

Aircraft, Aviation safety, Safety.

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends 14 CFR parts 23 and 91 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. 106(g), 40113, 44701, 44702, 44704.

2. Section 23.677(a) is revised to read as follows:

§ 23.677 Trim systems.

(a) Proper precautions must be taken to prevent inadvertent, improper, or abrupt trim tab operation. There must be means near the trim control to indicate to the pilot the direction of trim control movement relative to airplane motion. In addition, there must be means to indicate to the pilot the position of the trim device with respect to both the range of adjustment and, in the case of lateral and directional trim, the neutral position. This means must be visible to the pilot and must be located and designed to prevent confusion. The pitch trim indicator must be clearly marked with a position or range within which it has been demonstrated that take-off is safe for all center of gravity positions and each flap position approved for takeoff.

* * * * *

3. A new § 23.691 is added to read as follows:

§ 23.691 Artificial stall barrier system.

If the function of an artificial stall barrier, for example, stick pusher, is used to show compliance with § 23.201(c), the system must comply with the following:

(a) With the system adjusted for operation, the plus and minus airspeeds at which downward pitching control will be provided must be established.

(b) Considering the plus and minus airspeed tolerances established by paragraph (a) of this section, an airspeed must be selected for the activation of the downward pitching control that provides a safe margin above any airspeed at which any unsatisfactory stall characteristics occur.

(c) In addition to the stall warning required § 23.07, a warning that is clearly distinguishable to the pilot under all expected flight conditions without requiring the pilot's attention, must be provided for faults that would prevent the system from providing the required pitching motion.

(d) Each system must be designed so that the artificial stall barrier can be quickly and positively disengaged by the pilots to prevent unwanted downward pitching of the airplane by a quick release (emergency) control that meets the requirements of § 23.1329(b).

(e) A preflight check of the complete system must be established and the procedure for this check made available in the Airplane Flight Manual (AFM). Preflight checks that are critical to the safety of the airplane must be included in the limitations section of the AFM.

(f) For those airplanes whose design includes an autopilot system:

(1) A quick release (emergency) control installed in accordance with § 23.1329(b) may be used to meet the requirements of paragraph (d), of this section, and

(2) The pitch servo for that system may be used to provide the stall downward pitching motion.

(g) In showing compliance with § 23.1309, the system must be evaluated to determine the effect that any announced or unannounced failure may have on the continued safe flight and landing of the airplane or the ability of the crew to cope with any adverse conditions that may result from such failures. This evaluation must consider the hazards that would result from the airplane's flight characteristics if the system was not provided, and the hazard that may result from unwanted downward pitching motion, which could result from a failure at airspeeds above the selected stall speed.

4. Section 23.697(c) is added to read as follows:

§ 23.697 Wing flap controls

* * * * *

(c) If compliance with § 23.145(b)(3) necessitates wing flap retraction to positions that are not fully retracted, the wing flap control lever settings corresponding to those positions must be positively located such that a definite change of direction of movement of the lever is necessary to select settings beyond those settings.

5. Section 23.701 is amended by revising paragraphs (a)(1) and (a)(2) to read as follows:

§ 23.701 Flap interconnection.

(a) * * *

(1) Be synchronized by a mechanical interconnection between the movable flap surfaces that is independent of the flap drive system; or by an approved equivalent means; or

(2) Be designed so that the occurrence of any failure of the flap system that would result in an unsafe flight

characteristic of the airplane is extremely improbable; or

* * * * *

6. A new § 23.703 is added to read as follows:

§ 23.703 Takeoff warning system.

For commuter category airplanes, unless it can be shown that a lift or longitudinal trim device that affects the takeoff performance of the aircraft would not give an unsafe takeoff configuration when selection out of an approved takeoff position, a takeoff warning system must be installed and meet the following requirements:

(a) The system must provide to the pilots an aural warning that is automatically activated during the initial portion of the takeoff role if the airplane is in a configuration that would not allow a safe takeoff. The warning must continue until—

(1) The configuration is changed to allow safe takeoff, or

(2) Action is taken by the pilot to abandon the takeoff roll.

(b) The means used to activate the system must function properly for all authorized takeoff power settings and procedures and throughout the ranges of takeoff weights, altitudes, and temperatures for which certification is requested.

§ 23.723 [Amended]

7. Section 23.723(b) is amended by changing the word "reserved" to "reserve".

8. Section 23.729 is amended by revising paragraph (e) and by adding a new paragraph (g) to read as follows:

§ 23.729 Landing gear extension and retraction system.

* * * * *

(e) *Position indicator.* If a retractable landing gear is used, there must be a landing gear position indicator (as well as necessary switches to actuate the indicator) or other means to inform the pilot that each gear is secured in the extended (or retracted) position. If switches are used, they must be located and coupled to the landing gear mechanical system in a manner that prevents an erroneous indication of either "down and locked" if each gear is not in the fully extended position, or "up and locked" if each landing gear is not in the fully retracted position.

* * * * *

(g) *Equipment located in the landing gear bay.* 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 minimize damage from items such as a tire burst, or rocks, water, and slush that may enter the landing gear bay.

9. Section 23.735 is amended by redesignating paragraph (c) as paragraph (d), by revising the introductory text of paragraph (a), and by adding new paragraphs (c) and (e) to read as follows:

§ 23.735 Brakes.

(a) Brakes must be provided. The landing brake kinetic energy capacity rating of each main wheel brake assembly must not be less than the kinetic energy absorption requirements determined under either of the following methods:

* * * * *

(c) During the landing distance determination required by § 23.75, the pressure on the wheel braking system must not exceed the pressure specified by the brake manufacturer.

* * * * *

(e) In addition, for commuter category airplanes, the rejected takeoff brake kinetic energy capacity rating of each main wheel brake assembly must not be less than the kinetic energy absorption requirements determined under either of the following methods—

(1) The brake kinetic energy absorption requirements must be based on a conservative rational analysis of the sequence of events expected during a rejected takeoff at the design takeoff weight.

(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel brake assembly may be derived from the following formula—

$KE=0.0443 WV^2N$

where,

KE=Kinetic energy per wheel (ft.-lbs.);
W=Design takeoff weight (lbs.);
V=Ground speed, in knots, associated with the maximum value of V_1 selected in accordance with § 23.51(c)(1);
N=Number of main wheels with brakes.

10. A new § 23.745 is added to read as follows:

§ 23.745 Nose/tail wheel steering.

(a) If nose/tail wheel steering is installed, it must be demonstrated that its use does not require exceptional pilot skill during takeoff and landing, in crosswinds, or in the event of an engine failure; or its use must be limited to low speed maneuvering.

(b) Movement of the pilot's steering control must not interfere with the retraction or extension of the landing gear.

11. Section 23.775 is amended by revising paragraphs (a) and (c); by redesignating paragraphs (d) and (e) as paragraphs (e) and (d); by revising the newly designated paragraph (e); and by adding a new paragraph (h) to read as follows:

§ 23.775 Windshields and windows.

(a) The internal panels of windshields and windows must be constructed of a nonsplintering material, such as nonsplintering safety glass.

* * * * *

(c) On pressurized airplanes, if certification for operation up to and including 25,000 feet is requested, an enclosure canopy including a representative part of the installation must be subjected to special tests to account for the combined effects of continuous and cyclic pressurization loadings and flight loads, or compliance with the fail-safe requirements of paragraph (d) of this section must be shown.

* * * * *

(e) The windshield and side windows forward of the pilot's back when the pilot is seated in the normal flight position must have a luminous transmittance value of not less than 70 percent.

* * * * *

(h) In addition, for commuter category airplanes, the following applies:

(1) Windshield panes directly in front of the pilots in the normal conduct of their duties, and the supporting structures for these panes, must withstand, without penetration, the impact of a two-pound bird when the velocity of the airplane (relative to the bird along the airplane's flight path) is equal to the airplane's maximum approach flap speed.

(2) The windshield panels in front of the pilots must be arranged so that, assuming the loss of vision through any one panel, one or more panels remain available for use by a pilot seated at a pilot station to permit continued safe flight and landing.

12. Section 23.783 is amended by revising paragraph (b) and by adding a new paragraph (g) to read as follows:

§ 23.783 Doors.

* * * * *

(b) Passenger doors must not be located with respect to any propeller disk or any other potential hazard so as to endanger persons using the door.

* * * * *

(g) If lavatory doors are installed, they must be designed to preclude an occupant from becoming trapped inside the lavatory. If a locking mechanism is installed, it must be capable of being unlocked from outside of the lavatory.

13. Section 23.785 is amended by adding introductory text and by revising paragraphs (b) and (c) to read as follows:

§ 23.785 Seats, berths, litters, safety belts and shoulder harnesses.

There must be a seat or berth for each occupant that meets the following:

* * * * *

(b) Each forward-facing or aft-facing seat/restraint system in normal, utility, or acrobatic category airplanes must consist of a seat, a safety belt, and a shoulder harness, with a metal-to-metal latching device, that are designed to provide the occupant protection provisions required in § 23.562. Other seat orientations must provide the same level of occupant protection as a forward-facing or aft-facing seat with a safety belt and a shoulder harness, and must provide the protection provisions of § 23.562.

(c) For commuter category airplanes, each seat and the supporting structure must be designed for occupants weighing at least 170 pounds when subjected to the inertia loads resulting from the ultimate static load factors prescribed in § 23.561(b)(2) of this part. Each occupant must be protected from serious head injury when subjected to the inertia loads resulting from these load factors by a safety belt and shoulder harness, with a metal-to-metal latching device, for the front seats and a safety belt, or a safety belt and shoulder harness, with a metal-to-metal latching device, for each seat other than the front seats.

* * * * *

14. Section 23.787 is revised to read as follows:

§ 23.787 Baggage and cargo compartments.

(a) Each baggage and cargo compartment must:

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

(2) Have means to prevent the contents of any compartment from becoming a hazard by shifting, and to protect any controls, wiring, lines, equipment or accessories whose damage or failure would affect safe operations.

(3) Have a means to protect occupants from injury by the contents of any compartment, located aft of the occupants and separated by structure, when the ultimate forward inertial load factor is 9g and assuming the maximum allowed baggage or cargo weight for the compartment.

(b) Designs that provide for baggage or cargo to be carried in the same compartment as passengers must have a means to protect the occupants from injury when the baggage or cargo is subjected to the inertial loads resulting from the ultimate static load factors of § 23.561(b)(3), assuming the maximum allowed baggage or cargo weight for the compartment.

(c) For airplanes that are used only for the carriage of cargo, the flightcrew emergency exits must meet the requirements of § 23.807 under any cargo loading conditions.

15. A new § 23.791 is added to read as follows:

§ 23.791 Passenger information signs.

For those airplanes in which the flightcrew members cannot observe the other occupants' seats or where the flightcrew members' compartment is separated from the passenger compartment, there must be at least one illuminated sign (using either letters or symbols) notifying all passengers when seat belts should be fastened. Signs that notify when seat belts should be fastened must:

(a) When illuminated, be legible to each person seated in the passenger compartment under all probable lighting conditions; and

(b) Be installed so that a flightcrew member can, when seated at the flightcrew member's station, turn the illumination on and off.

16. Section 23.807 is amended by revising paragraphs (b) introductory text and (b)(5) and by adding new paragraphs (a)(4) and (b)(6) to read as follows:

§ 23.807 Emergency exits.

(a) * * *

(4) Emergency exits must not be located with respect to any propeller disk or any other potential hazard so as to endanger persons using that exit.

(b) *Type and operation.* Emergency exits must be movable windows, panels, canopies, or external doors, openable from both inside and outside the airplane, that provide a clear and unobstructed opening large enough to admit a 19-by-26-inch ellipse. Auxiliary locking devices used to secure the airplane must be designed to be overridden by the normal internal opening means. The inside handles of emergency exits that open outward must be adequately protected against inadvertent operation. In addition, each emergency exit must—

* * * * *

(5) In the case of acrobatic category airplanes, allow each occupant to abandon the airplane at any speed between V_{SO} and V_D; and

(6) In the case of utility category airplanes certificated for spinning, allow each occupant to abandon the airplane at the highest speed likely to be achieved in the maneuver for which the airplane is certificated.

* * * * *

§ 23.841 [Amended]

17. Section 23.841 is amended in paragraph (a) by removing the number "31,000" and replacing it with "25,000".

18. Section 23.853 is amended by revising the section heading to read as follows:

§ 23.853 Passenger and crew compartment interiors.

* * * * *

19. A new § 23.855 is added to read as follows:

§ 23.855 Cargo and baggage compartment fire protection.

(a) Sources of heat within each cargo and baggage compartment that are capable of igniting the compartment contents must be shielded and insulated to prevent such ignition.

(b) Each cargo and baggage compartment must be constructed of materials that meet the appropriate provisions of § 23.853(d)(3).

(c) In addition, for commuter category airplanes, each cargo and baggage compartment must:

(1) Be located where the presence of a fire would be easily discovered by the pilots when seated at their duty station, or it must be equipped with a smoke or fire detector system to give a warning at the pilots' station, and provide sufficient access to enable a pilot to effectively reach any part of the compartment with the contents of a hand held fire extinguisher, or

(2) Be equipped with a smoke or fire detector system to give a warning at the pilots' station and have ceiling and sidewall liners and floor panels constructed of materials that have been subjected to and meet the 45 degree angle test of Appendix F of this part. The flame may not penetrate (pass through) the material during application of the flame or subsequent to its removal. The average flame time after removal of the flame source may not exceed 15 seconds, and the average glow time may not exceed 10 seconds. The compartment must be constructed to provide fire protection that is not less than that required of its individual panels; or

(3) Be constructed and sealed to contain any fire within the compartment.

20. Section 23.867 is amended by revising the heading that precedes the section and the section heading to read as follows:

Electrical Bonding and Lighting Protection

§ 23.867 Electrical bonding and protection against lightning and static electricity.

* * * * *

21. Section 23.1303 is amended by revising the introductory text; by amending paragraph (d) by inserting the words "reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and" between the words "For" and "turbine"; by amending paragraph (e) concluding text by adding a line to read, "The lower limit of the warning device must be set to minimize nuisance warning;" at the end of the paragraph and by adding new paragraphs (f) and (g) to read as follows:

§ 23.1303 Flight and navigation instruments.

The following are the minimum required flight and navigation instruments:

* * * * *

(f) When an attitude display is installed, the instrument design must not provide any means, accessible to the flightcrew, of adjusting the relative positions of the attitude reference symbol and the horizon line beyond that necessary for parallax correction.

(g) In addition, for commuter category airplanes:

(1) If airspeed limitations vary with altitude, the airspeed indicator must have a maximum allowable airspeed indicator showing the variation of V_{MO} with altitude.

(2) The altimeter must be a sensitive type.

(3) Having a passenger seating configuration of 10 or more, excluding the pilot's seats and that are approved for IFR operations, a third attitude instrument must be provided that:

(i) Is powered from a source independent of the electrical generating system;

(ii) Continues reliable operation for a minimum of 30 minutes after total failure of the electrical generating system;

(iii) Operates independently of any other attitude indicating system;

(iv) Is operative without selection after total failure of the electrical generating system;

(v) Is located on the instrument panel in a position acceptable to the Administrator that will make it plainly visible to and usable by any pilot at the pilot's station; and

(vi) Is appropriately lighted during all phases of operation.

§ 23.1307 [Amended]

22. Section 23.1307 is amended by removing paragraphs (a) and (b); and by removing the designation from paragraph (c).

23. Section 23.1309(a)(4) is added to read as follows:

§ 23.1309 Equipment, systems, and installations.

(a) * * *

(4) In a commuter category airplane, must be designed to safeguard against hazards to the airplane in the event of their malfunction or failure.

* * * * *

24. Section 23.1311 is revised to read as follows:

§ 23.1311 Electronic display instrument systems.

(a) Electronic display indicators, including those with features that make isolation and independence between powerplant instrument systems impractical, must:

(1) Meet the arrangement and visibility requirements of § 23.1321.

(2) Be easily legible under all lighting conditions encountered in the cockpit, including direct sunlight, considering the expected electronic display brightness level at the end of an electronic display indictor's useful life. Specific limitations on display system useful life must be contained in the Instructions for Continued Airworthiness required by § 23.1529.

(3) Not inhibit the primary display of attitude, airspeed, altitude, or powerplant parameters needed by any pilot to set power within established limitations, in any normal mode of operation.

(4) Not inhibit the primary display of engine parameters needed by any pilot to properly set or monitor powerplant limitations during the engine starting mode of operation.

(5) Have an independent magnetic direction indicator and either an independent secondary mechanical altimeter, airspeed indicator, and attitude instrument or individual electronic display indicators for the altitude, airspeed, and attitude that are independent from the airplane's primary electrical power system. These secondary instruments may be installed in panel positions that are displaced from the primary positions specified by § 23.1321(d), but must be located where they meet the pilot's visibility requirements of § 23.1321(a).

(6) Incorporate sensory cues for the pilot that are equivalent to those in the instrument being replaced by the electronic display indicators.

(7) Incorporate visual displays of instrument markings, required by §§ 23.1541 through 23.1553, or visual displays that alert the pilot to abnormal operational values or approaches to established limitation values, for each parameter required to be displayed by this part.

(b) The electronic display indicators, including their systems and installations, and considering other airplane systems, must be designed so that one display of information essential for continued safe flight and landing will remain available to the crew, without need for immediate action by any pilot for continued safe operation, after any single failure or probable combination of failures.

(c) As used in this section, "instrument" includes devices that are physically contained in one unit, and devices that are composed of two or more physically separate units or components connected together (such as a remote indicating gyroscopic direction indicator that includes a magnetic sensing element, a gyroscopic unit, an amplifier, and an indicator connected together). As used in this section, "primary" display refers to the display of a parameter that is located in the instrument panel such that the pilot looks at it first when wanting to view that parameter.

§ 23.1321 [Amended]

25. Section 23.1321 is amended by removing the words "certificated for flight under instrument flight rules or of more than 6,000 pounds maximum weight" from paragraph (d) introductory text.

26. Section 23.1323 is amended by removing paragraph (d); redesignating paragraph (e) as (d) and paragraph (c) as (e); by removing the words "in flight and" from the first sentence of redesignated paragraph (e); and by adding new paragraphs (c) and (f) to read as follows:

§ 23.1323 Airspeed indicating system.

* * * * *

(c) The design and installation of each airspeed indicating system must provide positive drainage of moisture from the pitot static plumbing.

* * * * *

(f) For commuter category airplanes, where duplicate airspeed indicators are required, their respective pitot tubes must be far enough apart to avoid damage to both tubes in a collision with a bird.

§ 23.1325 [Amended]

27. Section 23.1325 is amended by inserting the words "or icing" between the words "meteorological" and "conditions" in paragraph (g).

28. A new § 23.1326 is added to read as follows:

§ 23.1326 Pitot heat indication systems.

If a flight instrument pitot heating system is installed to meet the requirements specified in § 23.1323(d), an indication system must be provided to indicate to the flight crew when that pitot heating system is not operating. The indication system must comply with the following requirements:

(a) The indication provided must incorporate an amber light that is in clear view of a flightcrew member.

(b) The indication provided must be designed to alert the flight crew if either of the following conditions exist:

(1) The pitot heating system is switched "off."

(2) The pitot heating system is switched "on" and any pitot tube heating element is inoperative.

§ 23.1329 [Amended]

29. Section 23.1329(b) is amended by adding the parenthetical phrase "(both stick controls, if the airplane can be operated from either pilot seat)" between the words, "or on the stick control," and the word "such".

30. Section 23.1337 is amended by revising the section heading, by revising the introductory text of paragraph (b), by redesignating paragraphs (b)(4) and (b)(5) as paragraph (b)(5) and (b)(6), respectively, and by adding a new paragraph (b)(4) to read as follows:

§ 23.1337 Powerplant instruments installation.

* * * * *

(b) *Fuel quantity indication.* There must be a means to indicate to the flightcrew members the quantity of usable fuel in each tank during flight. An indicator calibrated in appropriate units and clearly marked to indicate those units must be used. In addition:

* * * * *

(4) There must be a means to indicate the amount of usable fuel in each tank when the airplane is on the ground (such as by a stick gauge);

* * * * *

31. Section 23.1351 is amended by removing paragraph (b)(4), by redesignating paragraph (b)(5) as (b)(4), by adding a sentence to the end of paragraph (f) that reads, "The external power connection must be located so that its use will not result in a hazard to the airplane or ground personnel", and by revising paragraphs (b)(2), (b)(3), and (c)(3) to read as follows:

§ 23.1351 General.

* * * * *

(b) * * *

(2) Electric power sources must function properly when connected in combination or independently.

(3) No failure or malfunction of any electric power source may impair the ability of any remaining source to supply load circuits essential for safe operation.

* * * * *

(c) * * *

(3) Automatic means must be provided to prevent damage to any generator/alternator and adverse effects on the airplane electrical system due to reverse current. A means must also be provided to disconnect each generator/alternator from the battery and other generators/alternators.

* * * * *

32. Section 23.1353(h) is added to read as follows:

§ 23.1353 Storage battery design and installation.

* * * * *

(h) In the event of a complete loss of the primary electrical power generating system, the battery must be capable of providing at least 30 minutes of electrical power to those loads that are essential to continued safe flight and landing. The 30 minute time period includes the time needed for the pilots to recognize the loss of generated power and take appropriate load shedding action.

33. A new § 23.1359 is added to read as follows:

§ 23.1359 Electrical system fire protection.

(a) Each component of the electrical system must meet the applicable fire protection requirements of §§ 23.863 and 23.1182.

(b) Electrical cables, terminals, and equipment in designated fire zones that are used during emergency procedures must be fire-resistant.

(c) Insulation on electrical wire and electrical cable must be self-extinguishing when tested at an angle of 60 degrees in accordance with the applicable portions of Appendix F of this part, or other approved equivalent methods. The average burn length must not exceed 3 inches (76 mm) and the average flame time after removal of the flame source must not exceed 30 seconds. Drippings from the test specimen must not continue to flame for more than an average of 3 seconds after falling.

§ 23.1361 [Amended]

34. Section 23.1361(c) is amended by removing the last two words "in flight".

35. Section 23.1365 is amended by revising paragraph (b) and by adding new paragraphs (d), (e), and (f) to read as follows:

§ 23.1365 Electrical cables and equipment.

* * * * *

(b) Any equipment that is associated with any electrical cable installation and that would overheat in the event of circuit overload or fault must be flame resistant. That equipment and the electrical cables must not emit dangerous quantities of toxic fumes.

* * * * *

(d) Means of identification must be provided for electrical cables, terminals, and connectors.

(e) Electrical cables must be installed such that the risk of mechanical damage and/or damage cased by fluids vapors, or sources of heat, is minimized.

(f) Where a cable cannot be protected by a circuit protection device or other overload protection, it must not cause a fire hazard under fault conditions.

36. Section 23.1383 is revised to read as follows:

§ 23.1383 Taxi and landing lights.

Each taxi and landing light must be designed and installed so that:

(a) No dangerous glare is visible to the pilots.

(b) The pilot is not seriously affected by halation.

(c) It provides enough light for night operations.

(d) It does not cause a fire hazard in any configuration.

37. Section 23.1401 is amended by revising the introductory text of paragraph (a) to read as follows:

§ 23.1401 Anticollision light system.

(a) *General.* The airplane must have an anticollision light system that:

* * * * *

§ 23.1413 [Amended]

38. Section 23.1413 is removed.

39. Section 23.1431 is amended by adding new paragraphs (c), (d), and (e) to read as follows:

§ 23.1431 Electronic equipment.

* * * * *

(c) For those airplanes required to have more than one flightcrew member, or whose operation will require more than one flightcrew member, the cockpit must be evaluated to determine if the flightcrew members, when seated at their duty station, can converse without difficulty under the actual cockpit noise conditions when the airplane is being operated. If the airplane design includes provision for the use of communication headsets, the evaluation must also consider conditions where headsets are being used. If the evaluation shows conditions under which it will be difficult to converse, an intercommunication system must be provided.

(d) If installed communication equipment includes transmitter "off-on" switching, that switching means must be designed to return from the "transmit" to the "off" position when it is released and ensure that the transmitter will return to the off (non transmitting) state.

(e) If provisions for the use of communication headsets are provided, it must be demonstrated that the flightcrew members will receive all aural warnings under the actual cockpit noise conditions when the airplane is being operated when any headset is being used.

40. Section 23.1435(c) is revised to read as follows:

§ 23.1435 Hydraulic systems.

* * * * *

(c) *Accumulators.* A hydraulic accumulator or reservoir may be installed on the engine side of any firewall if—

(1) It is an integral part of an engine or propeller system, or

(2) The reservoir is nonpressurized and the total capacity of all such nonpressurized reservoirs is one quart or less.

41. Section 23.1447 is amended by revising paragraphs (d) and (e) and by adding a new paragraph (a)(4) to read as follows:

§ 23.1447 Equipment standards for oxygen dispensing units.

* * * * *

(a) * * *

(4) If radio equipment is installed, the flightcrew oxygen dispensing units must be designed to allow the use of that equipment and to allow communication with any other required crew member while at their assigned duty station.

* * * * *

(d) For a pressurized airplane designed to operate at flight altitudes above 25,000 feet (MSL), the dispensing units must meet the following:

(1) The dispensing units for passengers must be connected to an oxygen supply terminal and be immediately available to each occupant wherever seated.

(2) The dispensing units for crewmembers must be automatically presented to each crewmember before the cabin pressure altitude exceeds 15,000 feet, or the units must be of the quick-donning type, connected to an oxygen supply terminal that is immediately available to crewmembers at their station.

(e) If certification for operation above 30,000 feet is requested, the dispensing units for passengers must be automatically presented to each occupant before the cabin pressure altitude exceeds 15,000 feet.

* * * * *

42. A new § 23.1451 is added to read as follows:

§ 23.1451 Fire protection for oxygen equipment.

Oxygen equipment and lines must:

(a) Not be installed in any designed fire zones.

(b) Be protected from heat that may be generated in, or escape from, any designated fire zone.

(c) Be installed so that escaping oxygen cannot come in contact with and cause ignition of grease, fluid, or vapor accumulations that are present in normal operation or that may result from the failure or malfunction of any other system.

43. A new § 23.1453 is added to read as follows:

§ 23.1453 Protection of oxygen equipment from rupture.

(a) Each element of the oxygen system must have sufficient strength to withstand the maximum pressure and temperature, in combination with any externally applied loads arising from consideration of limit structural loads, that may be acting on that part of the system.

(b) Oxygen pressure sources and the lines between the source and the shutoff means must be:

(1) Protected from unsafe temperatures; and

(2) Located where the probability and hazard of rupture in a crash landing are minimized.

44. Section 23.1461(a) is revised to read as follows:

§ 23.1461 Equipment containing high energy rotors.

(a) Equipment, such as Auxiliary Power Units (APU) and constant speed drive units, containing high energy rotors must meet paragraphs (b), (c), or (d) of this section.

* * * * *

45. Appendix F to part 23 is amended by revising the introductory paragraph, by amending paragraph (c) to change the reference from paragraph (e) to paragraph (g), by amending paragraph (d) to change the reference from paragraph (f) to paragraph (h), by redesignating current paragraph (f) as paragraph (h), and by revising paragraph (b) and adding new paragraphs (f) and (g) to read as follows:

Appendix F To Part 23 Test Procedure

Acceptable test procedure for self-extinguishing materials for showing compliance with §§ 23.853, 23.855 and 23.1359.

* * * * *

(b) *Specimen configuration.* Except as provided for materials used in electrical wire and cable insulation and in small parts, materials must be tested either as a section cut from a fabricated part as installed in the airplane or as a specimen simulating a cut section, such as: a specimen cut from a flat sheet of the material or a model of the fabricated part. The specimen may be cut from any location in a fabricated part; however, fabricated units, such as sandwich panels, may not be separated for a test. The specimen thickness must be no thicker than the minimum thickness to be qualified for use in the airplane, except that: (1) Thick foam parts, such as seat cushions, must be tested in ½ inch thickness; (2) when showing compliance with § 23.853(d)(3)(v) for materials used in small parts that must be tested, the materials must be tested in no more than ⅛ inch thickness; (3) when showing compliance with § 23.1359(c) for materials used in electrical wire and cable insulation, the wire and cable specimens must be the same size as used in the airplane. In the case of fabrics, both the warp and fill direction of the weave must be tested to determine the most critical flammability conditions. When performing the tests prescribed in paragraphs (d) and (e) of this appendix, the specimen must be mounted in a metal frame so that (1) in the vertical tests of paragraph (d) of this appendix, the two long edges and the upper edge are held securely; (2) in the horizontal test of paragraph (e) of this appendix, the two long edges and the edge away from the flame are held securely; (3) the exposed area of the specimen is at least 2 inches wide and 12 inches long, unless the actual size used in the airplane is smaller; and (4) the edge to which the burner flame is applied must not consist of the finished or protected edge of the specimen but must be representative of the actual cross section of the material or part installed in the airplane. When performing the test prescribed in paragraph (f) of this appendix, the specimen must be mounted in metal frame so that all four edges are held securely and the exposed area of the specimen is at least 8 inches by 8 inches.

* * * * *

(f) *Forty-five degree test.* A minimum of three specimens must be tested and the results averaged. The specimens must be supported at an angle of 45 degrees to a horizontal surface. The exposed surface when installed in the aircraft must be face down for the test. The specimens must be exposed to a Bunsen or Tirrill burner with a nominal ⅜ inch I.D. tube adjusted to give a flame of 1½ inches in height. The minimum flame temperature measured by a calibrated thermocouple pyrometer in the center of the flame must be 1550°F. Suitable precautions must be taken to avoid drafts. The flame must be applied for 30 seconds with one-third contacting the material at the center of the specimen and then removed. Flame time, glow time, and whether the flame penetrates (passes through) the specimen must be recorded.

(g) *Sixty-degree test.* A minimum of three specimens of each wire specification (make and size) must be tested. The specimen of wire or cable (including insulation) must be placed at an angle of 60 degrees with the horizontal in the cabinet specified in paragraph (c) of this appendix, with the cabinet door open during the test or placed within a chamber approximately 2 feet high × 1 foot × 1 foot, open at the top and at one vertical side (front), that allows sufficient flow of air for complete combustion but is free from drafts. The specimen must be parallel to and approximately 6 inches from the front of the chamber. The lower end of the specimen must be held rigidly clamped. The upper end of the specimen must pass over a pulley or rod and must have an appropriate weight attached to it so that the specimen is held tautly throughout the flammability test. The test specimen span between lower clamp and upper pulley or rod must be 24 inches and must be marked 8 inches from the lower end to indicate the central point for flame application. A flame from a Bunsen or Tirrill burner must be applied for 30 seconds at the test mark. The burner must be mounted underneath the test mark on the specimen, perpendicular to the specimen and at an angle of 30 degrees to the vertical plane of the specimen. The burner must have a nominal bore of three-eighths inch, and must be adjusted to provide a three-inch-high flame with an inner cone approximately one-third of the flame height. The minimum temperature of the hottest portion of the flame, as measured with a calibrated thermocouple pyrometer, may not be less than 1,750 °F. The burner must be positioned so that the hottest portion of the flame is applied to the test mark on the wire. Flame time, burn length, and flaming time drippings, if any, must be recorded. The burn length determined in accordance with paragraph (h) of this appendix must be measured to the nearest one-tenth inch. Breaking of the wire specimen is not considered a failure.

* * * * *

PART 91—GENERAL OPERATING AND FLIGHT RULES

46. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 1301(7), 1303, 1344, 1348, 1352 through 1355, 1401, 1421 through 1431, 1471, 1472, 1502, 1510, 1522, and 2121 through 2125; Articles 12, 29, 21, and 32(a) of the Convention on International Civil Aviation (61 Stat. 1180); 42 U.S.C. 4321 *et seq.*; E.O. 11514; 49 U.S.C. 106(g).

47. Section 91.205 is amended by redesignating paragraphs (b)(11) through (b)(16) as paragraphs (b)(12) through (b)(17), respectively, and by adding a new paragraph (b)(11) to read as follows:

§ 91.205 Powered civil aircraft with standard category U.S. airworthiness certificates: Instrument and equipment requirements.

* * * * *

(b) * * *

(11) For small civil airplanes certificated after March 11, 1996, in accordance with part 23 of this chapter, an approved aviation red or aviation white anticollision light system. In the event of failure of any light of the anticollision light system, operation of the aircraft may continue to a location where repairs or replacement can be made.

* * * * *

48. Section 91.209 is revised to read as follows:

§ 91.209 Aircraft lights.

No person may:

(a) During the period from sunset to sunrise (or, in Alaska, during the period a prominent unlighted object cannot be seen from a distance of 3 statute miles or the sun is more than 6 degrees below the horizon)—

(1) Operate an aircraft unless it has lighted position lights;

(2) Park or move an aircraft in, or in dangerous proximity to, a night flight operations area of an airport unless the aircraft—

(i) Is clearly illuminated;

(ii) Has lighted position lights; or

(iii) is in an area that is marked by obstruction lights;

(3) Anchor an aircraft unless the aircraft—

(i) Has lighted anchor lights; or

(ii) Is in an area where anchor lights are not required on vessels; or

(b) Operate an aircraft that is equipped with an anticollision light system, unless it has lighted anticollision lights. However, the anticollision lights need not be lighted when the pilot-in-command determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.

Issued in Washington DC, on January 29, 1996.

David R. Hinson,

Administrator.

[FR Doc. 96–2083 Filed 2–8–96; 8:45 am]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. 27804; Amendment No. 23–51]

RIN 2120–AE60

Airworthiness Standards; Powerplant Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the powerplant airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certificated in these categories. This amendment will provide nearly uniform powerplant airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirements 23, simplifying international airworthiness approval.

EFFECTIVE DATE: March 11, 1996.

FOR FURTHER INFORMATION CONTACT: Norman Vetter, ACE–111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426–5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94–19 (59 FR 33822). All comments received in response to Notice 94–19 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment pertain to powerplants. Three other final rules are being issued in this **Federal Register** that pertain to airworthiness standards for systems and equipment flight, and airframe. These related rulemakings are also part of the harmonization effort. Interested persons should review all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the U.S. regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23 and part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeene des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice 94–19 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the powerplant airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR and part 23 harmonization, which ARAC assigned to the JAR 23/FAR 23 Harmonization Working Group. The proposals for powerplant airworthiness standards contained in Notice No. 94–19 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking, and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before October 28, 1994. Four commenters responded to Notice 94–19. Two commenters (Transport Canada and the Air Line Pilots Association) expressed overall support for the proposed changes. The JAA stated its overall support while commenting on specific proposed changes. The fourth commenter (Beechcraft) commented on several specific sections. The specific comments of JAA and Beechcraft are discussed in detail in this document and include an FAA response and a description of any changes to the final rule language. Other minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with the ARAC, and further review by the FAA.

Discussion of Amendments

Section 23.777 Cockpit Controls

The FAA proposed to revise § 23.777(c)(2) so that for single-engine airplanes designed for a single cockpit occupant, the powerplant controls would be located in the same position as they are for airplanes with tandem seats.

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

Section 23.779 Motion and Effect of Cockpit Controls

The FAA proposed to revise § 23.779(b)(1) by adding a new item, "fuel," to the "motion and effect" table to require that any fuel shutoff control other than mixture must move forward to open.

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

Section 23.901 Installation

The FAA proposed to revise § 23.901(d)(1), which concerns turbine engine installation and vibration characteristics that do not exceed those established during the type certification of the engine. The FAA proposed to add the word "carcass" before vibration in this paragraph in order to restrict analyses to those vibrations that are caused by external excitation to the main engine frame or "carcass." While the word "carcass" has not traditionally been used in this context in the United States, it is used in Europe and was proposed in the interest of harmonization.

The FAA proposed to revise § 23.901(d)(2) by deleting the last sentence, which reads: "The engine must accelerate and decelerate safely following stabilized operations under these rain conditions." This requirement is already provided for in the first sentence of paragraph (d)(2), which states that the turbine engine must be constructed and arranged to provide "continued safe operation."

The FAA proposed to revise paragraph (e) of this section by adding the word "powerplant" in front of "installation" to make clear that it pertains to all powerplant installations. The FAA proposed to revise paragraph (e)(1) by adding the word "installation" in front of "instruction" to make clear which instructions are applicable.

The FAA proposed that new paragraph (e)(1)(i) contain the requirement for an engine type certificate currently set forth in paragraph (e)(1). The FAA proposed that paragraph (e)(1)(ii) continue the current requirement for a propeller type certificate, and to allow an equivalency finding for certain propellers not type certificated in the United States. This revision was proposed to be consistent with the proposed revisions to § 23.905, Propellers.

No comments were received on the proposals. However, as discussed below, the FAA has determined that the proposed amendment to § 23.905(a) concerning propellers should be withdrawn. Consequently, proposed revisions to § 23.901(e) are no longer appropriate and are being withdrawn.

The proposal is adopted with the above change.

Section 23.903 Engines

The FAA proposed to revise § 23.903 (c) and (g) by adding the headings "Engine isolation" and "Restart capability," respectively, in order to identify the subjects of these paragraphs as is done for the other paragraphs in this section. The FAA also proposed to change the heading of paragraph (f) from "Restart capability" to "Restart envelope" since the paragraph addresses the altitude and airspeed envelope for restarting the engines in flight.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.905 Propellers

The FAA proposed to revise § 23.905(a) to permit approval, on part 23 airplanes, of propellers by a means other than the currently required type certificate.

Comment: Beechcraft objects to what it characterizes as "an unknown method of compliance." Beechcraft states that it appears that the economic burden of certification would be placed on the end user of the propeller without any guidance as to the means of compliance. Beechcraft asserts that experience indicates that equivalent level of safety findings are very subjective, that propellers would be certificated to various standards, and that this creates a liability for the aircraft manufacturer. Beechcraft believes that uniform airworthiness standards should be maintained and that "an aircraft manufacturer could not, for economic and liability reasons, afford to purchase a propeller without a type certificate, U.S. or foreign."

FAA Response: The FAA re-evaluated the proposal and determined that public interest would be best served if the proposal were withdrawn. Therefore, the FAA is withdrawing the proposal and will consider it for future rulemaking action.

Section 23.907 Propeller Vibration

The FAA proposed to revise § 23.907(a) to require that propellers "other than a conventional fixed-pitch wooden propeller" be evaluated for vibration. Fixed-pitch wooden propellers are not highly stressed, as are all metal and most composite propeller blades.

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

Section 23.925 Propeller Clearance

The FAA proposed to revise § 23.925 to require that propeller clearance must be evaluated with the airplane at the most adverse combination of weight and center of gravity, and with the propeller in the most adverse pitch position. This revision would make the requirement consistent with current certification practice.

Comment: The JAA pointed out that, under the JAR, the clearances provided in this section are intended to represent minimum values and that it had previously rejected the introductory text language that states "Unless smaller clearances are substantiated * * *."

FAA Response: The language quoted by the JAA is in present § 23.925 and would not be affected by the proposed change. The FAA acknowledges that the introductory language cited by the JAA has been previously identified as an area of known disharmony between the two sets of regulations that would not be affected by the proposed revisions.

No comments other than the JAA acknowledgment of disharmony were received on the changes proposed for this section in Notice 94–19, and the proposal is adopted as proposed.

Section 23.929 Engine Installation Ice Protection

The FAA proposed to replace the word "power" in § 23.929 in the phrase "without appreciable loss of power" with the word "thrust" because "thrust" is more descriptive of the loss experienced when ice forms on a propeller.

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

Section 23.933 Reversing Systems

The FAA proposed to revise § 23.933(a)(1) so that these provisions correspond to the turbojet and turbofan reversing system airworthiness standards of part 25.

The FAA also proposed to delete as unnecessary the word "forward" from paragraph (a)(3).

No comments were received on the proposals, and they are adopted as proposed.

Section 23.955 Fuel Flow

The FAA proposed to revise § 23.955(a) by deleting the word "and" where it occurs between the subparagraphs. Each of the four paragraphs is independent and all of them apply under paragraph (a).

The FAA also proposed to revise § 23.955(a)(3) by adding the word "probable" so that the requirement would read as follows: "If there is a flow meter without a bypass, it must not have any probable failure mode * * *." The addition of the word "probable" would clarify the intent of the requirement that only probable failures need be analyzed.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.959 Unusable Fuel Supply

The FAA proposed that the text of § 23.959 be redesignated as paragraph (a), and proposed the addition of a new paragraph (b) to require that the effect of any fuel pump failure on the unusable fuel supply be established. This change would not require any change in the fuel quantity indicator marking required by § 23.1553.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.963 Fuel Tanks: General

The FAA proposed to clarify § 23.963(b), which concerns fuel tank liners, by replacing the phrase "must be of an acceptable kind" with the phrase "must be shown to be suitable for the particular application." Also, the FAA proposed to revise the cross reference in this section to coincide with the proposed revision of § 23.959 discussed above.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.965 Fuel Tank Tests

The FAA proposed to revise § 23.965(b)(3)(i) by changing the phrase "the test frequency of vibration cycles per minute is obtained by * * *" to "the test frequency of vibration is the number of cycles per minute obtained by * * *" to clarify that it is the number of cycles per minute that is to be used during testing of a fuel tank.

No comments were received on the proposal. After further review of the proposal, however, the FAA determined that the second portion of paragraph (b)(3)(i), which includes the test frequency vibration cycles, should be redesignated as paragraphs (b)(3)(i) (A) and (B), and that the phrase "except that" should be removed and the word "and" added in its place. This would not be a substantive revision.

The proposal is adopted with the above change.

Section 23.973 Fuel Tank Filler Connection

The FAA proposed to revise § 23.973(f) by removing the language that limits its applicability so that the regulation would apply to all airplanes with turbine engines, including turbine engines that are equipped with pressure fueling systems.

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

Section 23.975 Fuel Tank Vents and Carburetor Vents

The FAA proposed to revise the first sentence of § 23.975(a)(5) to clarify that there may be no point in any vent line where moisture can accumulate unless drainage is provided. The FAA explained that the intent of this requirement is to allow low spots in the fuel tank vent system if a drain is provided for each low spot.

Comment: No comments were received concerning the proposed revision of the first sentence of § 23.975(a)(5). However, the JAA submitted a comment on the second sentence, for which no change was proposed. That sentence currently reads, "Any drain valve installed in the vent lines must discharge clear of the airplane and be accessible for drainage." The JAA's comment is threefold. First, JAA states that, in smaller, less complex part 23 airplanes, whether a vent will remain clear in all phases of operation cannot be guaranteed. Second, JAA states that, on more complex part 23 airplanes, "considerations of inaccessibility during operation of an aircraft when the need for a drain valve has been considered essential, has very often resulted in the acceptance of automatic valves that drain back into the fuel tank." Finally, JAA states that drainage/discharge clear of the airplane is not in accord with environmental concerns.

FAA Response: The FAA has concluded after reviewing the JAA comment and after discussions within the ARAC working group that further clarification of this drainage requirement is appropriate, since the rule language was never intended to limit discharge to an external drain valve. Therefore, the last sentence of § 23.975(a)(5), as adopted, reads "Any drain valve installed must be accessible for drainage."

Section 23.979 Pressure Fueling Systems

The FAA proposed to revise § 23.979(b) to require, for commuter category airplanes, an indication at each fueling station of failure of the automatic shutoff means. This revision would make the commuter category automatic shutoff means requirements similar to the requirements for transport category airplanes in § 25.979.

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

Section 23.1001 Fuel Jettisoning System

The FAA proposed to revise § 23.1001(b)(2) to redefine the speed at which the fuel jettisoning system tests should be conducted by referencing § 23.69(b). The JAA states that a comparable change will be made to JAR 23.

No other comments were received, and this proposal is adopted as proposed.

Section 23.1013 Oil Tanks

The FAA proposed to delete the word "crankcase" in § 23.1013(d)(1) to make this paragraph applicable to all engine installations.

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

Section 23.1041 General

The FAA proposed to revise § 23.1041, under the "Cooling" heading, to require, for all airplanes regardless of engine type, a demonstration of adequate cooling at one maximum ambient atmosphere temperature for which approval is requested.

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

Section 23.1043 Cooling Tests

The FAA stated in the preamble to Notice 94–19 that it proposed to revise § 23.1043(a)(3) to show that the minimum grade fuel requirement applies to both turbine and reciprocating engines and that the lean mixture requirement applies to reciprocating engines only.

The FAA proposed to simplify the introductory text of paragraph (a) by deleting the requirement that compliance must be shown "under critical ground, water, and flight operating conditions to the maximum altitude for which approval is requested" since this requirement is already contained in § 23.1041.

The FAA proposed to improve the organization of the section by moving to paragraph (a)(4) the requirement in the introductory text of paragraph (a) that for turbocharged engines, each turbocharger must be operated through the part of the climb profile for which turbocharger operation is requested.

The FAA proposed a non-substantive change to paragraph (a)(1) to make it consistent with proposed changes to § 23.1041.

The FAA proposed to reword paragraph (a)(2) without substantive change to make this language identical to the JAR.

The FAA proposed to revise paragraph (a)(3) to clarify that the requirement for mixture settings applies to reciprocating engines and that the mixture settings must be the leanest recommended for the climb. The FAA pointed out that the "leanest recommended for climb" mixture setting is considered a normal operating condition.

The FAA proposed to remove paragraph (a)(5) because water taxi tests are already required by § 23.1041 as amended by Amendment 23–43 (58 FR 18958, April 9, 1993).

The FAA proposed to revise paragraphs (c) and (d) by adding the requirement that cooling correction factors be determined for the appropriate altitude. This proposed change was intended to codify current certification practice and increase safety by ensuring that the proper correction factor is determined.

Comment: Beechcraft comments that the minimum fuel requirement of present paragraph (a)(3) should be deleted for turbine engines since there are not real measurable differences for turbine engine fuel as there are for reciprocating engine fuel.

FAA Response: The proposed rule did not contain any change to the minimum fuel grade requirements and the preamble statement may be unclear. The FAA agrees with the Beechcraft statement that today, turbine engine fuels are not graded. Since no change was proposed in this wording in the NPRM and since the present wording has not effect on the use of turbine engine fuels, no change is made for this final rule. However, after discussion within the ARAC Working Group, the FAA has determined that paragraph (a)(3) can be clarified by moving the second part of the sentence concerning mixture settings for reciprocating engines to a new paragraph (a)(5). This is not considered a substantive change to the proposed language, but a clarification of a current requirement.

The only comment received on the changes proposed for § 23.1043 concerned paragraph (a)(3), and that paragraph is adopted as explained above. The remaining changes are adopted as proposed.

Section 23.1045 Cooling Test Procedures for Turbine Engine Powered Airplanes

The FAA proposed to clarify § 23.1045(a) by stating more generally that (1) compliance with § 23.1041 must be shown for all phases of operations, not only the four listed phases: takeoff, climb, enroute, and landing; and that (2) the airplane must be flown in the configuration, at the speeds, and following the procedures recommended in the Airplane Flight Manual for the relative stage of flight that corresponds to the applicable performance requirements critical to cooling.

No comments were received on the proposals, and they are adopted as proposed.

Section 23.1047 Cooling Test Procedures for Reciprocating Engine Powered Airplanes

The FAA proposed to revise the cooling test procedures in § 23.1047 for reciprocating engine powered airplanes by deleting the specific procedures because experience has shown that some of the listed detailed procedures are not directly applicable to certain engine configurations and certain operating conditions.

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

Section 23.1091 Air Induction System

The FAA proposed to revise § 23.1091(c)(2) to require that air induction system design protect against foreign matter, from whatever source, "during takeoff, landing, and taxiing" rather than be limited, as is the present rule, to foreign material located on the runway, taxiway, or other airport operating surfaces.

Comment: Beechcraft comments that increasing the scope of the foreign material environment poses very difficult technical questions and potentially costly solutions. Beechcraft states that it is extremely difficult to compensate for and protect against airborne debris and also states its concern that the proposed rule language gives no guidance as to the levels of protection that are necessary.

FAA Response: As stated in the NPRM preamble, the proposed language is consistent with current certification practice and, therefore, would not be a significant new burden on aircraft manufacturers. However, it was not the FAA's intent to create an opportunity for an extreme interpretation of this rule, as suggested by Beechcraft. To clarify the intent, and after discussion within the ARAC Working Group, the FAA has added the words "hazard of" to the second sentence of § 23.1091(c)(2) to make it clear that the intent of the rule is to minimize the hazard of ingestion of foreign matter rather than to require zero ingestion.

This proposal is adopted with the change explained above.

Section 23.1093 Induction System Icing Protection

The FAA proposed to revise § 23.1093(c) by adding the heading "Reciprocating engines with superchargers" so that this paragraph would be consistent with paragraphs (a) and (b) of this section, which have headings.

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

Section 23.1105 Induction System Screens

The FAA proposed to revise § 23.1105 to include fuel injection systems, since some reciprocating engines incorporate a fuel injection system and the same provisions required for a carburetor are necessary for a fuel injection system.

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

Section 23.1107 Induction System Filters

The FAA proposed to revise the introductory text of § 23.1107 by deleting the reference to reciprocating engine installations to make the section applicable to airplanes with either reciprocating or turbine engines.

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

Section 23.1121 General

The FAA proposed to revise § 23.1121(g) by adding standards for APU exhaust systems because these standards were overlooked when APU standards were introduced into part 23 by Amendment 23–43 (58 FR 18958, April 9, 1993).

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

Section 23.1141 Powerplant Controls: General

The FAA proposed to clarify § 23.1141(b), which concerns flexible controls, by replacing the phrase "must be of an acceptable kind" with the phrase "must be shown to be suitable for the particular application."

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

Section 23.1143 Engine Controls

The FAA proposed to revise § 23.1143(f) to add a requirement that a fuel control (other than a mixture control) must have a means to prevent the inadvertent movement of the control into the shutoff position.

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

Section 23.1153 Propeller Feathering Controls

The FAA proposed to revise § 23.1153 to require that it be possible to feather each propeller separately, in order to prevent inadvertent operation.

After further review of the proposal, the FAA decided to remove the phrase "whether or not they are separate from the propeller speed and pitch controls" and add the word "installed" in its place. The meaning is maintained without the deleted phrase, which would be redundant.

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

Section 23.1181 Designated Fire Zones; Regions Included

The FAA proposed new § 23.1181(b)(3) to add as a designated fire zone for turbine engines "any complete powerplant compartment in which there is no isolation between compressor, accessory, combustor, turbine and tailpipe sections."

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

Section 23.1183 Lines, Fittings, and Components

The FAA proposed to clarify the intent of § 23.1183(a), which concerns the approval of flexible hose assemblies, by replacing the word "approved" with the words "shown to be suitable for the particular application."

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

Section 23.1191 Firewalls

The FAA proposed to amend § 23.1191(b) to require that each "firewall or shroud must be constructed so that no hazardous quantity of liquid, gas, or flame can pass from the compartment created by the firewall or shroud to other parts of the airplane." The intent of the proposed change was to clarify that the requirement applies to any compartment created by a firewall or shroud.

Comment: The JAA states that the additional wording proposed to be added to paragraph (b) is superfluous and will not be proposed for JAR 23.

FAA Response: The FAA has determined that the proposed change to § 23.1191(b) is needed to retain the intent of the rule and that it will not create a technical disharmony between the two bodies of regulation.

This proposal is adopted as proposed.

Section 23.1203 Fire Detector System

The FAA proposed to revise § 23.1203(e), which concerns the wiring and other components of each fire detector system in an engine compartment, by replacing the words "fire zone" with "designated fire zone" to make the wording consistent with § 23.1181.

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

Section 23.1305 Powerplant Instruments

The FAA proposed to revise § 23.1305(b)(3), concerning cylinder head temperature indicators, by deleting paragraph (b)(3)(ii), which refers to compliance with § 23.1041 at a speed higher than V_Y, to be consistent with a general deletion of the requirements for a determination of the V_Y speed.

No comments were received on the proposal. However, after further review, the FAA has determined that it would be simpler to remove the text of paragraph (b)(3)(ii) and to reserve paragraph (b)(3)(ii) for future use in order to avoid confusion that could come from redesignation of paragraph (b)(3)(iii).

The proposal is adopted as explained above.

Section 23.1337 Powerplant Instruments

The FAA proposed to change the reference in § 23.1337(b) to "§ 23.959" to "§ 23.959(a)" to conform the reference to a revision of § 23.959 made elsewhere in this document.

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

Regulatory Evaluation, Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations or modify existing regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: (1) Will generate benefits exceeding its costs and is "significant" as defined in Executive Order 12866; (2) is "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

Two comments were received regarding the economic impact of the proposals; one concerning an existing regulation (§ 23.1043 Cooling tests) and one concerning a new proposal (§ 23.1091 Air induction systems). Both of these comments, as well as the FAA's responses, are included above in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has determined that the benefits of the final rule, though not directly quantifiable, will exceed the expected costs. Minor costs, ranging from $240 to $6,000 per certification, are projected for four of the provisions. No costs are attributed to the other provisions. The benefits of the final rule are considered below in four categories: (1) Harmonization, (2) safety, (3) reduced need for special conditions, and (4) clarification.

Harmonization

These changes, in concert with other rulemaking and policy actions, will provide nearly uniform powerplant airworthiness standards for airplanes certificated in the United States and the JAA member countries. The resulting greater uniformity of standards simplifies airworthiness approval for import and export purposes.

Safety

In addition to the harmonization benefits, five provisions of the rule provide additional safety benefits. First, the final rule revises § 23.933(a)(1) to more closely agree with the corresponding turbojet and turbofan reversing system airworthiness standards of part 25. The FAA estimates that this provision will necessitate an additional 100 hours of failure mode and effects analysis at an assumed cost rate of $60 per hour, including labor and overhead. The estimated $6,000 cost applies to each certification. The FAA projects that no additional production or operating costs will result from this provision.

The primary potential benefit of the provision is the additional safety that could result from analyzing the feasible range of reverser system failures, the effects of those failures, and the corresponding capabilities necessary to correct the failure or circumvent its effects. Such an analysis could reduce the possibility that an unanticipated condition with catastrophic potential would remain in the system. In addition to the safety benefit, it is expected that operating benefits and manufacturing economies will result from the uniformity of standards between parts 23 and 25. The FAA is not able to quantify the potential benefits of this provision but has determined that the benefits will exceed the expected minor costs.

Second, the final rule adds a new paragraph (b) to § 23.959 requiring that the effect of any fuel pump failure on the unusable fuel supply be determined. Though not previously required, it has been industry practice to include this information in the Airplane Flight Manual. The FAA estimates that the nominal cost of making this determination will be $240 per certification (4 hours at $60 per hour). In addition, an insignificant cost ($1) will be incurred in adding a table entry to the manual for each airplane that is produced. The fact that this requirement is already standard practice supports the FAA's position that the potential benefit of the provision exceed the minor costs. The safety benefits of this provision derive from the assurance that this vital information will continue to be provided for future airplane models.

Third, under § 23.979, the final rule adds the requirement for commuter category airplanes that an indication be provided at each fueling station in the event of a failure of the shutoff means to stop fuel flow at the maximum level. The FAA estimates that the required device will necessitate an incremental design and development cost of $3,000 per certification (50 hours at $60 per hour) and an additional nominal manufacturing cost of $10 per airplane. The benefit of the provision is the avoidance of a potentially catastrophic condition whereby excess fuel could unknowingly be forced out of the contained fuel system by the pressure fueling system. The FAA has determined that these potential benefits will exceed the minor associated costs.

Fourth, § 23.1041 establishes the requirement that the powerplant cooling system must be able to maintain the temperature of the powerplant components and fluids. The ambient temperature for testing reciprocating engine airplanes is currently required to be corrected to show the capacity of the cooling system at 100°F. Under the amendment, this temperature standard is revised to the "maximum ambient temperature conditions for which approval is requested."

No costs are attributed to this provision. Reciprocating engine airplane manufacturers will continue to have the option to request approval for operations at the existing 100°F temperature. A decision to request approval for a higher temperature would necessitate demonstration of the capability of the cooling system at that temperature. That choice, however, will be made at the manufacturer's discretion and will be based on its decision that any associated incremental cooling system costs would be recovered in the marketplace or offset by other considerations. The potential benefit of this provision is the reduced likelihood that an inadequate cooling system would be relied on during high temperature operations.

Finally, paragraph (a) of § 23.1045 is revised to state more generally that compliance with the cooling margin requirements of § 23.1041 must be shown for all phases of operation, as compared to the four phases of flight currently listed. In effect, the amendment adds the taxi phase.

The FAA estimates that the specific addition of the taxi phase will necessitate an incremental 5 hours of engineering analysis valued at $60 per hour, ror a total of $300 per certification. The potential benefit of this provision is the enhanced safety that could result from evaluating the efficacy of the cooling system during the taxi phase of operation. In the taxi phase of operation, engine power settings and heat production may be generally lower than that experienced during flight, but available air circulation might also be lower. The heat mechanics of the two conditions are distinct and warrant separate evaluation. The FAA has determined that the potential benefits of this provision will exceed the nominal associated costs.

Reduced Need for Special Conditions

The final rule includes five provisions that will replace the need for "special conditions" processing of certain parts or materials that were previously considered as novel or unusual design features. The subjects of these provisions include composite propellers, fuel injection systems for reciprocating engines, induction filters on turbine engines, fuel shutoff controls other than mixture controls, and auxiliary power units. No additional costs are attributed to these provisions. Formalization of the equivalent safety standards and requirements for these subjects obviates the need for special conditions actions and simplifies the certification process for manufacturers.

Clarification

Several unclear provisions of part 23 were revealed during the harmonization review. In response to this finding, the final rule includes a number of no-cost, editorial revisions that clarify the existing requirements. These changes benefit manufacturers by removing potential confusion about the specific standards and requirements necessary for certification.

In summary, the FAA has determined that each of the amendments, as well as the final rule as a whole, will be cost beneficial.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) 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 would have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. Based on implementing FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that this rule will not have a significant economic impact on a substantial number of small entities.

Trade Impact Assessment

The final rule will not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the amended powerplant airworthiness standards have been harmonized with foreign aviation authorities and will reduce restraints on trade.

Federalism Implications

The regulations 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 rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA is revising the airworthiness standards to provide propulsion standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards that have been adopted for the same category airplanes by the Joint Aviation Authorities in Europe. The revisions will reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is significant under Executive Order 12866. In addition, the FAA certifies that this rule 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 rule is considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule 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 Amendments

In consideration of the foregoing, the Federal Aviation Administration amends 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. 106(g), 40113, 44701, 44702, 44704.

§ 23.777 [Amended]

2. Section 23.777(c)(2) is amended by adding the words "single and" between the words "for" and "tandem".

3. The table in § 23.779(b)(1) is amended by adding a new item between the items "mixture" and "carburetor air heat or alternate air" to read as follows:

§ 23.779 Motion and effect of cockpit controls.

* * * * *

(b) * * *

	Motion and effect
(1) *Powerplant controls:*	
* * *	* *
Fuel	Forward for open.
* * *	* *

4. Section 23.901 is amended by revising paragraphs (d)(1) and (d)(2) to read as follows:

§ 23.901 Installation.

* * * * *

(d) * * *

(1) Result in carcass vibration characteristics that do not exceed those established during the type certification of the engine.

(2) Provide continued safe operation without a hazardous loss of power or thrust while being operated in rain for at least three minutes with the rate of water ingestion being not less than four percent, by weight, of the engine induction airflow rate at the maximum installed power or thrust approved for takeoff and at flight idle.

* * * * *

5. Section 23.903 is amended by adding headings to paragraphs (c) and (g), and by revising the heading of paragraph (f) to read as follows:

§ 23.903 Engines.

* * * * *

(c) *Engine isolation.* * * *

* * * * *

(f) *Restart envelope.* * * *

(g) *Restart capability.* * * *

§ 23.907 [Amended]

6. Section 23.907(a) introductory text is amended by removing the phrase "with metal blades or highly stressed metal components" and adding the phrase "other than a conventional fixed-pitch wooden propeller" in its place.

7. Section 23.925 introductory text is revised to read as follows:

§ 23.925 Propeller clearance.

Unless smaller clearances are substantiated, propeller clearances, with the airplane at the most adverse combination of weight and center of gravity, and with the propeller in the most adverse pitch position, may not be less than the following:

* * * * *

§ 23.929 [Amended]

8. Section 23.929 is amended by removing the word "power" and adding, in its place, the word "thrust".

9. Section 23.933 is amended by removing the word "forward" in the two instances in which it is used in paragraph (a)(3); by removing the reference in paragraph (b)(2) that reads "(a)(1)" and adding the reference "(b)(1)" in its place; and by revising paragraph (a)(1) to read as follows:

§ 23.933 Reversing systems.

(a) * * *

(1) Each system intended for ground operation only must be designed so that, during any reversal in flight, the engine will produce no more than flight idle thrust. In addition, it must be shown by analysis or test, or both, that—

(i) Each operable reverser can be restored to the forward thrust position; or

(ii) The airplane is capable of continued safe flight and landing under any possible position of the thrust reverser.

* * * * *

10. Section 23.955 is amended by revising paragraphs (a)(1) through (a)(4) to read as follows:

§ 23.955 Fuel flow.

(a) * * *

(1) The quantity of fuel in the tank may not exceed the amount established as the unusable fuel supply for that tank under § 23.959(a) plus that quantity necessary to show compliance with this section.

(2) If there is a fuel flowmeter, it must be blocked during the flow test and the fuel must flow through the meter or its bypass.

(3) If there is a flowmeter without a bypass, it must not have any probable failure mode that would restrict fuel flow below the level required for this fuel demonstration.

(4) The fuel flow must include that flow necessary for vapor return flow, jet pump drive flow, and for all other purposes for which fuel is used.

* * * * *

11. Section 23.959 is amended by designating the current text of the section as paragraph (a) and by adding a new paragraph (b) to read as follows:

§ 23.959 Unusable fuel supply.

* * * * *

(b) The effect on the usable fuel quantity as a result of a failure of any pump shall be determined.

12. Section 23.963 is amended by removing the reference in paragraph (e) that reads "§ 23.959" and adding the reference "§ 23.959(a)" in its place, and by revising paragraph (b) to read as follows:

§ 23.963 Fuel tanks: general.

* * * * *

(b) Each flexible fuel tank liner must be shown to be suitable for the particular application.

* * * * *

13. Section 23.965 is amended by revising paragraph (b)(3)(i) to read as follows:

§ 23.965 Fuel tank tests.

* * * * *

(b) * * *

(3) * * *

(i) If no frequency of vibration resulting from any rpm within the normal operating range of engine or propeller speeds is critical, the test frequency of vibration is:

(A) The number of cycles per minute obtained by multiplying the maximum continuous propeller speed in rpm by 0.9 for propeller-driven airplanes, and

(B) For non-propeller driven airplanes the test frequency of vibration is 2,000 cycles per minute.

* * * * *

14. Section 23.973(f) is revised to read as follows:

§ 23.973 Fuel tank filler connection.

* * * * *

(f) For airplanes with turbine engines, the inside diameter of the fuel filler opening must be no smaller than 2.95 inches.

15. Section 23.975(a)(5) is revised to read as follows:

§ 23.975 Fuel tank vents and carburetor vapor vents.

(a) * * *

(5) There may be no point in any vent line where moisture can accumulate with the airplane in either the ground or level flight attitudes, unless drainage is

provided. Any drain valve installed must be accessible for drainage;

* * * * *

16. Section 23.979(b) is revised to read as follows:

§ 23.979 Pressure fueling systems.

* * * * *

(b) An automatic shutoff means must be provided to prevent the quantity of fuel in each tank from exceeding the maximum quantity approved for that tank. This means must—

(1) Allow checking for proper shutoff operation before each fueling of the tank; and

(2) For commuter category airplanes, indicate at each fueling station, a failure of the shutoff means to stop the fuel flow at the maximum quantity approved for that tank.

* * * * *

17. Section 23.1001(b)(2) is revised to read as follows:

§ 23.1001 Fuel jettisoning system.

* * * * *

(b) * * *

(2) A climb, at the speed at which the one-engine-inoperative enroute climb data have been established in accordance with § 23.69(b), with the critical engine inoperative and the remaining engines at maximum continuous power; and

* * * * *

§ 23.1013 [Amended]

18. Section 13.1013(d)(1) is amended by removing the word "crankcase".

§ 23.1041 [Amended]

19. Section 23.1041 is amended by adding the phrase "and maximum ambient atmospheric temperature conditions" between the phrases "maximum altitude" and "for which approval".

20. Section 23.1043 is amended by revising paragraphs (a), (c), and (d) to read as follows:

§ 23.1043 Cooling tests.

(a) *General.* Compliance with § 23.1041 must be shown on the basis of tests, for which the following apply:

(1) If the tests are conducted under ambient atmospheric temperature conditions deviating from the maximum for which approval is requested, the recorded powerplant temperatures must be corrected under paragraphs (c) and (d) of this section, unless a more rational correction method is applicable.

(2) No corrected temperature determined under paragraph (a)(1) of this section may exceed established limits.

(3) The fuel used during the cooling tests must be of the minimum grade approved for the engine.

(4) For turbocharged engines, each turbocharger must be operated through that part of the climb profile for which operation with the turbocharger is requested.

(5) For a reciprocating engine, the mixture settings must be the leanest recommended for climb.

* * * * *

(c) *Correction factor (except cylinder barrels).* Temperatures of engine fluids and powerplant components (except cylinder barrels) for which temperature limits are established, must be corrected by adding to them the difference between the maximum ambient atmospheric temperature for the relevant altitude for which approval has been requested and the temperature of the ambient air at the time of the first occurrence of the maximum fluid or component temperature recorded during the cooling test.

(d) *Correction factor for cylinder barrel temperatures.* Cylinder barrel temperatures must be corrected by adding to them 0.7 times the difference between the maximum ambient atmospheric temperature for the relevant altitude for which approval has been requested and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test.

21. Section 23.1045(a) is revised to read as follows:

§ 23.1045 Cooling test procedures for turbine engine powered airplanes.

(a) Compliance with § 23.1041 must be shown for all phases of operation. The airplane must be flown in the configurations, at the speeds, and following the procedures recommended in the Airplane Flight Manual for the relevant stage of flight, that correspond to the applicable performance requirements that are critical to cooling.

* * * * *

22. Section 23.1047 is revised to read as follows:

§ 23.1047 Cooling test procedures for reciprocating engine powered airplanes.

Compliance with § 23.1041 must be shown for the climb (or, for multiengine airplanes with negative one-engine-inoperative rates of climb, the descent) stage of flight. The airplane must be flown in the configurations, at the speeds and following the procedures recommended in the Airplane Flight Manual, that correspond to the applicable performance requirements that are critical to cooling.

23. Section 23.1091(c)(2) is revised to read as follows:

§ 23.1091 Air induction system.

* * * * *

(c) * * *

(2) The airplane must be designed to prevent water or slush on the runway, taxiway, or other airport operating surfaces from being directed into the engine or auxiliary power unit air intake ducts in hazardous quantities. The air intake ducts must be located or protected so as to minimize the hazard of ingestion of foreign matter during takeoff, landing, and taxiing.

§ 23.1093 [Amended]

24. Section 23.1093 is amended by adding the heading *"Reciprocating engines with Superchargers"* to paragraph (c).

25. Section 23.1105(a) is revised to read as follows:

§ 23.1105 Induction system screens.

* * * * *

(a) Each screen must be upstream of the carburetor or fuel injection system.

* * * * *

26. Section 23.1107 introductory text is revised to read as follows:

§ 23.1107 Induction system filters.

If an air filter is used to protect the engine against foreign material particles in the induction air supply—

* * * * *

27. Section 23.1121(g) is revised to read as follows:

§ 23.1121 General.

* * * * *

(g) If significant traps exist, each turbine engine and auxiliary power unit exhaust system must have drains discharging clear of the airplane, in any normal ground and flight attitude, to prevent fuel accumulation after the failure of an attempted engine or auxiliary power unit start.

* * * * *

28. Section 23.1141(b) is revised to read as follows:

§ 23.1141 Powerplant controls: general.

* * * * *

(b) Each flexible control must be shown to be suitable for the particular application.

* * * * *

29. Section 23.1143(f) is amended by revising the introductory text to read as follows:

§ 23.1143 Engine controls.

* * * * *

(f) If a power, thrust, or a fuel control (other than a mixture control) incorporates a fuel shutoff feature, the control must have a means to prevent the inadvertent movement of the control into the off position. The means must—

* * * * *

30. Section 23.1153 is revised to read as follows:

§ 23.1153 Propeller feathering controls.

If there are propeller feathering controls installed, it must be possible to feather each propeller separately. Each control must have a means to prevent inadvertent operation.

31. Section 23.1181 is amended by adding a new paragraph (b)(3) to read as follows:

§ 23.1181 Designated fire zones; regions included.

* * * * *

(b) * * *

(3) Any complete powerplant compartment in which there is no isolation between compressor, accessory, combustor, turbine, and tailpipe sections.

* * * * *

§ 23.1183 [Amended]

32. Section 23.1183(a) is amended by removing the word "approved" in the next to the last sentence, and adding the phrase "shown to be suitable for the particular application" in its place.

33. Section 23.1191(b) is revised to read as follows:

§ 23.1191 Firewalls.

* * * * *

(b) Each firewall or shroud must be constructed so that no hazardous quantity of liquid, gas, or flame can pass from the compartment created by the firewall or shroud to other parts of the airplane.

* * * * *

34. Section 23.1203(e) is revised to read as follows:

§ 23.1203 Fire detector system.

* * * * *

(e) Wiring and other components of each fire detector system in a designated fire zone must be at least fire resistant.

* * * * *

§ 23.1305 [Amended]

35. Section 23.1305(b)(3)(ii) is removed and reserved.

§ 23.1337 [Amended]

36. Section 23.1337(b)(1) is amended by removing the reference "§ 23.959" and adding the reference "§ 23.959(a)" in its place.

Issued in Washington, DC, on January 29, 1996.

David R. Hinson,

Administrator.

[FR Doc. 96–2084 Filed 2–8–96; 8:45 am]

BILLING CODE 4910–13–M

14 CFR Parts 1 and 23

[Docket No. 27807; Amendment Nos. 1–43, 23–50]

RIN 2120–AE61

Airworthiness Standards; Flight Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certification in these categories. This amendment will provide nearly uniform flight airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirement 23, simplifying international airworthiness approval.

EFFECTIVE DATE: March 11, 1996.

FOR FURTHER INFORMATION CONTACT: Lowell Foster, ACE–111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426–5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94–22 (59 FR 37878, July 25, 1994). All comments received in response to Notice 94–22 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment pertain to flight airworthiness standards. Three other final rules are being issued in this **Federal Register** that pertain to airworthiness standards for systems and equipment powerplant, and airframe. These related rulemakings are also part of the harmonization effort. Interested persons should receive all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the United States regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeanne des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and aerobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice No. 94–22 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the flight airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR/part 23 harmonization, which ARAC assigned to the JAR/FAR 23 Harmonization Working Group. The proposal for flight airworthiness standards contained in Notice No. 94–22 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before November 21, 1994. Four commenters responded to Notice No. 94–22. Minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with ARAC, and further review by the FAA.

Discussion of Amendments

Section 1.1 General Definitions

The FAA proposed to amend § 1.1 to add a definition of "maximum speed for stability characteristics, V_{FC}/M_{FC}." This change harmonizes part 1 and JAR 1. The definition is deleted from § 23.175(b)(2).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.3 Airplane Categories

The FAA proposed to revise § 23.3(b)(2) to add an outside limit of 90 degrees in angle of bank for lazy eights, chandelles, and seep turns.

The FAA proposed to revise § 23.3(d) to remove chandelles and lazy eights as approved operations in commuter category airplanes. The FAA does not anticipate any operational need for such maneuvers.

The FAA proposed to revise § 23.3(e) to prohibit type certification of commuter category airplanes in any other category. This rule change will not preclude the type certification of similar airplanes with different model numbers, such as the present Cessna models 500 and 501.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.25 Weight Limits

The FAA proposed to revise § 23.25(a) to clarify that the maximum weight that must be selected is the least of the three choices given in § 23.25(a)(1). The FAA proposed to remove the commuter category zero fuel weight requirement from current § 23.25(a). The requirement was proposed to be removed to § 23.343 by the airframe NPRM, Notice No. 94–20 (59 FR 35198, July 8, 1994). The FAA proposed to remove the reference to standby power rocket engines in § 23.25(a)(1)(iii) and to remove appendix E because this is a rare and obsolete design feature. If a manufacturer proposed to use this approach, the FAA would issue special conditions to ensure adequate airworthiness.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.33 Propeller Speed and Pitch Limits

The FAA proposed to revise § 23.33(b)(1) to remove the reference to V_Y and to replace it with "the all engine(s) operating climb speed specified in § 23.65," to be consistent with other changes in performance requirements. The FAA proposed to revise § 23.33(b)(2) to use "V_{NE}" in place of "never exceed speed," since V_{NE} is defined in part 1, and to remove the word "placarded," which is unnecessary.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.45 General

In Notice of Proposed Rulemaking, Small Airplane Airworthiness Review Program Notice No. 4, Notice No. 90–18 (55 FR 26534, June 28, 1990), the FAA requested comments on the need for weight, altitude, and temperature (WAT) criteria, as information or as a limitation on piston-powered, twin-engine part 23 airplanes. The FAA also requested comments about WAT criteria on turbine-powered twin-engine part 23 airplanes, specifically during takeoff and landing.

WAT criteria is used to determine the maximum weight an airplane can have in relation to altitude and temperature for safe takeoff. This criteria provides pilots with the information needed to determine if a takeoff and climb can be successfully completed if one engine becomes inoperative. WAT criteria has been required under part 23 for commuter category airplanes, at all approved altitudes. A limited WAT criteria has been required for turbine engine powered airplanes at 5,000 feet and at standard temperature plus 40°F, but not for higher altitudes or temperatures. For multiengine powered airplanes, WAT data has been provided by the manufacturer as information to pilots.

The FAA received three comments on mandating WAT criteria in part 23 and addressed these comments in detail in the preamble to Notice 94–22.

Based on statistics and conclusions from an FAA 1991 study (discussed in detail in Notice 94–22) and on comments, the FAA determined that

WAT limits are necessary for safe operation of multiengine airplanes of the type that will be involved in transporting passengers for hire.

The FAA proposed a complete revision of § 23.45 to require weight, altitude, and temperature (WAT) performance accountability for normal, utility, and acrobatic airplanes with a maximum takeoff weight over 6,000 pounds and all turbine-powered airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.49 Stalling Speed

The FAA proposed to revise § 23.49 by reorganizing and editing it for clarification. The FAA's proposed clarification merges, in paragraph (a), the V_{SO} and V_{S1} requirements, which were separated with parallel configuration items under paragraphs (a) and (d).

Other proposed changes to paragraph (a) are as follows:

(1) Proposed paragraph (a)(4) is a requirement that the airplane be in the condition existing in the test, in which V_{SO} and V_{S1} are being used.

(2) Proposed paragraph (a)(5) is a revised version of current paragraph (a)(6). The current requirement states that the center of gravity must be in the most unfavorable position within the allowable landing range. The proposed requirement would state that the center of gravity must be in the position that results in the highest value of V_{SO} and V_{S1}.

(3) Current paragraph (a)(5) is moved to § 23.45(c).

These changes are clarifying and are not an increase in requirements. The only comment received was from JAA, noting the existing disharmony between the JAR and the FAR concerning a V_{SO} more than 61 knots for single-engine airplanes and multiengine airplanes of 6,000 pounds maximum weight or less than do not meet the required minimum rate of climb.

The proposal is adopted as proposed.

Section 23.51 Takeoff Speeds

The FAA proposed to change the paragraph heading from "Takeoff" to "Takeoff speeds" and to incorporate the takeoff speed requirements currently contained in § 23.53. This revision to the heading and the reorganization of takeoff requirements is proposed for harmony with JAR 23.

The FAA proposed to move current § 23.51(a) to § 23.53(a). Current paragraph (a) requires that the distance required to take off and climb over a 50-foot obstacle must be determined with the engines operating within approved operating limitations and with cowl flaps in the normal takeoff position. These requirements for power and cowl flaps are now covered in final § 23.45, paragraphs (c) and (d), and in § 23.1587.

The FAA proposed to remove current § 23.51(b) on measuring seaplane and amphibian takeoff distances. It is a statement of an acceptable method of compliance, and there is no need to address a separate seaplane starting point.

The FAA proposed to remove current § 23.51(c) concerning pilot skills and conditions. It is covered under the general requirements in proposed § 23.45(f).

The FAA proposed to remove current § 23.51(d). The requirements are covered under § 23.45 in commuter category performance and other performance requirements, and the information requirements are covered under § 23.1587.

For multiengine normal, utility, and acrobatic category airplanes, the FAA proposed to transfer the determination of V_R from § 23.53(a) to § 23.51(a) with minor changes in the specified rotation speed. For multiengine airplanes in proposed paragraph (a)(1), the margin between rotation speed and V_{MC} or a margin of 1.10 V_{S1} is established between V_R and stall.

The FAA proposed to define V_R, in proposed paragraph (a), as the speed at which the pilot makes a control input with the intention of lifting the airplane out of contact with the runway or water surface. This definition would apply to tail wheel and tricycle gear airplanes, seaplanes, and single-engine airplanes.

The FAA also proposed to include rotation speeds for single-engine airplanes, seaplanes, and amphibians in paragraph (a). This extends V_R applicability to all part 23 airplanes to establish a safe and standardized procedure that can be used by pilots to achieve AFM takeoff performance. This use of rotation speed is consistent with part 25.

In proposed paragraph (b), the speed at 50 feet is based on current § 23.53(b) with no change in requirements.

For commuter category airplanes, the FAA proposed to move the takeoff speed requirements from § 23.53(c) to proposed § 23.51(c) with editorial changes. The option is added, in proposed (c)(1)(i), for an applicant to determine a V_{MCG} and to establish a V_1 based on V_{MCG} rather than a margin above V_{MCA}.

The only comment on this section was a non-substantive one, in which FAA concurred.

The proposal is adopted as proposed.

Section 23.53 Takeoff Performance

The FAA proposed a new heading for § 23.53 and a content based primarily on the general takeoff performance requirement of the current § 23.51.

The FAA proposed to remove the takeoff speed requirements from current § 23.53 and to place them in § 23.51. (See discussion for § 23.51.) Section 23.53 provides general takeoff performance requirements for normal, utility, acrobatic, and commuter category airplanes. Proposed paragraph (a) is based on current § 23.51(a). Proposed paragraph (b) is a modification of current § 23.1587(a)(5). Proposed paragraph (c) is based on current § 23.51(d).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.55 Accelerate-Stop Distance

The FAA proposed to revise § 23.55 to clarify the accelerate-stop segments and to make editorial changes.

The proposed requirement divides the accelerate-stop maneuver into three segments, rest to V_{EF} (paragraph (a)(1)), V_{EF} to V_1 (paragraph (a)(2)), and V_1 to rest (paragraph (a)(3)). The FAA proposed to remove the following four phrases: First, remove the phrase "in the case of engine failure," from current § 23.55(a)(2) because it is included in paragraph (a)(2). Second, remove the phrase "assuming that * * * the pilot has decided to stop as indicated by application of the first retarding means at the speed V_1," from § 23.55(a)(2) because it is stated in § 23.51(c)(1)(ii). Third, remove the phrase "exceptional skill" from § 23.55(b)(3) because it remains in § 23.45(h)(5)(i). Fourth, remove the phrase "if that means is available with the critical engine inoperative" from § 23.55(b) because it is covered by the safe and reliable requirements of § 23.55(b)(1).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.57 Takeoff Path

The FAA proposed to revise § 23.57 to clarify and to specify the takeoff path segments that must be determined in flight. Proposed paragraph (a) clarifies that the transition to the enroute configuration should be completed on or before reaching 1500 feet above the takeoff surface. Section 23.57(c)(1) requires the slope of the airborne part of the takeoff path to be "positive at each point"; proposed paragraph (c)(1) is revised to "not negative at any point," to allow acceleration in level flight, which is implied by current § 23.61(c). Proposed § 23.57(c)(3) specifies that the climb gradient "must not be less than * * *," as opposed to "may not be less than * * *." The option, in current § 23.57(d), to determine the takeoff path either by continuous demonstration or by synthesis from segments, does not reflect current practice. The best method to determine the takeoff path from rest to 35 feet above the takeoff surface is by a continuous demonstration. The most practical method to determine the takeoff path from 35 feet to 1500 feet above the takeoff surface is by synthesis from segments. Accordingly, § 23.57, paragraphs (d) and (e), incorporates these changes.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.59 Takeoff Distance and Takeoff Run

The FAA proposed to clarify § 23.59 with no substantial change in requirements. A change to the opening text is proposed to clarify that the determination of takeoff run is the applicant's option since the applicant may choose not to present clearway data. In current § 23.59 (a)(2) and (b)(2), the reference to "along the takeoff path," in a takeoff with all engines operating, is proposed to be removed since takeoff path is a one-engine-inoperative condition. Additionally, the FAA proposed to replace the reference to V_{LOF} with the words "liftoff point" to clarify that the requirements specify a point and related distance, not a speed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.63 Climbs: General

The FAA proposed a new § 23.63 to assemble general climb requirements from current §§ 23.65 and 23.67 into a single section and to differentiate between WAT limited airplanes and those airplanes that are not WAT limited. (See discussion under § 23.45.) As proposed, new § 23.63(a)(1) requires that compliance be shown out of ground effect. This requirement is in current § 23.67(e), which applies to commuter category airplanes. New § 23.63(a)(3) requires that compliance must be shown, unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees. This requirement is in current § 23.149 and has been applied generally to part 23 airplanes except commuter category airplanes in certain circumstances.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.65 Climb: All Engines Operating

The FAA proposed to change the applicability of § 23.65(a) from "each airplane," as adopted in Amendment No. 23–45 (58 FR 42136, August 6, 1993), to "each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight." The FAA also proposed to change the phrase "angle of climb" to "climb gradient" and to establish the climb gradient at 8.3 percent for landplanes and 6.7 percent for seaplanes and amphibians with certain specified performance conditions.

In paragraph (a)(4), the FAA proposed to establish a minimum climb speed for multiengine airplanes of not less than the greater of 1.1 V_{MC} and 1.2 V_{S1}, which provides a margin above V_{MC}.

The FAA proposed to move cowl flap requirements, in current paragraph (a)(5), to proposed § 23.45(c).

The FAA proposed to remove § 23.65(b) since these requirements should have been removed in Amendment No. 23–45 (58 FR 42136, August 6, 1993). Since the adoption of Amendment No. 23–45, there is no longer a rate of climb requirement in § 23.65(a).

The FAA proposed to add WAT limits to § 23.65(b), for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See § 23.45 discussion.)

The FAA proposed to move § 23.65(c) to § 23.65(b) and to remove the temperature and altitude requirements since WAT limits are required for turbine engine-powered airplanes and the four percent gradient applies at any approved takeoff ambient condition. In § 23.65(b)(2), the FAA proposed to require the landing gear be down for the test unless the gear can be retracted in not more than seven seconds. This is more stringent than the present requirement, but the same as the proposed one-engine-inoperative takeoff climb requirements, and is considered appropriate to this weight and class of airplane with WAT limits.

The FAA proposed to remove § 23.65(d) since the requirements are covered in amended § 23.45(h)(2) and in current § 23.21.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.66 Takeoff Climb; One-Engine Inoperative

The FAA proposed a new § 23.66 to require the determination of the one-engine-inoperative climb capability of all WAT limited reciprocating engine-powered and turbine engine-powered airplanes immediately after takeoff. Since most reciprocating engine-powered airplanes do not have autofeather, the condition immediately after takeoff can be critical. There is not a minimum climb requirement in this configuration, only the determination of the climb or decent gradient. This information is provided to the pilot in the AFM (see § 23.1587) to allow the pilot to make informed judgments before takeoff.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.67 Climb: One Engine Inoperative

The FAA proposed to reorganize § 23.67 for harmonization with the JAR; to require WAT limits for some airplanes; to require wings level climb up to 400 feet for commuter category airplanes; and to make minor changes in airplane configuration requirements.

Revised § 23.67(a) specifies the climb requirements for non-WAT airplanes with no change in requirements for those airplanes.

Revised § 23.67(b) specifies climb requirements for WAT airplanes. WAT criteria are applied for both reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See the discussion under § 23.45.) Turbine engine-powered airplanes have been subject to limited WAT limitations under § 23.67(c), which the FAA proposed to incorporate into § 23.67(b).

The FAA proposed to change the takeoff flap position for normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less to "wing flaps retracted" from "most favorable position" (§ 23.67(a)(4)). Wing flaps retracted is the position most used in certification and in service for this size of airplane (see new § 23.67 (a)(1)(iv) and (a)(2)(iv)).

The FAA proposed to remove § 23.67(d) since all climb speeds (both all-engine and one engine inoperative) are scheduled and the determination of V_Y is no longer required.

The FAA proposed to redesignate § 23.67(e) for commuter category airplanes as § 23.67(c) with no change in requirements except that the takeoff climb with landing gear extended must be conducted with the landing gear doors open. This is a conservative approach offered by the JAA to specify a definite gear door configuration and to remove the requirement to determine performance during the transient condition of gear doors opening and closing. The FAA proposed to specify, in § 23.67(c)(1), that the first segment climb must be conducted with the wings level and to further specify that the climb speed for the segment must be V_2 instead of the requirement for a range of speeds from V_{LOF} and whatever the applicant selects at gear retraction. Also, the FAA proposed, in § 23.67(c)(2), to require conducting the second segment climb with wings level, which is appropriate for operational scenarios.

The FAA proposed to revise § 23.67 by removing paragraph (e)(1) and by moving the requirements to § 23.67(c) and § 23.63 (a)(1) and (d).

In proposed § 23.67(c)(3), enroute climb, the FAA added a minimum climb speed to ensure an adequate margin above stall speed.

The FAA proposed to redesignate § 23.67(e)(3) as § 23.67(c)(4) and to remove the paragraph heading "Approach" and add "Discontinued approach" in its place. The FAA proposed to clarify, in new § 23.67(c)(4), that the climb gradients must be met at an altitude of 400 feet above the landing surface.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.69 Enroute Climb/Descent

The FAA proposed a new § 23.69 to require the determination of all engine and one-engine-inoperative climb/descent rates and gradients in the enroute configuration under all operational WAT conditions. This information is necessary for enroute flight planning and dispatch. Climb speeds are specified to provide a margin above V_{S1}.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.71 Glide: Single-Engine Airplanes

The FAA proposed a new § 23.71 to require the determination of glide distance and speed for single-engine airplanes. The information is necessary for flight planning and to provide the pilot with information from which to make informed decisions.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.73 Reference Landing Approach Speed

The FAA proposed a new § 23.73 to define the reference landing approach speeds, V_{REF}. Establishing a definition for these speeds simplifies the use of V_{REF} in other portions of the rule. The V_{REF} speeds for the various category airplanes are established as not less than 1.3 V_{SO}. Also, the established speeds consider the appropriate relationship to V_{MC} determined under § 23.149.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.75 Landing Distance

The FAA proposed to revise the heading, reorganize § 23.75 for harmonization with the JAR, add the landing reference speed, V_{REF}, and move the portion on brake pressure to § 23.735, Brakes.

The FAA proposed to remove the reference to the AFM from the introductory paragraph. Part 23, subpart B, is generally used to specify flight test requirements, and part 23, subpart G, is generally used to specify the AFM requirements. The FAA also proposed to revise the introductory paragraph to require landing distances to be determined at standard temperature for each weight and altitude. Service experience has shown that landing distances are not sensitive to temperatures. The use of standard temperature is consistent with WAT requirements. The FAA proposed to remove from the introductory paragraph the reference to "approximately 3 knots" for seaplanes and amphibians because this information is considered advisory material on acceptable methods of compliance.

The FAA proposed to revise § 23.75(a) to add V_{REF} and to require its use. (See § 23.73.)

The FAA proposed to remove § 23.75(b) because § 23.45 specifies these general requirements. New § 23.75(b) clarifies that a constant configuration must be maintained throughout the maneuver.

The FAA proposed to revise § 23.75(d) by adding the requirement to specify the weight that must be considered for the transition to the balked landing conditions. This requirement reflects current industry practice.

The FAA proposed new § 23.75(e) as a general requirement to ensure the reliability of the brakes and tires.

The FAA proposed to revise § 23.75(f) to remove the first use of the word "means" and to add the phrase "retardation means" in its place, and to remove paragraph (f)(3). Paragraph (f)(3) required that no more than average skill shall be required to control the airplane. This topic is covered in § 23.45(f).

The FAA proposed to remove § 23.75(h) because the introductory paragraph of § 23.75 contains commuter category requirements and § 23.1587 requires landing distance correction factors.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.77 Balked Landing

The FAA proposed to revise this section to include additional WAT requirements and to make editorial changes.

The proposed revisions to § 23.77 (a) and (b) differentiate between WAT and non-WAT. (See § 23.45.) Section 23.77(a)(4) adds a new climb speed requirement to ensure that acceleration is not necessary during the transition from landing to balked landing. The climb gradient of § 23.77(b) was selected to be slightly less than the non-WAT airplane sea level requirement in exchange for a balked landing climb capability at all altitudes and temperatures.

The commuter category climb gradient of 3.3 percent specified in § 23.77(c) changes to 3.2 percent for consistency with part 25. Additional editorial changes and deletions are made in § 23.77(c) because the general requirements are covered in final § 23.45.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.143 General

The FAA proposed to revise § 23.143(a) to add the phrase "during all flight phases" to the introductory paragraph and to add "Go-around" to the list of flight phases.

The JAA and FAA decided, during FAA/JAA Harmonization meetings, that the term "go-around" included the all engine balked landings of § 23.77, various all engine and one-engine-inoperative aborted landings specified in the AFM, and the commuter category discontinued approach of § 23.67(c)(4). Balked landing refers only to the all engine balked landing of § 23.77.

The FAA proposed to revise the two-hand roll force in the table of paragraph (c) from 60 to 50 pounds, to be consistent with JAR 25. The FAA also proposed to revise the table to show a one-hand on the rim roll force of 25 pounds. This is an FAA/JAA harmonized value.

Comment: Raytheon Aircraft Company comments that the control force limits table is specifically tied to the flight phases of paragraph (a) and that this "could be interpreted as providing an upper limit of maneuvering force (stick force per g) such that all normal operational maneuvers would have to be performed within a pitch force limit of 75 lbs (wheel, two hands), for unspecified normal acceleration limits."

Raytheon states that this has not been previous policy and could become a costly requirement for larger part 23 aircraft with large cg ranges, "if substantial normal acceleration excursions are considered 'normal' maneuvering." Raytheon recommends "that either the normal acceleration excursions be defined for normal, utility, acrobatic, and commuter categories or the explicit tie to the flight phases in this rule be deleted."

FAA Response: Raytheon's concern is whether "normal acceleration excursions are considered 'normal' maneuvering." They are not.

Section 23.143 has historically been titled "General" and has always been considered broad enough to cover controllability and maneuverability in general. The inclusion of "all flight phases" is considered clarifying, and Raytheon's concern that the concept of normal being expanded is unwarranted. Adopting this proposal would not change current certification practice.

The proposals are adopted as proposed.

Section 23.145 Longitudinal Control

The FAA proposed to revise § 23.145 to change the speed ranges applicable to the takeoff, enroute, and landing configurations.

Editorial changes were also proposed for the introductory text of paragraph (b) with no substantive change.

The FAA proposed in paragraph (b)(2) to change the requirement from "attaining and maintaining, as a minimum, the speed used to show compliance with § 23.77" to "allow the airspeed to transition from 1.3 V_{SO} to 1.3 V_{S1}."

The FAA also proposed to redesignate paragraphs (b)(2) (i) and (ii) as (b)(2) and (b)(3), respectively, and in paragraph (b)(3) to add more specific requirements if gated flap positions are used.

The FAA proposed to change the speed reference from 1.4 V_{SO} to V_{REF} for landing configuration in paragraph (b)(5). The FAA also proposed in paragraph (b)(5) to allow a two-handed control force since use of two hands is considered appropriate for a power off condition because the pilot does not need to change power settings.

Proposed paragraph (b)(6) is the same as former paragraph (b)(3).

In paragraph (c), the FAA proposed to change the speed range for maneuvering capability from "above V_{MO}/M_{MO} and up to V_D/M_D" to "above V_{MO}/M_{MO} and up to the maximum speed shown under § 23.251." This change is considered necessary because a range of speeds can be chosen as V_D/M_D, and reference to § 23.251 ensures a flight demonstrated speed instead of a design speed.

The FAA proposed in paragraph (d) to change the speed that must be maintained for power-off glide from 1.3 V_{SO} to V_{REF}.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.147 Directional and Lateral Control

The FAA proposed to make minor revisions to § 23.147(a) and to add two new requirements in proposed paragraphs (b) and (c). The flaps retracted configuration for § 23.147(a)(4) are consistent with proposed § 23.67.

In proposed § 23.147(b), the FAA proposed to add requirements for multiengine airplanes that, during an enroute climb, when an engine fails the airplane maintains a minimum standard of controllability after allowing for a pilot action delay of two seconds. This proposed change tests for a likely operational scenario and is intended to ensure satisfactory controllability.

In § 23.147(c), the FAA proposed to test for the failure or disconnection of the primary lateral control. This paragraph requires that the airplane exhibit adequate dihedral effect throughout the airplane's operational envelope to ensure continued safe flight and landings if a lateral control disconnects. In addition, this requirement complements the relaxed requirements of proposed § 23.177(b) (see proposal for § 23.177).

Comment: Raytheon comments that there is no basis provided for the new rules proposed in § 23.147 (b) and (c). Raytheon states that the "two second delay and the 45 degree bank appear to be arbitrary choices" and that there "is no comparable FAR requirement."

FAA Response: The values of 2 seconds and 45 degrees in proposed paragraph (b) were determined from § 23.367, "Unsymmetrical loads due to engine failure," which contains a 2 second delay for pilot corrective action. Historically, the 2 second delay and the 45 degree bank angle correlate to a similar requirement used for years by the United Kingdom CAA.

Proposed paragraph (c), failure of the lateral control, is part of a reduction in the overall lateral stability requirements. In Amendment 23–45, the FAA reduced the power requirements for § 23.177(a) in the landing configuration from 75 percent maximum continuous power to the power required to maintain a three degree angle of descent. The § 23.177 requirement essentially demonstrated that the airplane had the wing dihedral effect and rudder control power to raise a low (banked) wing using rudder only. Prior to this amendment, many manufacturers had to install an aileron/rudder interconnect to meet this requirement because of the high power setting. An aileron/rudder interconnect is a mechanism that ties the two controls together such that when one control surface deflects, the other will also deflect. In the case of § 23.177, the pilot uses the rudder, which also deflects the aileron and raises the wing to level. The underlying intent of this rule is to demonstrate that the airplane is controllable after an aileron control failure, similar to the elevator control failure demonstration currently in the requirements. This change, in conjunction with Amendment 23–45, will allow manufacturers to eliminate the need for the aileron/rudder interconnect.

The proposals are adopted as proposed.

Section 23.149 Minimum Control Speed

The FAA proposed to clarify § 23.149, to add a V_{MC} in the landing configuration, and to provide the procedure for determining a ground V_{MC}.

The FAA proposed to clarify § 23.149(a), with no requirement change. The FAA also proposed to clarify § 23.149(b) and to remove the reference to lesser weights in paragraph (b)(4) because the range of weights is covered in § 23.21.

The FAA proposed to revise § 23.149(c) to specify the requirements for a V_{MC} in the landing configuration for all WAT airplanes. This requirement is necessary for WAT airplanes to provide a V_{REF} margin above the V_{MC} determined in the landing configuration. (See proposal for § 23.73.)

The FAA proposed a new § 23.149(f) to contain requirements to determine a V_{MCG} for commuter category airplanes that could, at the option of the applicant, be used to comply with § 23.51. (See § 23.51.)

The only comment came from the JAA, which addressed a known disharmony, V_{SSE}, from a previous rule change.

The proposals are adopted as proposed.

Section 23.153 Control During Landings

The FAA proposed to revise § 23.153 to reference landing speeds to V_{REF} and to reorganize the section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.155 Elevator Control Forces in Maneuvers

The FAA proposed to revise § 23.155 to make changes to the power requirements and gradient of the stick force curve.

The FAA proposed to revise § 23.155(b) to specify the maximum continuous power for the test required by this section instead of allowing a power selected by the applicant as an operating limitation. This revision eliminates an unnecessary power specification and simplifies normal operations for the pilot.

The FAA proposed to revise § 23.155(c) to address stick force gradient to ensure that stick force lightening is not excessive. As stated in the preamble to Notice 94–22, the FAA will issue advisory material on acceptable methods of compliance.

Comment: Raytheon states that proposed paragraph (c) adds a new requirement that there must not be an "excessive decrease" in the gradient of the stick force per g with increasing load factor. Raytheon's concern is that this is a very loosely defined requirement and that the allowable decrease in maneuvering stability may be a function of aircraft size and mission.

FAA Response: The FAA agrees that every airplane is different and that, therefore, each must be considered separately. The FAA does not agree that paragraph (c) is loosely defined. For many of the flight requirements, including "excessive decrease," the FAA must evaluate the individual airplanes to determine if the handling qualities are safe.

This proposal are adopted as proposed.

Section 23.157 Rate of Roll

The FAA proposed to revise § 23.157(d) power and trim requirements and to clarify the flap position. In § 23.157(d)(1), the FAA proposed to clarify that the flaps should be in the landing position and § 23.157(d)(3) makes the power consistent with the approach configuration, which is the configuration being tested. The FAA proposed in § 23.157(d)(4) to relate the trim speed to V_{REF}. (See amendment for § 23.73.)

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.161 Trim

The FAA proposed to revise § 23.161 power, configurations, and speeds.

The FAA proposed to revise § 23.161(a) to state the safety principles underlying the trim requirements and to provide a regulatory requirement for considering conditions that might be encountered outside the requirements addressed in paragraphs (b) through (d).

The FAA proposed to revise § 23.161(b)(1) to add a requirement to trim at M_{MO} in addition to V_{MO} to clarify that the airplane must trim in the Mach limited speed range.

The FAA proposed to revise § 23.161(b)(2) to require lateral and directional trim over a range of 1.4 V_{S1} to V_H or V_{MO}/M_{MO} for commuter category airplanes instead of only the high speed requirement in the present rules.

The FAA proposed, in the introductory paragraph of § 23.161(c), to remove the reference to V_{MO}/M_{MO} because it is covered in the applicable individual sections. In § 23.161(c)(1), the FAA proposed to require trim at takeoff power, as this is a likely operational scenario for most airplanes and the condition should be tested. In addition, the change relates the maximum continuous power climb speeds and configuration to § 23.69, the enroute climb requirement. The FAA proposed to redesignate § 23.161(c)(2) as § 23.161(c)(4), to change the reference V_{REF} for a landing speed, and to add a requirement for the airplane to trim at the steepest landing approach gradient the applicant chooses under § 23.75. The FAA proposed to redesignate § 23.161(c)(3) as § 23.161(c)(2) with editorial changes and to redesignate § 23.161(c)(4) as § 23.161(c)(3) with an increase in the trim speed from 0.9 V_{NO} or V_{MO} to V_{NO} or V_{MO}/M_{MO}. The increase in trim speed is appropriate because descent is permitted and is common at V_{MO}.

In § 23.161(d), the FAA proposed to make editorial changes in the introductory paragraph, to reference the appropriate § 23.67 requirements, and to remove commuter category speed ranges, which are moved to the new § 23.161(e). The FAA proposed to revise § 23.161(d)(4) to specify flaps retracted instead of referencing the § 23.67 configurations. Flaps retracted is the likely sustained configuration where a pilot would need to trim. Also, the flaps retracted configuration for § 23.161(d)(4) is consistent with § 23.67.

The FAA proposed a new § 23.161(e) to ensure that excessive forces are not encountered in commuter category airplanes during extended climbs at V_2 in the takeoff configuration, when climb above 400 feet is required.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.175 Demonstration of Static Longitudinal Stability

The FAA proposed to revise § 23.175(a)(1) to change the flap position from the climb position to the flaps retracted position. This is a clarifying change since virtually all part 23 airplanes use the flaps retracted position for climb. Also, this change aligns the part 23 and part 25 climb static longitudinal stability requirements.

The FAA proposed, in § 23.175(a)(3), to remove the option for the applicant to select some power other than maximum continuous power as an operating limitation. As noted in the discussion of § 23.155, this eliminates a power specification that is unnecessary and simplifies normal operations for the pilot. In § 23.175(a)(4), the FAA proposed to make the trim speed consistent with the enroute all-engine climb speed.

The FAA proposed in § 23.175(b) to rearrange the paragraph with no change in requirements. The definition of V_{FC}/M_{MC} contained in § 23.175(b)(2) is moved to part 1, to harmonize with JAR 1. (See the change to § 1.1.)

The FAA proposed to remove § 23.175(c). The test for gear down cruise static longitudinal stability required under paragraph (c) is considered superfluous to the landing configuration static longitudinal stability test and does not represent a likely operating scenario.

The FAA proposed to redesignate § 23.175(d) as § 23.175(c) with a change to V_{REF} as the trim speed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.177 Static Directional and Lateral Stability

The FAA proposed to revise § 23.177 to remove the requirements for two-control airplanes, to make minor clarifying changes, and to specify an exclusion for acrobatic category airplanes.

The FAA proposed in § 23.177 to remove the introductory phrase concerning three-control airplanes, which is consistent with the removal of the requirements for two-control airplanes in paragraph (b). The two-control airplane regulations were introduced in 1945 but no two-control airplanes have been certificated for several decades and no need is foreseen for these regulations. If an applicant proposes a two-control airplane, the FAA would issue special conditions.

The FAA proposed that, after removing the introductory portion of § 23.177(a), paragraph (a)(1) would be redesignated as (a). In the first sentence, "skid" is replaced with "wings level sideslip" to clarify the intended maneuver. Also, this change increases the power requirement for demonstration of directional stability in the landing configuration. The requirement specifies power necessary to maintain a three degree angle of descent. Maximum continuous power is considered appropriate since directional stability should be maintained during a balked landing, particularly since directional instability is an undesirable characteristic at any point in the flight envelope. Also, the FAA proposed to replace V_A with V_O to be consistent with § 23.1507.

The FAA proposed, in § 23.177(b), to replace "any" with "all" in the first sentence to clarify that all landing gear and flap positions must be addressed. Also, the FAA proposed that the paragraph specify a minimum speed at which static lateral stability may not be negative, as 1.3 V_S, for all configurations except takeoff. This is consistent with the other speeds specified in § 23.177(b) and relieves the requirement for other than takeoff speeds.

The FAA proposed new § 23.177(c) to provide an exclusion for the dihedral effect for acrobatic category airplanes approved for inverted flight. This change recognizes that, in full acrobatic airplanes, the dihedral effect is not a desired characteristic

The addition of § 23.147(c), which ensures lateral control capability without the use of the primary lateral control system, compensates for the relieving nature of proposed § 23.177(b) and the exception from the requirements of § 23.177(b) for acrobatic category airplanes.

The FAA proposes to redesignate § 23.177(a)(3) as § 23.177(d) and to remove the next to the last sentence of § 23.177(d), concerning bank angle and heading. The requirement is not a necessary test condition and a constant heading during the sideslip may be impossible in some airplanes.

Comment: Raytheon commented on the requirements for stability in steady heading slips, which were changed in a previous amendment (Amendment 23–21; 43 FR 2318; January 16, 1978), and recommended clarifying language.

FAA Response: As Raytheon noted, the rule language they believe needs clarification was not addressed in Notice 94–22, and, therefore, is beyond the scope of this rulemaking.

The proposals are adopted as proposed.

Section 23.201 Wings Level Stall

The FAA proposed to remove the two-control airplane requirements, altitude loss requirements, and to make clarifying changes in § 23.201.

The FAA proposed to revise § 23.201(a) to remove the applicability reference for an airplane with independently controlled roll and directional controls and to replace the last word "pitches" with "stalls" since stalls may be defined by other than nose-down pitching.

The FAA proposed to remove § 23.201(b) since it applies to two-control airplanes. (See § 23.177 for discussion of two-control airplane requirements.)

The FAA proposed to divide § 23.201(c) into § 23.201(b), stall recognition, and § 23.201(c), stall recovery. The FAA proposed, in § 23.201(b), to clarify that the test should start from a speed at least 10 knots above the stall speed, with no change in requirements. The FAA proposed to add § 23.201(c) to specify how long the control must be held against the stop. This change ensures that the procedure for determining stall speed is the same procedure used to test stall characteristics. The FAA proposed to remove the last sentence of paragraph (c) on the increase of power because it only applies to altitude loss.

The FAA proposed to remove § 23.201(d), as suggested by the JAA, since the determination of altitude loss, and its subsequent furnishing in the AFM, is not considered information useful to the pilot for safe operation of the airplane.

The FAA proposed new § 23.201(d) based on present § 23.201(e), to clarify that the roll and yaw limits apply during both entry and recovery.

The FAA proposed new § 23.201(e) based on former paragraph (f) with some revisions. During FAA/JAA harmonization meetings, the JAA pointed out to the FAA that, in high power-to-weight ratio airplanes, extreme nose-up attitudes were the principal criteria for use of reduced power, not the presence of undesirable stall characteristics. The FAA concurs, and, therefore, proposed to remove the phrase concerning stall characteristics.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.203 Turning Flight and Accelerated Turning Stalls

The FAA proposed to revise § 23.203 to add the word "turning" before "stalls" and after "accelerated" in the heading, the introductory text, and in paragraphs (a)(2) and (b)(5). This change clarifies that accelerated stalls are performed in turning flight. This clarification reflects current practice.

In § 23.203 (a) and (b), the FAA proposed to reference the stall definition in current § 23.201(b), which is more specific than the present general words "when the stall has fully developed or the elevator has reached its stop."

For clarification, the FAA proposed that paragraph (b)(4) be separated into paragraphs (b)(4) and (b)(5) without substantive change, and that former paragraph (b)(5) be redesignated as paragraph (b)(6).

The FAA proposed in § 23.203(c)(1) to clarify the wing flap positions by changing "each intermediate position" to "each intermediate normal operating position," and in § 23.203(c)(4) to clarify the use of reduced power. (See the final change to § 23.201(f).)

The FAA proposed new paragraph (c)(6) to be consistent with new § 23.207(c)(6) configurations (Amendment No. 23–45).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.205 Critical Engine-Inoperative Stalls

The FAA proposed to remove § 23.205. The stall demonstration conditions are not realistic because the engine operation and power asymmetry do not represent conditions likely to accompany an inadvertent stall in service. Service history shows, however, that stalls with significant power asymmetry can result in a spin, even on airplanes that are certificated to the present requirement. Based on this service history, the FAA determined that the requirement for demonstrating one-engine-inoperative stalls is not effective in ensuring that inadvertent stalls with one engine inoperative will have satisfactory characteristics and be recoverable. Sufficient protection against the hazard of stalling with one engine inoperative is provided by the one-engine-inoperative performance requirements and operating speed margins, coupled with the requirements for determination of V_{MC}, and the addition of a directional and lateral control test under § 23.147(b).

No comments were received on the proposal for this section, and the section is removed as proposed.

Section 23.207 Stall Warning

The FAA proposed, in § 23.207(c), to reference the stall tests required by

§ 23.201(b) and § 23.203(a)(1) and to specify that during such tests for one knot per second deceleration stalls, both wings level and turning, the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots. The FAA proposed to remove the quantified upper limit in the rule of 10 knots or 15 percent of the stalling speed. The upper limit has created problems for manufacturers because of the complex design features required to show compliance. The upper limit requirement is, in effect, replaced by the nuisance stall warning provision in § 23.207(d).

The FAA proposed to divide § 23.207(d) into § 23.207 (d) and (e), with § 23.207(d) on nuisance stall warnings having no change in requirements. In § 23.207(e), the FAA proposed to remove the bottom limit of five knots for decelerations greater than one knot per second and to specify that the stall warning must begin sufficiently before the stall so that the pilot can take corrective action. This is considered appropriate because, at the higher deceleration rates of three to five knots per second, a specified five knots may not be enough stall warning.

The FAA proposed new § 23.207(f) to allow for a mutable stall warning system in acrobatic category airplanes, with automatic arming for takeoff and rearming for landing. This feature allows the pilot to disengage the warning during acrobatics while retaining the safety feature during takeoff and landing.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.221 Spinning

The FAA proposed to change the point to start the one-turn-spin recovery count, to delete the "characteristically incapable of spinning" option, and to make minor changes in acrobatic category spins in § 23.221.

The FAA proposed, in § 23.221(a), to replace the exception for airplanes characteristically incapable of spinning with an exception for airplanes that demonstrate compliance with the optional spin resistant requirements of paragraph (a)(2) of this section. Criteria for an airplane incapable of spinning are unnecessary since criteria for spin resistant airplanes are provided. As proposed, § 23.221(a) changed the point at which the count for the one-turn-spin recovery begins. The change provides a specific point to begin the count by replacing the phrase "after the controls have been applied" with "after initiation of the first control action for recovery." Under the former rules, if an applicant proposed a multiple step recovery procedure that starts with the rudder, then the airplane may be effectively recovered before the start of the recovery count.

The FAA proposed, in § 23.221(a)(1)(ii), to specify that no control force or characteristic can adversely affect prompt recovery. This would be an improvement over the present requirement because it includes yaw and roll as well as pitch control.

The FAA proposed to recodify § 23.221(a)(1) into § 23.221 (a)(1)(i) through (a)(1)(iv) with no changes in the requirements, and to restate § 23.221(a)(2) on spin resistant airplanes with minor editorial changes but with no change in requirements.

The FAA proposed to specify, in § 23,221(b), the emergency egress requirements of § 23.807(b)(5) for those utility category airplanes approved for spinning, thereby cross-referencing the requirements of § 23.807 to the flight requirements.

The FAA proposed, in the introductory paragraph of § 23.221(c), to require acrobatic category airplanes to meet the one-turn-spin requirements of § 23.221(a). This change is needed because acrobatic category airplanes should have sufficient controllability to recover from the developing one-turn-spin under the same conditions as normal category airplanes. The introductory paragraph also cross-references § 23.807 for emergency egress requirements.

The FAA proposed, in § 23.221(c)(1), pertaining to acrobatic category airplanes, to add a requirement for spin recovery after six turns or any greater number of turns for which certification is requested. This rule requires recovery within 1.5 turns after initiation of the first control action for recovery. This requirement ensures recovery within 1.5 turns if the spin mode changes beyond six turns. As an alternative, the applicant may stop at six turns and provide a limitation of six turns.

The FAA proposed, in § 23.221(c)(2), to remove the option to retract flaps during recovery and to provide the applicant with a choice of flaps up or flaps deployed for spin approval. The paragraph continues to prohibit exceeding applicable airspeed limits and limit maneuvering load factors.

The FAA proposed new § 23.221(c)(4) to ensure that the acrobatic spins do not cause pilot incapacitation.

The FAA proposed to remove § 23.221(d), relating to airplanes that are "characteristically incapable of spinning," which has been in the regulation since at least 1937. In 1942, the present weight, center of gravity, and control mis-rig criteria were introduced into Civil Air Regulation (CAR) 03. Since then, the National Aeronautics and Space Administration (NASA) spin resistant requirements, which are based on research, have been developed and incorporated in the regulations by Amendment No. 23–42 (56 FR 344, January 3, 1991). If an applicant proposes a non-spinable airplane, it would be appropriate to apply the requirements of § 23.221(a)(2) as proposed in Notice 90–22.

The only comment on this section was a JAA statement recognizing this as an existing disharmony.

The proposals are adopted as proposed.

Section 23.233 Directional Stability and Control

The FAA proposed to make minor word changes to § 23.233(a) to harmonize this section with the corresponding JAR section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.235 Operation on Unpaved Surfaces

The FAA proposed to revise the heading of § 23.235 and to remove water operating requirements, which are moved to new § 23.237.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.237 Operation on Water

New § 23.237, for operation on water, is the same as the former § 23.235(b).

The only comment on this section is a JAA statement acknowledging an existing disharmony.

The proposal is adopted as proposed.

Section 23.253 High Speed Characteristics

The FAA proposed to remove paragraph (b)(1), since the requirement for piloting strength and skill is covered in § 23.141.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.562 Emergency Landing Dynamic Conditions

The FAA proposed to change the one engine inoperative climb to remove the reference in § 23.562(d) and to add it to § 23.67(a)(1).

The only comment on this section is a JAA statement acknowledging existing disharmony.

The proposal is adopted as proposed.

Section 23.1325 Static Pressure System

The FAA proposed to revise § 23.1325(e) to clarify that the static pressure calibration must be conducted in flight, which is standard practice, and to remove and reserve § 23.1325(f).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1511 Flap Extended Speed

The FAA proposed to remove from § 23.1511(a) references to § 23.457. Section 23.457 is proposed to be removed in a related NPRM, Notice No. 94–20 (59 FR 35196, July 8, 1994), on the airframe.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1521 Powerplant Limitations

The FAA proposed to amend § 23.1521 to require maximum temperature be established for takeoff operation and to require an ambient temperature limit for reciprocating engines in airplanes of more than 6,000 pounds.

The FAA proposed in § 23.1521(b)(5) to require the establishment of maximum cylinder head, liquid coolant, and oil temperature limits for takeoff operation without regard to the allowable time. Previously, temperature limits were required only if the takeoff power operation is permitted for more than two minutes. It is appropriate to require operating temperature limitations because most takeoff operations will exceed two minutes.

The FAA proposed in § 23.1521(e) to require an ambient temperature limit for turbine engine-powered airplanes and reciprocating engine-powered airplanes over 6,000 pounds. These airplanes are subject to WAT limits and the revision will ensure that airplane engines will cool at the ambient temperature limit.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1543 Instrument Markings: General

The FAA proposed new § 23.1543(c) to require that all related instruments be calibrated in compatible units. This is considered essential for safe operation.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1545 Airspeed Indicator

The FAA proposed in § 23.1545(b)(5) to delete any one-engine-inoperative best rate of climb speed marking requirements for WAT limited airplanes. These airplanes already have scheduled speeds in case of an engine failure. The FAA proposed that paragraph (b)(5) apply only to non-WAT airplanes for which the one-engine-operative best rate of climb speed marking has been simplified to reflect performance for sea level at maximum weight. Since the blue arc rule was promulgated in Amendment No. 23–23 (43 FR 50593, October 30, 1978), certification experience has shown that the marking of an arc is unnecessarily complicated. For many airplanes, the approved arc was so narrow that the arc was a line; therefore, final paragraph (b)(5) requires a blue radial line instead of an arc.

The FAA proposed to revise § 23.1545(b)(6) to retain the existing V_{MC} requirement for non-WAT airplanes and to remove the requirement for V_{MC} markings for WAT airplanes since WAT airplanes already have scheduled speeds in case of engine failure.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1553 Fuel Quantity Indicator

The FAA proposed to remove, from § 23.1553, the use of an arc to show a quantity of unusable fuel. The FAA proposed that the rule reference the unusable fuel determination and require only a red radial line, which provides a clearer indication of fuel quantity for pilots.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1555 Control Markings

The FAA proposed to add to § 23.1555(e)(2) a requirement that no controls except emergency controls be red.

Comment: Transport Canada states that certain cockpit controls serve a dual purpose in that they serve normal aircraft operation functions as well as emergency functions. Examples are fuel selector valves and door handles. Transport Canada recommends rule language that recognizes dual usage.

FAA Response: Transport Canada's statement about the existence of dual usage controls is correct. The FAA originally intended to address the dual usage issue in an AC. On further evaluation of the proposed rule language, dual usage controls would be prohibited, if it were adopted as proposed. Therefore, an AC could not be used to allow controls such as the mixture (which is usually red) to continue to be red without violating the rule. The FAA has incorporated the dual usage language in the final rule to avoid confusion between the intent of the rule and the current practice.

The proposal is adopted with the changes mentioned above.

Section 23.1559 Operating Limitations Placard

The FAA proposed to simplify § 23.1559 and to remove duplicate material while requiring essentially the same information. Most airplanes currently operate with an AFM and the new rule places emphasis on using the AFM to define required operating limitations.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1563 Airspeed Placards

The FAA proposed to add a new paragraph (c) to § 23.1563. The new paragraph is applicable to WAT limited airplanes and requires providing the maximum V_{MC} in the takeoff configuration determined under § 23.149(b). This is desirable since the V_{MC} is not marked on the airspeed indicator for these airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1567 Flight Maneuver Placard

The FAA proposed to add new § 23.1567(d) to apply to acrobatic and utility airplanes approved for intentional spinning, which requires a placard listing control actions for recovery. New paragraph (d) proposed to require a statement on the placard that the airplane be recovered when spiral characteristics occur, or after six turns, or at any greater number of turns for which certification tests have been conducted. This paragraph replaces the similar placard requirement in current § 23.1583(e)(3) for acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1581 General

The FAA proposed to make editorial changes in § 23.1581 that recognize WAT limited and non-WAT limited airplanes.

In new § 23.1581(a)(3), the FAA proposed to require information necessary to comply with relevant operating rules. This is a FAR and JAR harmonization item and is considered necessary because some operational rules, such as § 135.391, require flight planning with one-engine-inoperative cruise speed and/or driftdown data. For airplanes operated under part 135 in the United States, it represents no change in requirements.

The FAA proposed § 23.1581(b)(2) to require that only WAT limited airplane AFM's provide data necessary for determining WAT limits.

The FAA proposed new § 23.1581(c) to require the AFM units to be the same as on the instruments.

The FAA proposed new § 23.1581(d) to remove the requirement for a table of contents. This is considered a format requirement and is not appropriate for this section, which specifies AFM content. Section 23.1581(d) is replaced by a requirement to present all operational airspeeds as indicated airspeeds. This adopts current practice.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1583 Operating Limitations

The FAA proposed to revise § 23.1583 operating limitations information for the AFM. The FAA proposed to revise airspeed limitations for commuter category airplanes, to require AFM limitations for WAT limited airplanes, to furnish ambient temperature limitations and smoking restriction information, and to specify types of runway surfaces.

The FAA proposed, in § 23.1583(a)(3), to make V_{MO}/M_{MO} airspeed operating limitations applicable only to turbine powered commuter category airplanes. This is consistent with current practice since no reciprocating engine-powered commuter category airplanes have been proposed.

In § 23.1583(c)(3), the FAA proposed to add takeoff and landing weight limitations for WAT limited airplanes. (See § 23.45.)

The FAA proposed to revise § 23.1583(c)(4) and (c)(5), to renumber § 23.1583(c)(3) and (c)(4), and to make editorial and cross-reference changes. In paragraph (c)(4)(ii), the FAA proposed a new requirement that the AFM include the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if available. This is currently required for transport category airplanes and is necessary for harmonization with JAR 23.

In § 23.1583(c)(6), the FAA proposed to establish the zero wing fuel weight of § 23.343 as a limitation. This provides the pilot with information necessary to prevent exceeding airplane structural limits.

The FAA proposed editorial changes to § 23.1583(d) and, in paragraphs (e)(1) and (e)(2), to remove references to "characteristically incapable of spinning." As discussed under § 23.221, requirements for "characteristically incapable of spinning" are removed.

In § 23.1583(e)(4), the FAA proposed to add a requirement to specify limitations associated with spirals, six turn spins, or more than six turn spins. The requirement for a placard is removed since the requirement is covered in § 23.1567.

The FAA proposed to revise § 23.1583(e)(5) based on former paragraph (e)(4) for commuter category airplanes. This restates the maneuvers as those proposed for commuter category airplanes in § 23.3.

The FAA proposed to revise the heading of § 23.1583(f) and to add a limit negative load factor for acrobatic category airplanes.

The FAA proposed to revise § 23.1583(g) to make editorial changes with no change in requirements and to reference the flight crews' requirements in § 23.1523. As proposed, § 23.1583(k), (l), and (m) are redesignated as § 23.1583(i), (j), and (k).

The FAA proposed new § 23.1583(l) to require baggage and cargo loading limits in the AFM.

The FAA proposed a new § 23.1583(m) to require any special limitations on systems and equipment in the AFM. This provides the pilot with information necessary for safe operation of the airplane systems and equipment.

The FAA proposed a new § 23.1583(n) to require a statement on ambient temperature limitations. Maximum cooling temperature limits have been required for turbine powered airplanes by § 23.1521(e); however, the requirement for the limitation has never been specified in § 23.1583. Proposed § 23.1583(n) requires both maximum and minimum temperature limits if appropriate. A minimum temperature limit provides the pilot with information necessary to avoid airplane damage during low temperature operations.

The FAA proposed a new § 23.1583(o) to state any occupant smoking limitations on the airplane in the AFM.

The FAA proposed a new § 23.1583(p) to require the applicant to state what runway surfaces have been approved.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.1585 Operating Procedures

The FAA proposed to rearrange the material in § 23.1585(a). Also, the FAA proposed to add, for all airplanes, a requirement to paragraph (a) that information in the following areas be included: Unusual flight or ground handling characteristics; maximum demonstrated values of crosswinds; recommended speed for flight in rough air; restarting an engine in flight; and making a normal approach and landing in accordance with §§ 23.73 and 23.75. All of these requirements are in former § 23.1585(a) except for restarting a turbine engine in flight, which is in former paragraph (c)(5) pertaining only to multiengine airplanes. The FAA decided that a restart capability is not required for single reciprocating engine airplanes for the reasons given in the preamble discussion of proposal 3 in Amendment No. 23–43 (58 FR 18958, April 9, 1993). The requirement to provide restart information should apply to single turbine engines, however, since turbine engine designs incorporate a restart capability and inadvertent shutdowns may occur. The requirement for normal approach and landing information, in accordance with the landing requirement in §§ 23.73 and 23.75, is new. This information is necessary to enable pilots to achieve the published landing distances and, if necessary, to safely transition to a balked landing.

The FAA proposed to revise § 23.1585(b) by adding new requirements, which cover gliding after an engine failure for single-engine airplanes, to reference the new requirements proposed in § 23.71.

The FAA proposed to revise § 23.1585(c) to require compliance with paragraph (a) plus the following requirements from former paragraph (c): Approach and landing with an engine inoperative; balked landing with an engine inoperative; and V_{SSE} as determined in § 23.149. The FAA also proposed to redesignate paragraph (c) requirements, information on procedures for continuing a takeoff following an engine failure and continuing a climb following an engine failure, as proposed (e) for normal, utility, and acrobatic multiengines.

The FAA proposed to revise § 23.1585(d) to apply to normal, utility, and acrobatic airplanes, which would have to comply with paragraph (a) and either (b) or (c). These airplanes must also comply with the normal takeoff, climb, and abandoning a takeoff procedures, which were contained in paragraph (a).

The FAA proposed to revise § 23.1585(c), for normal, utility and acrobatic multiengine airplanes, to require compliance with proposed (a), (c), and (d), plus requirements for continuing a takeoff or climb with one engine inoperative that were in former paragraph (c) (1) and (2).

The FAA proposed to revise § 23.1585(f) to amend normal takeoff requirements in former paragraph (a)(2); to add accelerate-stop requirements; and to continue takeoff after engine failure, which was in former paragraph (c)(1).

The FAA proposed no substantial changes in § 23.1585 (g) and (h), which are based on paragraphs (d) and (e), respectively.

The FAA proposed to revise § 23.1585(i) based on former paragraph (g) on the total quantity of usable fuel and to add information on the effect of pump failure on unusable fuel.

The FAA proposed a new § 23.1585(j) to require procedures for safe operation of the airplanes' systems and equipment that, although not previously required, are current industry practice.

In the proposed revision of § 23.1585(h), the commuter category airplane procedures for restarting turbine engines in flight would no longer be necessary because the requirement is covered under paragraph (a)(4).

Comment: The JAA comments that the JAA does not agree with limiting the inflight engine restart requirements of proposed paragraph (a)(4) to turbine engines only.

FAA Response: The JAA comment addresses a known disharmony between the regulations.

No substantive comment was received, and the proposals are adopted as proposed.

Section 23.1587 Performance Information

The FAA proposed to revise § 23.1587 to rearrange existing material, to remove ski plane performance exceptions, to remove the option of calculating approximate performance, to remove staff altitude loss data, and to require overweight landing performance in § 23.1587. Stalling speed requirements of paragraph (c)(2) and (3) are combined and moved to final paragraph (a)(1) and reference and stalling speed requirement of § 23.49. Information on the steady rate and gradient of climb with all engines operating is required by paragraph (a)(2). This is revised from paragraph (a)(2). The climb section referenced in existing § 23.1587(a)(2) is removed and replaced with § 23.69(a).

The FAA proposed to revise paragraph (a)(3) to add that landing distance determined under § 23.75 must be provided for each airport altitude, standard temperature, and type of surface for which it is valid. The FAA proposed to revise paragraph (a)(4) to require information on the effect on landing distance when landing on other than hard surface, as determined under § 23.45(g). The FAA proposed to revise paragraph (a)(5) to cover information on the effects on landing distance of runway slope and wind. This provides the pilot with data with which to account for these factors in his or her takeoff calculations.

The FAA proposed to remove requirements on ski planes from § 23.1587(b) and to add a requirement for a steady angle of climb/descent, as determined under § 23.77(a), in its place. This requirement applies to all non-WAT airplanes.

The FAA proposed to revise paragraph (c) to apply normal, utility, and acrobatic category airplanes, rather than all airplanes. The FAA proposed to remove the stall altitude loss requirements from paragraph (c)(1). As mentioned, the FAA proposed to remove the stalling speed requirements from paragraphs (c)(2) and (c)(3) and to place them in paragraph (a)(1). The FAA also proposed to remove paragraph (c)(4) on cooling climb speed data since most airplanes cool at scheduled speeds.

The FAA proposes to revise paragraph (c)(1) to pertain to the takeoff distance determined under § 23.53 and to the type of surface. Proposed paragraphs (c)(2) and (c)(3) pertain to the effect on takeoff distance of the runway surface, slope, and headwind and tailwind component.

The FAA proposed to revise paragraph (c)(4) to add a new requirement pertaining to the one-engine inoperative takeoff climb/descent performance for WAT-limited airplanes. This pertains only to reciprocating engine-powered airplanes. It provides the pilot with the information determined under final § 23.66.

The FAA proposed a new paragraph (c)(5), which pertains to enroute rate and gradient and climb/descent determined under § 23.69(b), for multiengine airplanes.

The FAA proposed to revised § 23.1587(d) to incorporate into commuter category airplanes the present data and accelerate-stop data, overweight landing performance, and the effect of operation on other than smooth hard surfaces. In addition, in order to consolidate all of the requirements for what must appear in the AFM in subpart G, the FAA proposed that § 23.1587(d)(10) contain the requirement, found in former § 23.1323(d), to show the relationship between IAS and CAS in the AFM.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1589 Loading Information

The FAA proposed to make editorial changes in § 23.1589(b) to simplify the text, with no change in requirements.

No comments were received on the proposal for this section, and it is adopted as proposed.

Appendix E

The FAA proposed to remove Appendix E and to reserve it for the reasons given in the change to § 23.25.

No comments were received on the proposal, and Appendix E is removed and reserved as proposed.

Regulatory Evaluation, Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: (1) Will generate benefits exceeding its costs and is "significant" as defined in the Executive Order; (2) is "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

One comment was received regarding the economics, § 23.143 Controllability and Maneuverability. This comment, as well as the FAA's response, are included in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has identified 15 sections that will result in additional compliance costs to one or more airplane categories. Amendments to five sections will result in cost savings. The greatest costs will be incurred by manufacturers of WAT limited airplanes (e.g., multiengine airplanes with maximum weights of more than 6,000 pounds). When amortized over a production run, the incremental costs will have a negligible impact on airplane prices, less than $100 per airplane.

The primary benefit of the rule will be the cost efficiencies of harmonization with the JAR for those manufacturers that choose to market airplanes in JAA countries as well as to manufacturers in JAA countries that market airplanes in the United States. Other benefits of the rule will be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

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 Federal 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. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The rule will not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the impact of foreign airplanes into the United States. Instead, the flight certification procedures have been harmonized with those of the JAA and will lessen restraints on trade.

Federalism Implications

The regulations 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 rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA is revising the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards of the Joint Aviation Authorities in Europe for the same category airplanes. The revisions will reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is significant under Executive Order 12866. In addition, the FAA certifies that this rule 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 rule is considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule has been placed in the docket. A copy may be obtained by contracting the person identified under **FOR FURTHER INFORMATION CONTACT.**

List of Subjects

14 CFR Part 1

Air transportation.

14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

The Amendments

In consideration of the foregoing, the Federal Aviation Administration amends 14 CFR parts 1 and 23 to read as follows:

PART 1—DEFINITIONS AND ABBREVIATIONS

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

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

2. A new definition is added in alphabetical order to § 1.1 to read as follows:

§ 1.1 General definitions.

* * * * * * *

Maximum speed for stability characteristics, V_{FC}/M_{FC} means a speed that may not be less than a speed midway between maximum operating limit speed (V_{MO}/M_{MO}) and demonstrated flight diving speed (V_{DF}/M_{DF}), except that, for altitudes where the Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

* * * * *

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

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

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

4. Section 23.3 is amended by revising paragraphs (b)(2), (d), and (e) to read as follows:

§ 23.3 Airplane categories.

* * * * *

(b) * * *

(2) Lazy eights, chandelles, and steep turns, or similar maneuvers, in which the angle of bank is more than 60 degrees but not more than 90 degrees.

* * * * *

(d) The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, of 19 or less, and a maximum certificated takeoff weight of 19,000 pounds or less. The commuter category operation is limited to any maneuver incident to normal flying, stalls (except whip stalls), and steep turns, in which the angle of bank is not more than 60 degrees.

(e) Except for commuter category, airplanes may be type certificated in more than one category if the requirements of each requested category are met.

5. Section 23.25 is amended by revising paragraphs (a) introductory text and (a)(1) introductory text, and paragraphs (a)(1)(i) and (a)(1)(iii) to read as follows:

§ 23.25 Weight limits.

(a) *Maximum weight.* The maximum weight is the highest weight at which compliance with each applicable requirement of this part (other than those complied with at the design landing weight) is shown. The maximum weight must be established so that it is—

(1) Not more than the least of—

(i) The highest weight selected by the applicant; or

* * * * *

(iii) The highest weight at which compliance with each applicable flight requirement is shown, and

* * * * *

6. Section 23.33 is amended by revising paragraphs (b) (1) and (2) to read as follows:

§ 23.33 Propeller speed and pitch limits.

(b) * * *

(1) During takeoff and initial climb at the all engine(s) operating climb speed

specified in § 23.65, the propeller must limit the engine r.p.m., at full throttle or at maximum allowable takeoff manifold pressure, to a speed not greater than the maximum allowable takeoff r.p.m.; and

(2) During a closed throttle glide, at V_{NE}, the propeller may not cause an engine speed above 110 percent of maximum continuous speed.

* * * * *

7. Section 23.45 is revised to read as follows:

§ 23.45 General.

(a) Unless otherwise prescribed, the performance requirements of this part must be met for—

(1) Still air and standard atmosphere; and

(2) Ambient atmospheric conditions, for commuter category airplanes, for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and for turbine engine-powered airplanes.

(b) Performance data must be determined over not less than the following ranges of conditions—

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

(2) For reciprocating engine-powered airplanes of 6,000 pounds, or less, maximum weight, temperature from standard to 30 °C above standard; or

(3) For reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes, temperature from standard to 30 °C above standard, or the maximum ambient atmospheric temperature at which compliance with the cooling provisions of § 23.1041 to § 23.1047 is shown, if lower.

(c) Performance data must be determined with the cowl flaps or other means for controlling the engine cooling air supply in the position used in the cooling tests required by § 23.1041 to § 23.1047.

(d) The available propulsive thrust must correspond to engine power, not exceeding the approved power, less—

(1) Installation losses; and

(2) The power absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

(e) The performance, as affected by engine power or thrust, must be based on a relative humidity:

(1) Of 80 percent at and below standard temperature; and

(2) From 80 percent, at the standard temperature, varying linearly down to 34 percent at the standard temperature plus 50 °F.

(f) Unless otherwise prescribed, in determining the takeoff and landing distances, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service. These procedures must be able to be executed consistently by pilots of average skill in atmospheric conditions reasonably expected to be encountered in service.

(g) The following, as applicable, must be determined on a smooth, dry, hard-surfaced runway—

(1) Takeoff distance of § 23.53(b);

(2) Accelerate-stop distance of § 23.55;

(3) Takeoff distance and takeoff run of § 23.59; and

(4) Landing distance of § 23.75.

Note: The effect on these distances of operation on other types of surfaces (for example, grass, gravel) when dry, may be determined or derived and these surfaces listed in the Airplane Flight Manual in accordance with § 23.1583(p).

(h) For commuter category airplanes, the following also apply:

(1) Unless otherwise prescribed, the applicant must select the takeoff, enroute, approach, and landing configurations for the airplane.

(2) The airplane configuration may vary with weight, altitude, and temperature, to the extent that they are compatible with the operating procedures required by paragraph (h)(3) of this section.

(3) Unless otherwise prescribed, in determining the critical-engine-inoperative takeoff performance, takeoff flight path, and accelerate-stop distance, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service.

(4) Procedures for the execution of discontinued approaches and balked landings associated with the conditions prescribed in § 23.67(c)(4) and § 23.77(c) must be established.

(5) The procedures established under paragraphs (h)(3) and (h)(4) of this section must—

(i) Be able to be consistently executed by a crew of average skill in atmospheric conditions reasonably expected to be encountered in service;

(ii) Use methods or devices that are safe and reliable; and

(iii) Include allowance for any reasonably expected time delays in the execution of the procedures.

8. Section 23.49 is revised to read as follows:

§ 23.49 Stalling period.

(a) V_{SO} and V_{S1} are the stalling speeds or the minimum steady flight speeds, in knots (CAS), at which the airplane is controllable with—

(1) For reciprocating engine-powered airplanes, the engine(s) idling, the throttle(s) closed or at not more than the power necessary for zero thrust at a speed not more than 110 percent of the stalling speed;

(2) For turbine engine-powered airplanes, the propulsive thrust not greater than zero at the stalling speed, or, if the resultant thrust has no appreciable effect on the stalling speed, with engine(s) idling and throttle(s) closed;

(3) The propeller(s) in the takeoff position;

(4) The airplane in the condition existing in the test, in which V_{SO} and V_{S1} are being used;

(5) The center of gravity in the position that results in the highest value of V_{SO} and V_{S1}; and

(6) The weight used when V_{SO} and V_{S1} are being used as a factor to determine compliance with a required performance standard.

(b) V_{SO} and V_{S1} must be determined by flight tests, using the procedure and meeting the flight characteristics specified in § 23.201.

(c) Except as provided in paragraph (d) of this section, V_{SO} and V_{S1} at maximum weight must not exceed 61 knots for—

(1) Single-engine airplanes; and

(2) Multiengine airplanes of 6,000 pounds or less maximum weight that cannot meet the minimum rate of climb specified in § 23.67(a) (1) with the critical engine inoperative.

(d) 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(a)(1), must comply with § 23.562(d).

9. Section 23.51 is revised to read as follows:

§ 23.51 Takeoff speeds.

(a) For normal, utility, and acrobatic category airplanes, rotation speed, V_R, is the speed at which the pilot makes a control input, with the intention of lifting the airplane out of contact with the runway or water surface.

(1) For multiengine landplanes, V_R, must not be less than the greater of 1.05 V_{MC}; or 1.10 V_{S1};

(2) For single-engine landplanes, V_R, must not be less than V_{S1}; and

(3) For seaplanes and amphibians taking off from water, V_R, may be any speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete failure of the critical engine.

(b) For normal, utility, and acrobatic category airplanes, the speed at 50 feet above the takeoff surface level must not be less than:

(1) or multiengine airplanes, the highest of—

(i) A speed that is shown to be safe for continued flight (or emergency landing, if applicable) under all reasonably expected conditions, including turbulence and complete failure of the critical engine;

(ii) 1.10 V_{MC}; or

(iii) 1.20 V_{S1}.

(2) For single-engine airplanes, the higher of—

(i) A speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete engine failure; or

(ii) 1.20 V_{S1}.

(c) For commuter category airplanes, the following apply:

(l) V_1 must be established in relation to V_{EF} as follows:

(i) V_{EF} is the calibrated airspeed at which the critical engine is assumed to fail. V_{EF} must be selected by the applicant but must not be less than 1.05 V_{MC} determined under § 23.149(b) or, at the option of the applicant, not less than V_{MCG} determined under § 23.149(f).

(ii) The takeoff decision speed, V_1, is the calibrated airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to continue or discontinue the takeoff. The takeoff decision speed, V_1, must be selected by the applicant but must not be less than V_{EF} plus the speed gained with the critical engine inoperative during the time interval between the instant at which the critical engine is failed and the instant at which the pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during the accelerate-stop determination of § 23.55.

(2) The rotation speed, V_R, in terms of calibrated airspeed, must be selected by the applicant and must not be less than the greatest of the following:

(i) V_1;

(ii) 1.05 V_{MC} determined under § 23.149(b);

(iii) 1.10 V_{S1}; or

(iv) The speed that allows attaining the initial climb-out speed, V_2, before reaching a height of 35 feet above the takeoff surface in accordance with § 23.57(c)(2).

(3) For any given set of conditions, such as weight, altitude, temperature, and configuration, a single value of V_R must be used to show compliance with both the one-engine-inoperative takeoff and all-engines-operating takeoff requirements.

(4) The takeoff safety speed, V_2, in terms of calibrated airspeed, must be selected by the applicant so as to allow the gradient of climb required in § 23.67 (c)(1) and (c)(2) but mut not be less than 1.10 V_{MC} or less than 1.20 V_{S1}.

(5) The one-engine-inoperative takeoff distance, using a normal rotation rate at a speed 5 knots less than V_R, established in accordance with paragraph (c)(2) of this section, must be shown not to exceed the corresponding one-engine-inoperative takeoff distance, determined in accordance with § 23.57 and § 23.59(a)(1), using the established V_R. The takeoff, otherwise performed in accordance with § 23.57, must be continued safely from the point at which the airplane is 35 feet above the takeoff surface and at a speed not less than the established V_2 minus 5 knots.

(6) The applicant must show, with all engines operating, that marked increases in the scheduled takeoff distances, determined in accordance with § 23.59(a)(2), do not result from over-rotation of the airplane or out-of-trim conditions.

10. Section 23.53 is revised to read as follows:

§ 23.53 Takeoff performance.

(a) For normal, utility, and acrobatic category airplanes, the takeoff distance must be determined in accordance with paragraph (b) of this section, using speeds determined in accordance with § 23.51 (a) and (b).

(b) For normal, utility, and acrobatic category airplanes, the distance required to takeoff and climb to a height of 50 feet above the takeoff surface must be determined for each weight, altitude, and temperature within the operational limits established for takeoff with—

(1) Takeoff power on each engine;

(2) Wing flaps in the takeoff position(s); and

(3) Landing gear extended.

(c) For commuter category airplanes, takeoff performance, as required by §§ 23.55 through 23.59, must be determined with the operating engine(s) within approved operating limitations.

11. Section 23.55 is amended by revising paragraph (a) and the introductory text of paragraph (b) to read as follows:

§ 23.55 Accelerate-stop distance.

* * * * *

(a) The accelerate-stop distance is the sum of the distances necessary to—

(1) Accelerate the airplane from a standing start to V_{EF} with all engines operating;

(2) Accelerate the airplane from V_{EF} to V_1, assuming the critical engine fails at V_{EF}; and

(3) Come to a full stop from the point at which V_1 is reached.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distances if that means—

* * * * *

12. Section 23.57 is amended by revising paragraphs (a) introductory text, (b), (c)(1), (c)(3) introductory text, (c)(4), and (d); and by adding a new paragraph (e) to read as follows:

§ 23.57 Takeoff path.

* * * * *

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1500 feet above the takeoff surface at or below which height the transition from the takeoff to the enroute configuration must be completed; and

* * * * *

(b) During the acceleration to speed V_2, the nose gear may be raised off the ground at a speed not less than V_R. However, landing gear retraction must not be initiated until the airplane is airborne.

(c) * * *

(1) The slope of the airborne part of the takeoff path must not be negative at any point;

* * * * *

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb must not be less than—

* * * * *

(4) Except for gear retraction and automatic propeller feathering, the airplane configuration must not be changed, and no change in power that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path to 35 feet above the takeoff surface must be determined by a continuous demonstrated takeoff.

(e) The takeoff path to 35 feet above the takeoff surface must be determined by synthesis from segments; and

(1) The segments must be clearly defined and must be related to distinct changes in configuration, power, and speed;

(2) The weight of the airplane, the configuration, and the power must be assumed constant throughout each segment and must correspond to the most critical condition prevailing in the segment; and

(3) The takeoff flight path must be based on the airplane's performance without utilizing ground effect.

13. Section 23.59 is amended by revising the introductory text, paragraph (a)(2), and paragraph (b) to read as follows:

§ 23.59 Takeoff distance and takeoff run.

For each commuter category airplane, the takeoff distance and, at the option of the applicant, the takeoff run, must be determined.

(a) * * *

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

(b) If the takeoff distance includes a clearway, the takeoff run is the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

14. A new § 23.63 is added to read as follows:

§ 23.63 Climb: general.

(a) Compliance with the requirements of §§ 23.65, 23.66, 23.67, 23.69, and 23.77 must be shown—

(1) Out of ground effect; and

(2) At speeds that are not less than those at which compliance with the powerplant cooling requirements of §§ 23.1041 to 23.1047 has been demonstrated; and

(3) Unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, compliance must be shown with § 23.65(a), § 23.67(a), where appropriate, and § 23.77(a) at maximum takeoff or landing weight, as appropriate, in a standard atmosphere.

(c) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, compliance must be shown at weights as a function of airport altitude and ambient temperature, within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.65(b) and 23.67(b) (1) and (2), where appropriate, for takeoff, and

(2) Section 23.67(b)(2), where appropriate, and § 23.77(b), for landing.

(d) For commuter category airplanes, compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.67(c)(1), 23.67(c)(2), and 23.67(c)(3) for takeoff; and

(2) Sections 23.67(c)(3), 23.67(c)(4), and 23.77(c) for landing.

15. Section 23.65 is revised to read as follows:

§ 23.65 Climb: all engines operating.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must have a steady climb gradient at sea level of at least 8.3 percent for landplanes or 6.7 percet for seaplanes and amphibians with—

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed not less than the greater of 1.1 V_{MC} and 1.2 V_{S1} for multiengine airplanes and not less than 1.2 V_{S1} for single—engine airplanes.

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and turbine engine-powered airplanes in the normal, utility, and acrobatic category must have a steady gradient of climb after takeoff of at least 4 percent with

(1) Take off power on each engine;

(2) The landing gear extended, except that if the landing gear can be retracted in not more than sven seconds, the test may be conducted with the gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed as specified in § 23.65(a)(4).

16. A new § 23.66 is added to read as follows:

§ 23.66 Takeoff climb: One-engine inoperative.

For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the steady gradient of climb or descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

(a) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(b) The remaining engine(s) at takeoff power;

(c) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;

(d) The wing flaps in the takeoff position(s):

(e) The wings level; and

(f) A climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

17. Section 23.67 is revised to read as follows:

§ 23.67 Climb: One engine inoperative.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the following apply:

(1) 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 a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(2) For each airplane that meets the requirements prescribed in § 23.562(d), or that has a V_{SO} of 61 knots or less, the steady gradient of climb or descent at a pressure altitude of 5,000 feet must be determined with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2V_{S1}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category—

(1) The steady gradient of climb at an altitude of 400 feet above the takeoff must be measurably positive with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the takeoff position(s); and

(v) Climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

(2) The steady gradient of climb must not be less than 0.75 percent at an altitude of 1,500 feet above the takeoff surface, or landing surface, as appropriate, with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(c) For commuter category airplanes, the following apply:

(1) *Takeoff; landing gear extended.* The steady gradient of climb at the altitude of the takeoff surface must be measurably positive for two-engine airplanes, not less than 0.3 percent for three-engine airplanes, or 0.5 percent for four-engine airplanes with—

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear extended, and all landing gear doors open;

(iv) The wing flaps in the takeoff position(s);

(v) The wings level; and

(vi) A climb speed equal to V_2.

(2) *Takeoff; landing gear retracted.* The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be not less than 2.0 percent of two-engine airplanes, 2.3 percent for three-engine airplanes, and 2.6 percent for four-engine airplanes with—

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear retracted;

(iv) The wing flaps in the takeoff position(s);

(v) A climb speed equal to V_2.

(3) *Enroute.* The steady gradient of climb at an altitude of 1,500 feet above the takeoff or landing surface, as appropriate, must be not less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes, and 1.7 percent for four-engine airplanes with—

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at not more than maximum continuous power;

(iii) The landing gear retracted;

(iv) The wing flaps retracted; and

(v) A climb speed not less than 1.2 V_{S1}.

(4) *Discontinued approach.* The steady gradient of climb at an altitude of 400 feet above the landing surface must be not less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes, and 2.7 percent for four-engine airplanes, with—

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the approach position(s) in which V_{S1} for these position(s) does not exceed 110 percent of the V_{S1} for the related all-engines-operated landing position(s); and

(v) A climb speed established in connection with normal landing procedures but not exceeding 1.5 V_{S1}.

18. A new § 23.69 is added to read as follows:

§ 23.69 Enroute climb/descent.

(a) *All engines operating.* The steady gradient and rate of climb must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps retracted; and

(4) A climb speed not less than 1.3 V_{S1}.

(b) *One engine inoperative.* The steady gradient and rate of climb/descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at not more than maximum continuous power;

(3) The landing gear retracted;

(4) The wing flaps retracted; and

(5) A climb speed not less than 1.2 V_{S1}.

19. A new § 23.71 is added to read as follows:

§ 23.71 Glide: Single-engine airplanes.

The maximum horizontal distance traveled in still air, in nautical miles, per 1,000 feet of altitude lost in a glide, and the speed necessary to achieve this must be determined with the engine inoperative, its propeller in the minimum drag position, and landing gear and wing flaps in the most favorable available position.

20. A new § 23.73 is added to read as follows:

§ 23.73 Reference landing approach speed.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(b) with the wing flaps in the most extended takeoff position, and 1.3 V_{SO}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

(c) For commuter category airplanes, the reference landing approach speed, V_{REF}, must not be less than the greater of 1.05 V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

21. Section 23.75 is amended by revising the section heading, introductory text, the introductory text of paragraph (a), and paragraphs (b), (d), (e), and (f); and by removing paragraph (h), to read as follows:

§ 23.75 Landing distance.

The horizontal distance necessary to land and come to a complete stop from a point 50 feet above the landing surface must be determined, for standard temperatures at each weight and altitude within the operational limits established for landing, as follows:

(a) A steady approach at not less than V_{REF}, determined in accordance with § 23.73 (a), (b), or (c), as appropriate, must be maintained down to the 50 foot height and—

* * * * *

(b) A constant configuration must be maintained throughout the maneuver.

* * * * *

(d) It must be shown that a safe transition to the balked landing conditions of § 23.77 can be made from the conditions that exist at the 50 foot height, at maximum landing weight, or at the maximum landing weight for altitude and temperature of § 23.63 (c)(2) or (d)(2), as appropriate.

(e) The brakes must be used so as to not cause excessive wear of brakes or tires.

(f) Retardation means other than wheel brakes may be used if that means—

(1) Is safe and reliable; and

(2) Is used so that consistent results can be expected in service.

* * * * *

22. Section 23.77 is revised to read as follows:

§ 23.77 Balked landing.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane at 6,000 pounds or less maximum weight must be able to maintain a steady gradient of climb at sea level of at least 3.3 percent with—

(1) Takeoff power on each engine;

(2) The landing gear extended;

(3) The wing flaps in the landing position, except that if the flaps may safely be retracted in two seconds or less without loss of altitude and without sudden changes of angle of attack, they may be retracted; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(a).

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and each normal, utility, and acrobatic category turbine engine-powered airplane must be able to maintain a steady gradient of climb of at least 2.5 percent with—

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from minimum flight-idle position;

(2) The landing gear extended;

(3) The wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(b).

(c) Each commuter category airplane must be able to maintain a steady gradient of climb of at least 3.2 percent with—

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from the minimum flight idle position;

(2) Landing gear extended;

(3) Wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(c).

23. Section 23.143 is amended by revising paragraphs (a) and (c) to read as follows:

§ 23.143 General.

(a) The airplane must be safely controllable and maneuverable during all flight phases including—

(1) Takeoff;

(2) Climb;

(3) Level flight;

(4) Descent;

(5) Go-around; and

(6) Landing (power on and power off) with the wing flaps extended and retracted.

* * * * *

(c) If marginal conditions exist with regard to required pilot strength, the control forces necessary must be determined by quantitative tests. In no case may the control forces under the conditions specified in paragraphs (a) and (b) of this section exceed those prescribed in the following table:

Values in pounds force applied to the relevant control	Pitch	Roll	Yaw
(a) For temporary application:			
Stick	60	30	....
Wheel (Two hands on rim)	75	50	....
Wheel (One hand on rim)	50	25	....
Rudder Pedal	....	....	150
(b) For prolonged application	10	5	20

24. Section 23.145 is amended by revising paragraph (b) introductory text, paragraphs (b)(2) through (b)(5); adding a new paragraph (b)(6); and revising paragraphs (c) and (d) to read as follows:

§ 23.145 Longitudinal control.

* * * * *

(b) Unless otherwise required, it must be possible to carry out the following maneuvers without requiring the application of single-handed control forces exceeding those specified in § 23.143(c). The trimming controls must not be adjusted during the maneuvers:

* * * * *

(2) With landing gear and flaps extended, power off, and the airplane as nearly as possible in trim at 1.3 V_{SO}, quickly apply takeoff power and retract the flaps as rapidly as possible to the recommended go around setting and allow the airspeed to transition from 1.3 V_{SO} to 1.3 V_{S1}. Retract the gear when a positive rate of climb is established.

(3) With landing gear and flaps extended, in level flight, power necessary to attain level flight at 1.1 V_{SO}, and the airplane as nearly as possible in trim, it must be possible to maintain approximately level flight while retracting the flaps as rapidly as possible with simultaneous application of not more than maximum continuous power. If gated flat positions are provided, the flap retraction may be demonstrated in stages with power and trim reset for level flight at 1.1 V_{S1}, in the initial configuration for each stage—

(i) From the fully extended position to the most extended gated position;

(ii) Between intermediate gated positions, if applicable; and

(iii) From the least extended gated position to the fully retracted position.

(4) With power off, flaps and landing gear retracted and the airplane as nearly as possible in trim at 1.4 V_{S1}, apply takeoff power rapidly while maintaining the same airspeed.

(5) With power off, landing gear and flaps extended, and the airplane as nearly as possible in trim at V_{REF}, obtain and maintain airspeeds between 1.1 V_{SO}, and either 1.7 V_{SO} or V_{FE}, whichever is lower without requiring the application of two-handed control forces exceeding those specified in § 23.143(c).

(6) With maximum takeoff power, landing gear retracted, flaps in the takeoff position, and the airplane as nearly as possible in trim at V_{FE} appropriate to the takeoff flap position, retract the flaps as rapidly as possible while maintaining constant speed.

(c) At speeds above V_{MO}/M_{MO}, and up to the maximum speed shown under § 23.251, a maneuvering capability of 1.5 g must be demonstrated to provide a margin to recover from upset or inadvertent speed increase.

(d) It must be possible, with a pilot control force of not more than 10 pounds, to maintain a speed of not more than V_{REF} during a power-off glide with landing gear and wing flaps extended, for any weight of the airplane, up to and including the maximum weight.

* * * * *

25. Section 23.147 is revised to read as follows:

§ 23.147 Directional and lateral control.

(a) For each multiengine airplane, it must be possible, while holding the wings level within five degrees, to make sudden changes in heading safely in both directions. This ability must be shown at 1.4 V_{S1} with heading changes up to 15 degrees, except that the heading change at which the rudder force corresponds to the limits specified in § 23.143 need not be exceeded, with the—

(1) Critical engine inoperative and its propeller in the minimum drag position;

(2) Remaining engines at maximum continuous power;

(3) Landing gear—

(i) Retracted; and

(ii) Extended; and

(4) Flaps retracted.

(b) For each multiengine airplane, it must be possible to regain full control of the airplane without exceeding a bank angle of 45 degrees, reaching a dangerous attitude or encountering dangerous characteristics, in the event of a sudden and complete failure of the critical engine, making allowance for a delay of two seconds in the initiation of recovery action appropriate to the situation, with the airplane initially in trim, in the following condition:

(1) Maximum continuous power on each engine;

(2) The wing flaps retracted;

(3) The landing gear retracted;

(4) A speed equal to that at which compliance with § 23.69(a) has been shown; and

(5) All propeller controls in the position at which compliance with § 23.69(a) has been shown.

(c) For all airplanes, it must be shown that the airplane is safely controllable without the use of the primary lateral control system in any all-engine configuration(s) and at any speed or altitude within the approved operating envelope. It must also be shown that the airplane's flight characteristics are not impaired below a level needed to permit continued safe flight and the ability to maintain attitudes suitable for a controlled landing without exceeding the operational and structural limitations of the airplane. If a single failure of any one connecting or transmitting link in the lateral control system would also cause the loss of additional control system(s), compliance with the above requirement must be shown with those additional systems also assumed to be inoperative.

26. Section 23.149 is revised to read as follows:

§ 23.149 Minimum control speed.

(a) V_{MC} is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane with that engine still inoperative, and thereafter maintain straight flight at the same speed with an angle of bank of not more than 5 degrees. The method used to simulate critical engine failure must represent the most critical mode of powerplant failure expected in service with respect to controllability.

(b) V_{MC} for takeoff must not exceed 1.2 V_{S1}, where V_{S1} is determined at the maximum takeoff weight. V_{MC} must be determined with the most unfavorable weight and center of gravity position and with the airplane airborne and the ground effect negligible, for the takeoff configuration(s) with—

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for takeoff;

(3) Flaps in the takeoff position(s);

(4) Landing gear retracted; and

(5) All propeller controls in the recommended takeoff position throughout.

(c) For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the conditions of paragraph (a) of this section must also be met for the landing configuration with—

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for an approach, with all engines operating, at V_{REF}, at an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75;

(3) Flaps in the landing position;

(4) Landing gear extended; and

(5) All propeller controls in the position recommended for approach with all engines operating.

(d) A minimum speed to intentionally render the critical engine inoperative must be established and designated as the safe, intentional, one-engine-inoperative speed, V_{SSE}.

(e) At V_{MC}, the rudder pedal force required to maintain control must not exceed 150 pounds and it must not be necessary to reduce power of the operative engine(s). During the maneuver, the airplane must not assume any dangerous attitude and it must be possible to prevent a heading change of more than 20 degrees.

(f) At the option of the applicant, to comply with the requirements of § 23.51(c)(1), V_{MCG} may be determined. V_{MCG} is the minimum control speed on the ground, and is the calibrated airspeed during the takeoff run at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane using the rudder control alone (without the use of nosewheel steering), as limited by 150 pounds of force, and using the lateral control to the extent of keeping the wings level to enable the takeoff to be safely continued. In the determination of V_{MCG}, assuming that the path of the airplane accelerating with all engines operating is along the centerline of the runway, its path from the point at which the critical engine is made inoperative to the point at which recovery to a direction parallel to the centerline is completed may not deviate more than 30 feet laterally from the centerline at any point. V_{MCG} must be established with—

(1) The airplane in each takeoff configuration or, at the option of the applicant, in the most critical takeoff configuration;

(2) Maximum available takeoff power on the operating engines;

(3) The most unfavorable center of gravity;

(4) The airplane trimmed for takeoff; and

(5) The most unfavorable weight in the range of takeoff weights.

27. Section 23.153 is revised to read as follows:

§ 23.153 Control during landings.

It must be possible, while in the landing configuration, to safely complete a landing without exceeding the one-hand control force limits specified in § 23.143(c) following an approach to land—

(a) At a speed of V_{REF} minus 5 knots;

(b) With the airplane in trim, or as nearly as possible in trim and without the trimming control being moved throughout the maneuver;

(c) At an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75; and

(d) With only those power changes, if any, that would be made when landing normally from an approach at V_{REF}.

28. Section 23.155 is amended by revising the introductory text of paragraph (b) and paragraph (b)(1), and by adding a new paragraph (c) to read as follows:

§ 23.155 Elevator control force in maneuvers.

* * * * *

(b) The requirement of paragraph (a) of this section must be met at 75 percent of maximum continuous power for reciprocating engines, or the maximum continuous power for turbine engines, and with the wing flaps and landing gear retracted—

(1) In a turn, with the trim setting used for wings level flight at V_O; and

* * * * *

(c) There must be no excessive decrease in the gradient of the curve of stick force versus maneuvering load factor with increasing load factor.

29. Section 23.157 is amended by revising paragraph (d) to read as follows:

§ 23.157 Rate of roll.

* * * * *

(d) The requirement of paragraph (c) of this section must be met when rolling the airplane in each direction in the following conditions—

(1) Flaps in the landing position(s);

(2) Landing gear extended;

(3) All engines operating at the power for a 3 degree approach; and

(4) The airplane trimmed at V_{REF}.

30. Section 23.161 is amended by revising paragraphs (a), (b)(1), (b)(2), (c), the introductory text of paragraph (d), and (d)(4), and by adding a new paragraph (e) to read as follows:

§ 23.161 Trim.

(a) *General.* Each airplane must meet the trim requirements of this section after being trimmed and without further pressure upon, or movement of, the primary controls or their corresponding trim controls by the pilot or the automatic pilot. In addition, it must be possible, in other conditions of loading, configuration, speed and power to ensure that the pilot will not be unduly fatigued or distracted by the need to apply residual control forces exceeding those for prolonged application of

§ 23.143(c). This applies in normal operation of the airplane and, if applicable, to those conditions associated with the failure of one engine for which performance characteristics are established.

(b) * * *

(1) For normal, utility, and acrobatic category airplanes, at a speed of 0.9 V_H, V_C, or V_{MO}/M_O, whichever is lowest; and

(2) For commuter category airplanes, at all speeds from 1.4 V_{S1} to the lesser of V_H or V_{MO}/M_{MO}.

(c) *Longitudinal trim.* The airplane must maintain longitudinal trim under each of the following conditions:

(1) A climb with—

(i) Takeoff power, landing gear retracted, wing flaps in the takeoff position(s), at the speeds used in determining the climb performance required by § 23.65; and

(ii) Maximum continuous power at the speeds and in the configuration used in determining the climb performance required by § 23.69(a).

(2) Level flight at all speeds from the lesser of V_H and either V_{NO} or V_{MO}/M_{MO} (as appropriate), to 1.4 V_{S1}, with the landing gear and flaps retracted.

(3) A descent at V_{NO} or V_{MO}/M_{MO}, whichever is applicable, with power off and with the landing gear and flaps retracted.

(4) Approach with landing gear extended and with—

(i) A 3 degree angle of descent, with flaps retracted and at a speed of 1.4 V_{S1};

(ii) A 3 degree angle of descent, flaps in the landing position(s) at V_{REF}; and

(iii) An approach gradient equal to the steepest used in the landing distance demonstrations of § 23.75, flaps in the landing position(s) at V_{REF}.

(d) In addition, each multiple airplane must maintain longitudinal and directional trim, and the lateral control force must not exceed 5 pounds at the speed used in complying with § 23.67(a), (b)(2), or (c)(3), as appropriate, with—

* * * * *

(4) Wing flaps retracted; and

* * * * * * *

(e) In addition, each commuter category airplane for which, in the determination of the takeoff path in accordance with § 23.57, the climb in the takeoff configuration at V_2 extends beyond 400 feet above the takeoff surface, it must be possible to reduce the longitudinal and lateral control forces to 10 pounds and 5 pounds, respectively, and the directional control force must not exceed 50 pounds at V_2 with—

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at takeoff power;

(3) Landing gear retracted;

(4) Wing flaps in the takeoff position(s); and

(5) An angle of bank not exceeding 5 degrees.

31. Section 23.175 is revised to read as follows:

§ 23.175 Demonstration of static longitudinal stability.

Static longitudinal stability must be shown as follows:

(a) *Climb.* The stick force curve must have a stable slope at speeds between 85 and 115 percent of the trim speed, with—

(1) Flaps retracted;

(2) Landing gear retracted;

(3) Maximum continuous power; and

(4) The airplane trimmed at the speed used in determining the climb performance required by § 23.69(a).

(b) *Cruise.* With flaps and landing gear retracted and the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to V_{NO} or V_{MO}/M_{MO}, as appropriate, except that the speed need not exceed V_H—

(1) For normal, utility, and acrobatic category airplanes, the stick force curve must have a stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than 1.3 V_{S1}; or

(ii) For airplanes with V_{NE} established under § 23.1505(a), at speeds greater than V_{NE}; or

(iii) For airplanes with V_{MO}/M_{MO} established under § 23.1505(c), at speeds greater than V_{FC}/M_{FC}.

(2) For commuter category airplanes, the stick force curve must have a stable slope at all speeds within a range of 50 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than 1.4 V_{S1}; or

(ii) At speeds greater than V_{FC}/M_{FC}; or

(iii) At speeds that require a stick force greater than 50 pounds.

(c) *Landing.* The stick force curve must have a stable slope at speeds between 1.1 V_{S1} and 1.8 V_{S1} with—

(1) Flaps in the landing position;

(2) Landing gear extended; and

(3) The airplane trimmed at—

(i) V_{REF}, or the minimum trim speed if higher, with power off; and

(ii) V_{REF} with enough power to maintain a 3 degree angle of descent.

32. Section 23.177 is revised to read as follows:

§ 23.177 Static directional and lateral stability.

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from 1.2 V_{S1} up to the maximum allowable speed for the condition being investigated. The angel of sideslip for these tests must be appropriate to the type of airplane. At larger angles of sideslip, up to that at which full rudder is used or a control force limit in § 23.143 is reached, whichever occurs first, and at speeds from 1.2 V_{S1} to V_O, the rudder pedal force must not reverse.

(b) The static lateral stability, as shown by the tendency to raise the low wing in a sideslip, must be positive for all landing gear and flap positions. This must be shown with symmetrical power up to 75 percent of maximum continuous power at speeds above 1.2 V_{S1} in the take off configuration(s) and at speeds above 1.3 V_{S1} in other configurations, up to the maximum allowable speed for the configuration being investigated, in the takeoff, climb, cruise, and approach configurations. For the landing configuration, the power must be that necessary to maintain a 3 degree angle of descent in coordinated flight. The static lateral stability must not be negative at 1.2 V_{S1} in the takeoff configuration, or at 1.3 V_{S1} in other configurations. The angle of sideslip for these tests must be appropriate to the type of airplane, but in no case may the constant heading sideslip angle be less than that obtainable with a 10 degree bank, or if less, the maximum bank angle obtainable with full rudder deflection or 150 pound rudder force.

(c) Paragraph (b) of this section does not apply to acrobatic category airplanes certificated for inverted flight.

(d) In straight, steady slips at 1.2 V_{S1} for any landing gear and flap positions, and for any symmetrical power conditions up to 50 percent of maximum continuous power, the aileron and rudder control movements and forces must increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. At larger slip angles, up to the angle at which full rudder or aileron control is used or a control force limit contained in § 23.143 is reached, the aileron and rudder control movements and forces must not reverse as the angle of sideslip is increased. Rapid entry into, and recovery from, a maximum sideslip considered appropriate for the airplane must not result in uncontrollable flight characteristics.

33. Section 23.201 is revised to read as follows:

§ 23.201 Wings level stall.

(a) It must be possible to produce and to correct roll by unreversed use of the rolling control and to produce and to correct yaw by unreversed use of the directional control, up to the time the airplane stalls.

(b) The wings level stall characteristics must be demonstrated in flight as follows. Starting from a speed at least 10 knots above the stall speed, the elevator control must be pulled back so that the rate of speed reduction will not exceed one knot per second until a stall is produced, as shown by either:

(1) An uncontrollable downward pitching motion of the airplane;

(2) A downward pitching motion of the airplane that results from the activation of a stall avoidance device (for example, stick pusher); or

(3) The control reaching the stop.

(c) Normal use of elevator control for recovery is allowed after the downward pitching motion of paragraphs (b)(1) or (b)(2) of this section has unmistakably been produced, or after the control has been held against the stop for not less than the longer of two seconds or the time employed in the minimum steady slight speed determination of § 23.49.

(d) During the entry into and the recovery from the maneuver, it must be possible to prevent more than 15 degrees of roll or yaw by the normal use of controls.

(e) Compliance with the requirements of this section must be shown under the following conditions:

(1) *Wing flaps.* Retracted, fully extended, and each intermediate normal operating position.

(2) *Landing gear.* Retracted and extended.

(3) *Cowl flaps.* Appropriate to configuration.

(4) *Power:*

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power result in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{SO}, except that the power may not be less than 50 percent of maximum continuous power.

(5) *Trim.* The airplane trimmed at a speed as near 1.5 V_{S1} as practicable.

(6) *Propeller.* Full increase r.p.m. position for the power off condition.

34. Section 23.203 is amended by revising the section heading and introductory text, paragraph (a), the introductory text of paragraph (b), paragraphs (b)(4) and (b)(5), the introductory text of paragraph (c), and paragraphs (c)(1) and (c)(4), and by adding new paragraphs (b)(6) and (c)(6) to read as follows:

§ 23.203 Turning flight and accelerated turning stalls.

Turning flight and accelerated turning stalls must be demonstrated in tests as follows:

(a) Establish and maintain a coordinated turn in a 30 degree bank. Reduce speed by steadily and progressively tightening the turn with the elevator until the airplane is stalled, as defined in § 23.201(b). The rate of speed reduction must be constant, and—

(1) For a turning flight stall, may not exceed one knot per second; and

(2) For an accelerated turning stall, be 3 to 5 knots per second with steadily increasing normal acceleration.

(b) After the airplane has stalled, as defined in § 23.201(b), it must be possible to regain wings level flight by normal use of the flight controls, but without increasing power and without—

* * * * *

(4) Exceeding a bank angle of 60 degrees in the original direction of the turn or 30 degrees in the opposite direction in the case of turning flight stalls;

(5) Exceeding a bank angle of 90 degrees in the original direction of the turn or 60 degrees in the opposite direction in the case of accelerated turning stalls; and

(6) Exceeding the maximum permissible speed or allowable limit load factor.

(c) Compliance with the requirements of this section must be shown under the following conditions:

(1) *Wing flaps:* Retracted, fully extended, and each intermediate normal operating position;

* * * * *

(4) *Power:*

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power results in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{SO}, except that the power may not be less than 50 percent of maximum continuous power.

* * * * *

(6) *Propeller.* Full increase rpm position for the power off condition.

§ 23.205 [Removed]

35. Section 23.205 is removed.

36. Section 23.207 is amended by revising paragraphs (c) and (d), and by adding new paragraphs (e) and (f) to read as follows:

§ 23.207 Stall warning.

* * * * *

(c) During the stall tests required by § 23.201(b) and § 23.203(a)(1), the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots and must continue until the stall occurs.

(d) When following procedures furnished in accordance with § 23.1585, the stall warning must not occur during a takeoff with all engines operating, a takeoff continued with one engine inoperative, or during an approach to landing.

(e) During the stall tests required by § 23.203(a)(2), the stall warning must begin sufficiently in advance of the stall for the stall to be averted by pilot action taken after the stall warning first occurs.

(f) For acrobatic category airplanes, an artificial stall warning may be mutable, provided that it is armed automatically during takeoff and rearmed automatically in the approach configuration.

37. Section 23.221 is revised to read as follows:

§ 23.221 Spinning.

(a) *Normal category airplanes.* A single-engine, normal category airplane must be able to recover from a one-turn spin or a three-second spin, whichever takes longer, in not more than one additional turn after initiation of the first control action for recovery, or demonstrate compliance with the optional spin resistant requirements of this section.

(1) The following apply to one turn or three second spins:

(i) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and positive limit maneuvering load factor must not be exceeded;

(ii) No control forces or characteristic encountered during the spin or recovery may adversely affect prompt recovery;

(iii) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin; and

(iv) For the flaps-extended condition, the flaps may be retracted during the recovery but not before rotation has ceased.

(2) At the applicant's option, the airplane may be demonstrated to be spin resistant by the following:

(i) During the stall maneuver contained in § 23.201, the pitch control must be pulled back and held against the stop. Then, using ailerons and rudders in the proper direction, it must be possible to maintain wings-level flight within 15 degrees of bank and to roll the airplane from a 30 degree bank in one direction to a 30 degree bank in the other direction;

(ii) Reduce the airplane speed using pitch control at a rate of approximately one knot per second until the pitch control reaches the stop; then, with the pitch control pulled back and held against the stop, apply full rudder control in a manner to promote spin entry for a period of seven seconds or through a 360 degree heading change, whichever occurs first. If the 360 degree heading change is reached first, it must have taken no fewer than four seconds. This maneuver must be performed first with the ailerons in the neutral position, and then with the ailerons deflected opposite the direction of turn in the most adverse manner. Power and airplane configuration must be set in accordance with § 23.201(e) without change during the maneuver. At the end of seven seconds or a 360 degree heading change, the airplane must respond immediately and normally to primary flight controls applied to regain coordinated, unstalled flight without reversal of control effect and without exceeding the temporary control forces specified by § 23.143(c); and

(iii) Compliance with §§ 23.201 and 23.203 must be demonstrated with the airplane in uncoordinated flight, corresponding to one ball width displacement on a slip-skid indicator, unless one ball width displacement cannot be obtained with full rudder, in which case the demonstration must be with full rudder applied.

(b) *Utility category airplanes.* A utility category airplane must meet the requirements of paragraph (a) of this section. In addition, the requirements of paragraph (c) of this section and § 23.807(b)(7) must be met if approval for spinning is requested.

(c) *Acrobatic category airplanes.* An acrobatic category airplane must meet the spin requirements of paragraph (a) of this section and § 23.807(b)(6). In addition, the following requirements must be met in each configuration for which approval for spinning is requested:

(1) The airplane must recover from any point in a spin up to and including six turns, or any greater number of turns for which certification is requested, in not more than one and one-half additional turns after initiation of the first control action for recovery. However, beyond three turns, the spin may be discontinued if spiral characteristics appear.

(2) The applicable airspeed limits and limit maneuvering load factors must not be exceeded. For flaps-extended configurations for which approval is requested, the flaps must not be retracted during the recovery.

(3) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin.

(4) There must be no characteristics during the spin (such as excessive rates of rotation or extreme oscillatory motion) that might prevent a successful recovery due to disorientation or incapacitation of the pilot.

38. Section 23.233(a) is revised to read as follows:

§ 23.233 Directional stability and control.

(a) A 90 degree cross-component of wind velocity, demonstrated to be safe for taxiing, takeoff, and landing must be established and must be not less than 0.2 V_{SO}.

* * * * *

39. Section 23.235 is revised to read as follows:

§ 23.235 Operation on unpaved surfaces.

The airplane must be demonstrated to have satisfactory characteristics and the shock-absorbing mechanism must not damage the structure of the airplane when the airplane is taxied on the roughest ground that may reasonably be expected in normal operation and when takeoffs and landings are performed on unpaved runways having the roughest surface that may reasonably be expected in normal operation.

40. A new § 23.237 is added to read as follows:

§ 23.237 Operation on water.

A wave height, demonstrated to be safe for operation, and any necessary water handling procedures for seaplanes and amphibians must be established.

§ 23.253 [Amended]

41. Section 23.253 is amended by removing paragraph (b)(1) and by redesignating paragraphs (b)(2) and (b)(3) as paragraphs (b)(1) and (b)(2), respectively.

42. Section 23.562(d) introductory text is revised to read as follows:

§ 23.562 Emergency landing dynamic 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(a)(1);

* * * * *

43. Section 23.1325 is amended by revising paragraph (e), by removing and reserving paragraph (f) to read as follows:

§ 23.1325 Static pressure system.

* * * * *

(e) Each static pressure system must be calibrated in flight to determine the system error. The system error, in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, may not exceed ±30 feet per 100 knot speed for the appropriate configuration in the speed range between 1.3 V_{SO} with flaps extended, and 1.8 V_{S1} with flaps retracted. However, the error need not be less than 30 feet.

(f) [Reserved]

* * * * *

44. Section 23.1511 is amended by revising paragraphs (a)(1) and (a)(2) to read as follows:

§ 23.1511 Flap extended speed.

(a) * * *

(1) Not less than the minimum value of V_F allowed in § 23.345(b); and

(2) Not more than V_F established under § 23.345(a), (c), and (d).

* * * * *

45. Section 23.1521 is amended by revising paragraphs (b)(5) and (e) to read as follows:

§ 23.1521 Powerplant limitations.

* * * * *

(b) * * *

(5) The maximum allowable cylinder head (as applicable), liquid coolant and oil temperatures.

* * * * *

(e) *Ambient temperature.* For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, ambient temperature limitations (including limitations for winterization installations if applicable) must be established as the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 23.1041 through 23.1047 is shown.

46. Section 23.1543(c) is added to read as follows:

§ 23.1543 Instrument markings: General.

* * * * *

(c) All related instruments must be calibrated in compatible units.

47. Section 23.1545 is amended by revising paragraphs (b)(5) and (b)(6) to read as follows:

§ 23.1545 Airspeed indicator.

* * * * *

(b) * * *

(5) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the speed at which compliance has been shown with § 23.69(b) relating to rate of climb at maximum weight and at sea level, a blue radial line.

(6) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the maximum value of minimum control speed, V_{MC}, (one-engine-inoperative) determined under § 23.149(b), a red radial line.

* * * * *

48. Section 23.1553 is revised to read as follows:

§ 23.1553 Fuel quantity indicator.

A red radial line must be marked on each indicator at the calibrated zero reading, as specified in § 23.1337(b)(1).

49. Section 23.1555(e)(2) is revised to read as follows:

§ 23.1555 Control markings.

* * * * *

(e) * * *

(2) Each emergency control must be red and must be marked as to method of operation. No control other than an emergency control, or a control that serves an emergency function in addition to its other functions, shall be this color.

50. Section 23.1559 is revised to read as follows:

§ 23.1559 Operating limitations placard.

(a) There must be a placard in clear view of the pilot stating—

(1) That the airplane must be operated in accordance with the Airplane Flight Manual; and

(2) The certification category of the airplane to which the placards apply.

(b) For airplanes certificated in more than one category, there must be a placard in clear view of the pilot stating that other limitations are contained in the Airplane Flight Manual.

(c) There must be a placard in clear view of the pilot that specifies the kind of operations to which the operation of the airplane is limited or from which it is prohibited under § 23.1525.

51. Section 23.1563(c) is added to read as follows:

§ 23.1563 Airspeed placards.

* * * * *

(c) For reciprocating multiengine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes, the maximum value of the minimum control speed, V_{MC} (one-engine-inoperative) determined under § 23.149(b).

52. Section 23.1567(d) is added to read as follows:

§ 23.1567 Flight maneuver placard.

* * * * *

(d) For acrobatic category airplanes and utility category airplanes approved for spinning, there must be a placard in clear view of the pilot—

(1) Listing the control actions for recovery from spinning maneuvers; and

(2) Stating that recovery must be initiated when spiral characteristics appear, or after not more than six turns or not more than any greater number of turns for which the airplane has been certificated.

53. Section 23.1581 is amended by adding new paragraphs (a)(3) and (c), and by revising the introductory text of paragraph (b)(2) and paragraph (d) to read as follows:

§ 23.1581 General.

(a) * * *

(3) Further information necessary to comply with the relevant operating rules.

(b) * * *

(2) The requirements of paragraph (b)(1) of this section do not apply to reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, if the following is met:

* * * * *

(c) The units used in the Airplane Flight Manual must be the same as those marked on the appropriate instruments and placards.

(d) All Airplane Flight Manual operational airspeeds, unless otherwise specified, must be presented as indicated airspeeds.

* * * * *

54. Section 23.1583 is amended by revising the introductory text, and paragraphs (a)(3) introductory text, (a)(3)(i), (c)(3), (c)(4), (d), (e), (f), and (g); by redesignating paragraphs (k), (l), and (m) as paragraphs (i), (j), and (k), respectively, and revising them; and by adding new paragraphs (c)(5), (c)(6), (l), (m), (n), (o), and (p) to read as follows:

§ 23.1583 Operating limitations.

The Airplane Flight Manual must contain operating limitations determined under this part 23, including the following—

(a) * * *

(3) In addition, for turbine powered commuter category airplanes—

(i) The maximum operating limit speed, V_{MO}/M_{MO} and a statement that this speed must not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training;

* * * * *

(c) * * *

(3) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and for turbine engine-powered airplanes in the normal, utility, and acrobatic category, performance operating limitations as follows—

(i) The maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(1).

(ii) The maximum landing weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(2).

(4) For commuter category airplanes, the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which—

(i) The airplane complies with the climb requirements of § 23.63(d)(1); and

(ii) The accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if utilized; and either:

(iii) The takeoff distance determined under § 23.59(a) is equal to the available runway length; or

(iv) At the option of the applicant, the takeoff distance determined under § 23.59(a) is equal to the available runway length plus the length of any clearway and the takeoff run determined under § 23.59(b) is equal to the available runway length.

(5) For commuter category airplanes, the maximum landing weight for each airport altitude within the range selected by the applicant at which—

(i) The airplane complies with the climb requirements of § 23.63(d)(2) for ambient temperatures within the range selected by the applicant; and

(ii) The landing distance determined under § 23.75 for standard temperatures is equal to the available runway length.

(6) The maximum zero wing fuel weight, where relevant, as established in accordance with § 23.343.

(d) *Center of gravity.* The established center of gravity limits.

(e) *Maneuvers.* The following authorized maneuvers, appropriate airspeed limitations, and unauthorized maneuvers, as prescribed in this section.

(1) *Normal category airplanes.* No acrobatic maneuvers, including spins, are authorized.

(2) *Utility category airplanes.* A list of authorized maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations. No other maneuver is authorized.

(3) *Acrobatic category airplanes.* A list of approved flight maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations.

(4) *Acrobatic category airplanes and utility category airplanes approved for spinning.* Spin recovery procedure established to show compliance with § 23.221(c).

(5) *Commuter category airplanes.* Maneuvers are limited to any maneuver incident to normal flying, stalls, (except whip stalls) and steep turns in which the angle of bank is not more than 60 degrees.

(f) *Maneuver load factor.* The positive limit load factors in g's, and, in addition, the negative limit load factor for acrobatic category airplanes.

(g) *Minimum flight crew.* The number and functions of the minimum flight crew determined under § 23.1523.

* * * * *

(i) *Maximum operating altitude.* The maximum altitude established under § 23.1527.

(j) *Maximum passenger seating configuration.* The maximum passenger seating configuration.

(k) *Allowable lateral fuel loading.* The maximum allowable lateral fuel loading differential, if less than the maximum possible.

(l) *Baggage and cargo loading.* The following information for each baggage and cargo compartment or zone—

(1) The maximum allowable load; and

(2) The maximum intensity of loading.

(m) *Systems.* Any limitations on the use of airplane systems and equipment.

(n) *Ambient temperatures.* Where appropriate, maximum and minimum ambient air temperatures for operation.

(o) *Smoking.* Any restrictions on smoking in the airplane.

(p) *Types of surface.* A statement of the types of surface on which operations may be conducted. (See § 23.45(g) and § 23.1587 (a)(4), (c)(2), and (d)(4)).

55. Section 23.1585 is revised to read as follows:

§ 23.1585 Operating procedures.

(a) For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the achievement of the scheduled performance must be furnished, including—

(1) An explanation of significant or unusual flight or ground handling characteristics;

(2) The maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds;

(3) A recommended speed for flight in rough air. This speed must be chosen to protect against the occurrence, as a result of gusts, of structural damage to the airplane and loss of control (for example, stalling);

(4) Procedures for restarting any turbine engine in flight, including the effects of altitude; and

(5) Procedures, speeds, and configuration(s) for making a normal approach and landing, in accordance with §§ 23.73 and 23.75, and a transition to the balked landing condition.

(6) For seaplanes and amphibians, water handling procedures and the demonstrated wave height.

(b) In addition to paragraph (a) of this section, for all single-engine airplanes, the procedures, speeds, and configuration(s) for a glide following engine failure, in accordance with § 23.71 and the subsequent forced landing, must be furnished.

(c) In addition to paragraph (a) of this section, for all multiengine airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making an approach and landing with one engine inoperative;

(2) Procedures, speeds, and configuration(s) for making a balked landing with one engine inoperative and the conditions under which a balked landing can be performed safely, or a warning against attempting a balked landing;

(3) The V_{SSE} determined in § 23.149; and

(4) Procedures for restarting any engine in flight including the effects of altitude.

(d) In addition to paragraphs (a) and either (b) or (c) of this section, as appropriate, for all normal, utility, and acrobatic category airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff, in accordance with § 23.51 (a) and (b), and § 23.53 (a) and (b), and the subsequent climb, in accordance with § 23.65 and § 23.69(a).

(2) Procedures for abandoning a takeoff due to engine failure or other cause.

(e) In addition to paragraphs (a), (c), and (d) of this section, for all normal, utility, and acrobatic category multiengine airplanes, the information must include the following:

(1) Procedures and speeds for continuing a takeoff following engine failure and the conditions under which takeoff can safely be continued, or a warning against attempting to continue the takeoff.

(2) Procedures, speeds, and configurations for continuing a climb following engine failure, after takeoff, in accordance with § 23.67, or enroute, in accordance with § 23.69(b).

(f) In addition to paragraphs (a) and (c) of this section, for commuter category airplanes, the information must include the following:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff.

(2) Procedures and speeds for carrying out an accelerate-stop in accordance with § 23.55.

(3) Procedures and speeds for continuing a takeoff following engine failure in accordance with § 23.59(a)(1) and for following the flight path determined under § 23.57 and § 23.61(a).

(g) For multiengine airplanes, information identifying each operating condition in which the fuel system independence prescribed in § 23.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(h) For each airplane showing compliance with § 23.1353 (g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

(i) Information on the total quantity of usable fuel for each fuel tank, and the effect on the usable fuel quantity, as a result of a failure of any pump, must be furnished.

(j) Procedures for the safe operation of the airplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.

56. Section 23.1587 is revised to read as follows:

§ 23.1587 Performance information.

Unless otherwise prescribed, performance information must be provided over the altitude and temperature ranges required by § 23.45(b).

(a) For all airplanes, the following information must be furnished—

(1) The stalling speeds V_{SO} and V_{S1} with the landing gear and wing flaps

retracted, determined at maximum weight under § 23.49, and the effect on these stalling speeds of angles of bank up to 60 degrees;

(2) The steady rate and gradient of climb with all engines operating, determined under § 23.69(a);

(3) The landing distance, determined under § 23.75 for each airport altitude and standard temperature, and the type of surface for which it is valid;

(4) The effect on landing distances of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g); and

(5) The effect on landing distances of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component.

(b) In addition to paragraph (a) of this section, for all normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the steady angle of climb/descent, determined under § 23.77(a), must be furnished.

(c) In addition to paragraphs (a) and (b) of this section, if appropriate, for normal, utility, and acrobatic category airplanes, the following information must be furnished—

(1) The takeoff distance, determined under § 23.53 and the type of surface for which it is valid.

(2) The effect on takeoff distance of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(3) The effect on takeoff distance of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(4) For multiengine reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and multiengine turbine powered airplanes, the one-engine-inoperative takeoff climb/descent gradient, determined under § 23.66;

(5) For multiengine airplanes, the enroute rate and gradient of climb/descent with one engine inoperative, determined under § 23.69(b); and

(6) For single-engine airplanes, the glide performance determined under § 23.71.

(d) In addition to paragraph (a) of this section, for commuter category airplanes, the following information must be furnished—

(1) The accelerate-stop distance determined under § 23.55;

(2) The takeoff distance determined under § 23.59(a);

(3) At the option of the applicant, the takeoff run determined under § 23.59(b);

(4) The effect on accelerate-stop distance, takeoff distance and, if determined, takeoff run, of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(5) The effect on accelerate-stop distance, takeoff distance, and if determined, takeoff run, of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(6) The net takeoff flight path determined under § 23.61(b);

(7) The enroute gradient of climb/descent with one engine inoperative, determined under § 23.69(b);

(8) The effect, on the net takeoff flight path and on the enroute gradient of climb/descent with one engine inoperative, of 50 percent of the headwind component and 150 percent of the tailwind component;

(9) Overweight landing performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights) as follows—

(i) The maximum weight for each airport altitude and ambient temperature at which the airplane complies with the climb requirements of § 23.63(d)(2); and

(ii) The landing distance determined under § 23.75 for each airport altitude and standard temperature.

(10) The relationship between IAS and CAS determined in accordance with § 23.1323 (b) and (c).

(11) The altimeter system calibration required by § 23.1325(e).

57. Section 23.1589(b) is revised to read as follows:

§ 23.1589 Loading information.

* * * * *

(b) Appropriate loading instructions for each possible loading condition between the maximum and minimum weights established under § 23.25, to facilitate the center of gravity remaining within the limits established under § 23.23.

Appendix E to Part 23 [Removed and Reserved]

58. Appendix E to Part 23 is removed and reserved.

Issued in Washington, DC, on January 29, 1996.

David R. Hinson,

Administrator.

[FR Doc. 96–2082 Filed 2–8–96; 8:45 am]

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Federal Aviation Administration

14 CFR Part 23

[Docket No. 27805; Amendment No. 23–48]

RIN 2120–AE62

Airworthiness Standards; Airframe Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the airframe airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certificated in these categories. This amendment will provide nearly uniform airframe airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirements 23, simplifying international airworthiness approval.

EFFECTIVE DATE: March 11, 1996.

FOR FURTHER INFORMATION CONTACT: Kenneth W. Payauys, ACE–111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426–5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94–20 (59 FR 35196, July 8, 1994). All comments received in response to Notice 94–20 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment largely pertain to airframe airworthiness standards. Three other final rules are being issued in this **Federal Register** that pertain to airworthiness standards for systems and equipment, flight, and powerplant. These related rulemakings are also part of the harmonization effort. Interested persons should review all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the U.S. regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeenne des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice 94–20 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the airframe airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR 23/part 23 harmonization, which ARAC assigned to the JAR/FAR 23 Harmonization Working Group. The proposal for airframe airworthiness standards contained in Notice No. 94–20 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the

April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before October 28, 1994. Five commenters responded to Notice 94–20. Minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with the ARAC, and further review by the FAA

Discussion of Amendments

Section 23.301 Loads

The FAA proposed to amend § 23.301(d) by limiting the applicability of Appendix A to part 23 to "single-engine, excluding turbines" airplanes, rather than the current single-engine limitation. The effect of the proposed changes would be to eliminate alternative Appendix A airplane design requirements for turbine engines because the JAA determined, and the FAA agrees, that only single-engine airplanes, excluding turbines, were envisioned when Appendix A was introduced. Turbine airplane designs could continue to be FAA certificated by substantiation to part 23.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.335 Design Airspeeds

The FAA proposed to revise portions of § 23.335 for clarification and harmonization with JAR 23. The FAA proposed to revise paragraph (a)(1) by adding the phrase "wing loading at the design maximum takeoff weight" as a definition for W/S and by revising paragraphs (a)(1)(i) and (ii) to correct the equations for design cruise speed from "33 W/S" to $\surd$"33 (W/S)" and from "36 $\surd$W/S" to "36 $\surd$(W/S)."

The FAA proposed to revise § 23.335(b)(4) by adding a new paragraph (b)(4)(iii) that includes a new mach number speed margin, 0.07M, for commuter category airplanes. Because commuter category airplanes are normally operated at higher altitudes than normal, utility, and acrobatic category airplanes, they experience greater atmospheric variations, such as horizontal gusts and the penetration of jet streams or cold fronts; therefore, a higher minimum speed margin is required. The JAR proposed adding this mach number speed margin. The original mach number speed margin of 0.05M would be retained for normal, utility, and acrobatic category airplanes.

An incorrect equation, $\surd n_g\ V_{s1}$, appears in § 23.335(d)(1). This equation for the design speed for maximum gust intensity, V_B, is corrected to $V_{s1}\ \surd(n_g)$.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.337 Limit Maneuvering Load Factors

The FAA proposed to revise § 23.337(a)(1) by clarifying the equation and by adding a definition for "W." This definition of "W," "design maximum takeoff weight," was requested by the JAA to harmonize with JAR 23.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.341 Gust Load Factors

The FAA proposed to reorganize § 23.341 to provide a new paragraph (a), that would clarify that each airplane must be designed to withstand loads of each lifting surface that result from gusts specified in § 23.333(c). It also proposed to reorganize the section as follows: (1) Redesignate existing paragraphs (a) and (b) as (b) and (c), respectively; (2) revise the text of new paragraph (b) to delete the phrase "considering the criteria of § 23.333(c), to develop the gust loading on each lifting surface" since this requirement would be located in proposed paragraph (a); and, (3) revise new paragraph (c) to delete the phrase "for conventional configurations" because it is no longer accurate, and to revise the definition for wing loading (W/S).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.343 Design Fuel Loads

The FAA proposed a new § 23.343. The proposed requirement would apply to all part 23 airplane categories, except paragraph (c), which is limited to commuter category airplanes.

Comment: The JAA states that while the JAR 23 Study Group supports the technical intent of paragraph (c), since the JAA has no JAR 91 operating rule corresponding to part 91. The JAA must wait for an operating rule to be developed. The JAA has proposed a Notice of Proposed Action (NPA) to adopt paragraph (c) in JAR 23 if and when an operating rule for a 45-minute fuel reserve is created.

FAA Response: The FAA decided to continue with the final rule, as proposed.

This proposal is adopted as proposed.

Section 23.345 High Lift Devices

To place all "flap" requirements in one location, and to harmonize the requirements with JAR 23, the FAA proposed to revise § 23.345 as follows: (1) Make minor organizational, and non-substantive, clarifying changes; (2) Change the term "fully deflected" to "fully extended" because it more accurately describes flap conditions and positions; (3) Remove the phrase "resulting in limit load factors" because the requirement already exists in § 23.301(a); (4) Redesignate current paragraph (c) as paragraph (d) and revise it to include the flap requirements of § 23.457; (5) Redesignate current paragraph (d) as paragraph (c); and (6) Incorporate the flap requirements of § 23.457 into § 23.345(b) and § 23.345(d), as redesignated, and delete paragraph (e), which is redundant.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.347 Unsymmetrical Flight Conditions

The FAA proposed to revise § 23.347 to redesignate the existing text as paragraph (a) and to add a new paragraph (b) to include requirements for a flick maneuver (snap roll), if requested for acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.349 Rolling Conditions

The FAA proposed to revised § 23.349(a)(2) to simplify the unsymmetric semispan load assumption for normal, utility, and commuter category airplanes to 100 percent on one wing semispan and 75 percent on the other wing semispan for all design weights up through 19,000 pounds. The preamble to the NPRM did not include the explanation that the proposed 100 percent and 75 percent load distribution applied only to normal, utility, and commuter category airplanes. The NPRM did not include acrobatic category airplanes in this proposed requirement. However, the proposed regulatory language for § 23.349(c)(2) correctly reflects the FAA's intent.

While preparing the NPRM, the FAA had suggested varying the latter percentage linearly between 70 percent and 77.5 percent to include aircraft weighing up to 19,000 pounds. After discussion with the JAA, the FAA agreed that 75 percent is an appropriate assumption for all part 23 airplanes except acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.369 Rear Lift Truss

The FAA proposed to amend § 23.369 by amending the equation and by adding a definition for wing loading (W/S) to clarify the rule.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.371 Gyroscopic and Aerodynamic Loads

The FAA proposed to revise and reorganize § 23.371 by designating the existing text as paragraph (a) and adding new paragraphs (b) and (c).

The proposed revisions to the text of proposed paragraph (a) would delete the limitation for turbine powered engines; add inertial loads; and replace the word "engines" with "engine(s) and propeller(s), if applicable." The proposed changes clarify that these requirements apply to all part 23 airplanes.

The FAA proposed a new paragraph (b) to clarify and distinguish the requirements for airplanes approved for aerobatic maneuvers.

The FAA proposed new paragraph (c) to clarify that commuter category airplanes must comply with the gust conditions in § 23.341 in addition to the requirement of § 23.371(a).

Comment: The JAA recommended that the words "In addition," which appear at the beginning of JAR 23.371(b) but not in § 23.371(b), could result in misreading the requirements for airplanes approved for aerobatic maneuvers. The JAA's concern is that a reader might think that the requirements of paragraph (b) for airplanes approved for aerobatic maneuvers are in place of, rather than in addition to, the requirements of paragraph (a).

FAA Response: The FAA is aware that the words "in addition" appear in the JAR and understands that the JAA believes the words are necessary to prevent an interpretation that airplanes approved for aerobatic maneuvers need only comply with the requirements of paragraph (b).

Under standard rules of regulatory interpretation, it is not necessary to add the words "in addition" since the applicability of paragraph (a) should be based on its wording and not on the wording of paragraph (b). However, the FAA concludes that JAA's concern can be addressed by rewording paragraph (b) and new paragraph (c) to make it clear that persons subject to those paragraphs must meet both paragraphs (a) and certain additional requirements. As rewritten, paragraph (b) states "For airplanes approved for aerobatic maneuvers, each engine mount and its supporting structure must meet the requirements of paragraph (a) of this section and be designed to withstand the load factors expected during combined maximum yaw and pitch velocities." Paragraph (c) uses parallel language. Paragraph (c) would apply to aircraft certificated in the commuter category, whereas, as proposed, paragraph (b) would apply to aircraft "approved for aerobatic maneuvers," since this approval can be given for aircraft not certificated in the acrobatic category.

This proposal is adopted with the above changes.

Section 23.391 Control Surface Loads

The FAA proposed to revise § 23.391 by deleting paragraph (b). Paragraph (b) references Appendix B, which was removed by Amendment No. 23–42 (56 FR 344, January 3, 1991).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.393 Loads Parallel to Hinge Line

The FAA proposed a new § 23.393. Proposed new § 23.393 would contain a modified version of the requirement of § 23.657(c) concerning loads parallel to the hinge line, which were proposed to be deleted from § 23.657.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.399 Dual Control System

The FAA proposed to redesignate the text of § 23.399 as paragraph (a), and to add a new paragraph (b) that addresses the forces exerted on a dual control system when both pilots act together. This would clarify that it is the greater of the forces that apply.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.415 Ground Gust Conditions

The FAA proposed to amend § 23.415 by revising paragraph (a)(2) to add a definition for wing loading (W/S). The FAA also proposed to revise paragraph (c), which was added in Amendment No. 23–45 (58 FR 42136, August 6, 1993), to incorporate a more comprehensive tie-down criteria.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.441 Maneuvering Loads

The FAA proposed to revise § 23.441(b) to include a new design requirement for the vertical tail of a commuter category airplane.

Comment: The JAA comments that while the intent of the proposed requirement is the same as the comparable requirement in JAR 23, the wording is different. The JAA reported that the FAA proposed final rule version will be considered for full harmonization by the JAA through NPA action once the final rule is published.

FAA Response: The proposal is adopted as proposed.

Section 23.443 Gust Loads

The FAA proposed to revise § 23.443(c) by changing the format of the formula, revising the definition of weight ("W"), and correcting the subscripts of the distance to the lift center, ("l_{vt}"). The current definition reads "W=airplane weight (lbs.)." The new definition reads "W=the applicable weight of the airplane in the particular load case (lbs.)." These changes are for clarity.

No comments were received on the proposal for this section, and it is adopted as proposed.

Sections 23.455 Ailerons

The FAA proposed to amend the heading the precedes § 23.455 by deleting the term "Wing Flaps" so that the heading reads "AILERONS AND SPECIAL DEVICES." This change would reflect the deletion of the wing flap requirements from § 23.457 and their placement in § 23.345.

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

Section 23.457 Wing Flaps

The FAA proposed to delete this section. As discussed under § 23.345, above, the wing flap requirements have been revised and consolidated in § 23.345 to group these requirements together.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.473 Ground Load Conditions and Assumptions

The FAA proposed to revise § 23.473(c)(1) to change the incorrect reference to "§ 23.67 (a) or (b)(1)" to "§ 23.67 (b)(1) or (c)."

Because the FAA intended that turbine powered airplanes be included in § 23.473(c)(1), since these airplanes are required to be "climb positive" with one engine inoperative, the FAA proposed that § 23.473(c)(1) also reference § 23.67(c). The FAA also determined that to achieve the intent described, § 23.473(c)(1) should also reference § 23.67 (b)(1) or (c).

The FAA also proposed to revise paragraph (f), which addresses energy absorption tests, to parallel the language of JAR 23.473(f). No substantive change from current paragraph (f) was proposed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.497 Supplementary Conditions for Tail Wheels

The FAA proposed a new § 23.497(c) to relocate tail wheel, bumper, or energy absorption device design standards for airplanes with aft-mounted propellers. These requirements currently exist in § 23.925(b). They are being moved because the FAA determined that certain portions of the design standards for these devices more properly belong in Subpart C—Structure.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.499 Supplementary Conditions for Nose Wheels

The FAA proposed to add new paragraphs (d) and (e) to § 23.499 to establish nose wheel conditions for airplanes with a steerable nose wheel controlled by hydraulic or other power and for airplanes with a steerable wheel that has a direct mechanical connection to the rudder pedals.

Comment: The JAA comments that the phrase "has a mechanical connection to the rudder pedals" in proposed paragraph (e), absent appropriate advisory material, could be interpreted to require different technical solutions than the comparable wording in JAR 23, "directly connected mechanically to the rudder pedals."

FAA Response: The FAA agrees that the proposed language in paragraph (e) requires clarification; in the final rule, the word "direct" is inserted before the word "mechanical". Also, the last phrase of paragraph (e) is revised to read "the mechanism must be designed to withstand the steering torque for the maximum pilot forces specified in § 23.397(b)."

This proposal is adopted with the above changes to paragraph (e).

Section 23.521 Water Load Conditions

The FAA proposed to amend § 23.521 by deleting paragraph (c), which deals with previously approved floats, because the FAA agreed with the JAA that the requirements of paragraph (c) are covered by the general requirements of paragraph (a).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.561 General

The FAA proposed to amend § 23.561 by revising paragraphs (b) and (d), and adding a new paragraph (e). These changes simplify, clarify, and "add references * * * to ensure." The FAA proposed to revise paragraph (b), concerning occupant protection, to make it correspond to 14 CFR part 25 and JAR 25 that cover large airplanes. The proposed revision of paragraph (d), concerning turnovers would simplify and clarify the requirements without making substantive changes. The FAA proposed a new paragraph (e) to ensure that items of mass that could injure an occupant are retained by the supporting structure.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.571 Metallic Pressurized Cabin Structures

The FAA proposed to revise § 23.571 by changing the heading from "Pressurized cabin" to "Metallic pressurized cabin structures" because nonmetallic structure is addressed in § 23.573(a). The FAA proposed to revise the introductory text to limit the applicability to normal, utility, and acrobatic categories because commuter category airplanes are addressed separately. The FAA proposed to revise paragraph (a) to require the fatigue strength investigation to show that the structure can withstand repeated loads of variable magnitude expected in service.

Comment: The JAA comments that the JAR will be revised to delete commuter category airplanes from this section. Kal-Aero comments that a literal interpretation of the proposed changes to §§ 23.571 and 23.572 "would require that every subsequent modification to an aircraft have a fatigue program to substantiate each major repair or alteration." Kal-Aero states that this change is both uneconomical (Kal-Aero estimates a part 23 fatigue test could cost at least $20 million per certification) and is unnecessary.

FAA Response: The FAA does not agree that the proposed rule language would require the result suggested by Kal-Aero. The intent is to provide that there be some test evidence to verify the analysis validity. The amount of test evidence needed would depend on the complexity of the design. The FAA points out that this evidence would be required only when fatigue analysis is used to satisfy the type certification requirements.

The proposals for this section are adopted as proposed.

Section 23.572 Metallic Wing, Empennage, and Associated Structures

The FAA proposed to revise the section heading to add the word "metallic," to revise paragraph (a) to limit the applicability to normal, utility, and acrobatic category airplanes, and to make minor editorial changes. Paragraph (a)(1) would be revised to harmonize with JAR 23 by requiring tests, or analysis supported by test evidence, as discussed under § 23.571 of this preamble.

The only comment received on this section is from Kal-Aero, and applies to this section and to § 23.571. The comment was discussed under § 23.571.

The proposals are adopted as proposed.

Section 23.573 Damage Tolerance and Fatigue Evaluation of Structure

The FAA proposed to amend § 23.573(a)(5) to make clear that the limit load capacity of a bonded joint must be substantiated only if the failure of the bonded joint would result in catastrophic loss of the airplane.

The FAA proposed to delete § 23.573(c) because its requirements for inspections and other procedures were proposed to be moved to § 23.575.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.574 Metallic Damage Tolerance and Fatigue Evaluation of Commuter Category Airplanes

The FAA proposed to add a new § 23.574 that addresses damage tolerance and fatigue evaluation requirements for commuter category airplanes. As discussed previously, §§ 23.571 and 23.572 are being revised to clarify that these sections apply only to normal, utility, and acrobatic category airplanes. Newly type certificated commuter category airplanes would have to meet proposed § 23.574 instead of §§ 23.571 and 23.572.

The only comment received on this proposed new section is a JAA statement that this change will be considered for JAR 23. The proposal is adopted as proposed.

Section 23.575 Inspections and Other Procedures

The FAA proposed to add a new § 23.575 to clarify that airplane manufacturers are required to provide recommendations for inspections frequencies, locations, and methods when a design is approved by the FAA, and that these items must be included in the Limitations Section of the Instructions for Continued Airworthiness required by § 23.1529.

The requirements of § 23.573(c) would be moved to § 23.575 and the requirements are made applicable to §§ 23.571, 23.572, 23.573 and 23.574.

The only comment on this proposed new section is a JAA statement that this change will be considered for JAR 23. The proposals are adopted as proposed.

Section 23.607 Fasteners

The FAA proposed to amend § 23.607 by changing the section heading, by redesignating the existing text as paragraph (c), and by adding new paragraphs (a) and (b), as outlined in the NPRM.

Comment: Transport Canada comments that it is possible the language of proposed paragraph (a) could be interpreted to mean that compliance is satisfied by the use of a self-locking nut alone in certain situations, such as when a bolt is not subject to rotation. Transport Canada suggests adopting the wording of § 27.607, which requires "two separate locking devices" when the loss of a removable bolt, screw, nut, pin or other fastener would jeopardize the safe operation of the aircraft.

FAA Response: The FAA agrees that the proposed language of paragraph (a) could be misinterpreted and that the intent of the section would be clearer if language comparable to § 27.607 is used. Also, the FAA finds that the section is clearer if it addresses all removable fasteners without specific mention of bolts, screws, nuts, pins, etc. Accordingly, paragraph (a) has been revised to read "Each removable fastener must incorporate two retaining devices if the loss of such fastener would preclude continued safe flight and landing" in the final rule.

This proposal is adopted with the noted change to paragraph (a).

Section 23.611 Accessibility Provisions

The FAA proposed to amend § 23.611 to require that, for any part requiring maintenance, such as an inspection or other servicing, there must be a means of access incorporated into the aircraft design to allow this servicing to be accomplished. The FAA pointed out in the NPRM that whether the access provided is appropriate in a particular case will depend on the nature of the item and the frequency and complexity of the required inspection or maintenance actions.

The only comment received on this proposed change is a JAA statement that this change will be considered for the JAR. The proposal is adopted as proposed.

Section 23.629 Flutter

The FAA proposed to revise § 23.629 to require either flight flutter tests and rational analysis, or flight flutter tests and compliance with the FAA's "Simplified Flutter Prevention Criteria." Section 23.629 currently requires flutter substantiation by only one of three methods: A rational analysis, flight flutter test, or compliance with the "Simplified Flutter Prevention Criteria."

The FAA also proposed to revise paragraph (d)(3)(i) to change the phrase "T-tail or boom tail" to "T-tail or other unconventional tail configurations" to be more inclusive and to represent the standard used in current certification. The FAA also proposed to harmonize with JAR 23 by amending paragraphs 23.629 (g) and (h) to remove the "or test" phrase to require that substantiation be done only by analysis. The FAA proposed a new paragraph (i) that would allow freedom from flutter to be shown by tests (under paragraph (a)) or by analysis alone if that analysis is based on previously approved data for an airplane that has undergone modification that could affect its flutter characteristics.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.657 Hinges

The FAA proposed to amend § 23.657 by deleting paragraph (c) that covers loads parallel to the hinge line because it would be covered in proposed § 23.393.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.673 Primary Flight Controls

The FAA proposed to revise § 23.673 to delete the requirements for two-control airplanes consistent with actions being taken in the proposed rule on flight requirements for part 23 airplanes (Docket No. 27807, Notice No. 94–22; (59 FR 37878, July 25, 1994)) that affect §§ 23.177 and 23.201. The two-control requirements are considered obsolete. Additionally, harmonization with JAR 23 would be accomplished by this action.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.725 Limit Drop Tests

The FAA proposed to amend the effective weight equation in § 23.725(b) by adding mathematical brackets to the numerator and parentheses to the denominator to clarify the equation.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.755 Hulls

The FAA proposed to amend § 23.755 by deleting paragraph (b), which provides, that hulls of hull seaplanes or amphibians of less than 1,500 pounds need not be compartmented, because paragraph (b) is redundant. The applicable requirements are contained in paragraph (a). The FAA also proposed to redesignate paragraph (c) as new paragraph (b) and to edit it for clarification.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.865 Fire Protection of Flight Controls, Engine Mounts, and Other Flight Structures

The FAA proposed to revise § 23.865 by changing the words "engine compartment" to "designated fire zones" for consistency with recent revisions to §§ 23.1203 and 23.1181. The proposed revision would also add the phrase "adjacent areas that would be subjected to the effects of fire in the designated fire zones."

Comment: The JAA agrees that the technical intent of proposed § 23.865 is similar to the JAR 23 requirement. Changes to JAR 23 to adopt the terms proposed in this part 23 section are being considered by the JAA.

FAA Response: No substantive comment was received, and the proposals are adopted as proposed.

Section 23.925 Propeller Clearance

The FAA proposed to amend § 23.925(b), Aft mounted propellers, by removing the requirements on tail wheels, bumpers, and energy absorption devices and moving them to § 23.497, Supplementary conditions for tail wheels, as discussed as discussed above. The FAA also proposed to delete the inspection and replacement criteria for tail wheel, bumper, and energy absorption devices because the inspection and replacement requirements are stated in § 23.1529.

No comments were received on the proposals for this section, and they are adopted as proposed.

Appendix A

The FAA proposed to revise three areas of Appendix A: (1) A23.1 General; (2) A23.11 Control surface loads, paragraph (c), Surface loading conditions; and (3) Table 2—Average limit control surface loading. The FAA proposed to add a new figure to Appendix A: Figure A7, Chordwise load distribution for stabilizer and elevator, or fin and rudder. The revisions specify the configurations for which the wing and tail surface loads, required by A23.7, are valid. The FAA discovered a need for a clarification change in paragraph A23.a(a)(1) during the post comment review period. The words "excluding turbine powerplants" are clearer than the words "excluding turbines." This revision is included in the final rule to more clearly convey the intended meaning.

No comments were received on the proposals for Appendix A, and they are adopted with the change explained above.

Final Regulatory Evaluation, Final Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: (1) Will generate benefits exceeding its costs and is "significant" as defined in the Executive Order; (2) is "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

Two comments were received regarding the economic impact of the proposals; one concerning § 23.571, Metallic pressurized cabin structures, and one concerning § 23.572, Metallic wing, empennage, and associated structures. Both of these comments, as well as the FAA's responses, are included in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has identified 6 sections that will result in additional compliance costs, totalling between $10,000 and $17,000 per certification. When amortized over a production run, these costs will have a negligible impact on airplane price, less than $100 per airplane.

The primary benefit of the rule will be the cost efficiencies of harmonization with the JAR for those manufacturers that market airplanes in JAA countries as well as to manufacturers in JAA countries that market airplanes in the United States. Other benefits of the rule will be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

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 Federal 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. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The rule will not constitute a barrier to international trade, including the export of U.S. goods and services to foreign countries and the import of foreign goods and services into the United States. Instead, the airframe certification procedures have been harmonized with those of the JAA and will lessen restraints on trade.

Federalism Implications

The regulations 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 rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA is revising the airframe airworthiness standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards that were published for the same categories of airplanes by the Joint Airworthiness Authorities in Europe. The revisions reduce the regulatory burden on United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is not significant under Executive Order 12866. In addition, the FAA certifies that this rule will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This rule is considered not significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule 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 Amendments

In consideration of the foregoing, the Federal Aviation Administration amends 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. 106(g), 40013, 44701, 44702, 44704.

2. Section 23.301(d) is revised to read as follows:

§ 23.301 Loads.

* * * * *

(d) Simplified structural design criteria may be used if they result in design loads not less than those prescribed in §§ 23.331 through 23.521. For airplane configurations described in appendix A, § 23.1, the design criteria of appendix A of this part are an approved equivalent of §§ 23.321 through 23.459. If appendix A of this part is used, the entire appendix must be substituted for the corresponding sections of this part.

3. Section 23.335 is amended by revising paragraph (a)(1); by removing the period and adding "; and either—"

to the end of paragraph (b)(4)(i); by revising paragraph (b)(4)(ii); by adding a new paragraph (b)(4)(iii); and by revising the introductory text of paragraph (d)(1) to read as follows:

§ 23.335 Design airspeeds.

* * * * *

(a) * * *

(1) Where W/S′=wing loading at the design maximum takeoff weight, V_c (in knots) may not be less than—

(i) 33 $\sqrt{(W/S)}$ (for normal, utility, and commuter category airplanes);

(ii) 36 $\sqrt{(W/S)}$ (for acrobatic category airplanes).

* * * * *

(b) * * *

(4) * * *

(ii) Mach 0.05 for normal, utility, and acrobatic category airplanes (at altitudes where M_D is established); or

(iii) Mach 0.07 for commuter category airplanes (at altitudes where M_D is established) unless a rational analysis, including the effects of automatic systems, is used to determine a lower margin. If a rational analysis is used, the minimum speed margin must be enough to provide for atmospheric variations (such as horizontal gusts), and the penetration of jet streams or cold fronts), instrument errors, airframe production variations, and must not be less than Mach 0.05.

* * * * *

(d) * * *

(1) V_B may not be less than the speed determined by the intersection of the line representing the maximum positive lift, $C_{N\,MAX}$, and the line representing the rough air gust velocity on the gust V-n diagram, or $V_{S1}\sqrt{n_g}$, whichever is less, where:

* * * * *

4. Section 23.337(a)(1) is revised to read as follows:

§ 23.337 Limit maneuvering load factors.

(a) * * *

(1) 2.1+(24,000÷(W+10,000)) for normal and commuter category airplanes, where W=design maximum takeoff weight, except that n need not be more than 3.8;

* * * * *

5. Section 23.341 is amended by redesignating existing paragraphs (a) and (b) as paragraphs (b) and (c), respectively; by adding a new paragraph (a); by revising the redesignated paragraph (b); and by revising the introductory text, the formula, and the definition of "W/S" in the redesignated paragraph (c) to read as follows:

§ 23.341 Gust loads factors.

(a) Each airplane must be designed to withstand loads on each lifting surface resulting from gusts specified in § 23.333(c).

(b) The gust load for a canard or tandem wing configuration must be computed using a rational analysis, or may be computed in accordance with paragraph (c) of this section, provided that the resulting net loads are shown to be conservative with respect to the gust criteria of § 23.333(c).

(c) In the absence of a more rational analysis, the gust load factors must be computed as follows—

$$n = 1 + \frac{K_g U_{de} V a}{498\,(W/S)}$$

* * * * *

W/S=Wing loading (p.s.f.) due to the applicable weight of the airplane in the particular load case.

* * * * *

6. A new § 23.343 is added to read as follows:

§ 23.343 Design fuel loads.

(a) The disposable load combinations must include each fuel load in the range from zero fuel to the selected maximum fuel load.

(b) If fuel is carried in the wings, the maximum allowable weight of the airplane without any fuel in the wing tank(s) must be established as "maximum zero wing fuel weight," if it is less than the maximum weight.

(c) For commuter category airplanes, a structural reserve fuel condition, not exceeding fuel necessary for 45 minutes of operation at maximum continuous power, may be selected. If a structural reserve fuel condition is selected, it must be used as the minimum fuel weight condition for showing compliance with the flight load requirements prescribed in this part and—

(1) The structure must be designed to withstand a condition of zero fuel in the wing at limit loads corresponding to:

(i) Ninety percent of the maneuvering load factors defined in § 23.337, and

(ii) Gust velocities equal to 85 percent of the values prescribed in § 23.333(c).

(2) The fatigue evaluation of the structure must account for any increase in operating stresses resulting from the design condition of paragraph (c)(1) of this section.

(3) The flutter, deformation, and vibration requirements must also be met with zero fuel in the wings.

7. Section 23.345 is revised to read as follows:

§ 23.345 High lift devices.

(a) If flaps or similar high lift devices are to be used for takeoff, approach or landing, the airplane, with the flaps fully extended at V_F, is assumed to be subjected to symmetrical maneuvers and gusts within the range determined by—

(1) Maneuvering, to a positive limit load factor of 2.0; and

(2) Positive and negative gust of 25 feet per second acting normal to the flight path in level flight.

(b) V_F must be assumed to be not less than 1.4 V_S or 1.8 V_{SF}, whichever is greater, where—

(1) V_S is the computed stalling speed with flaps retracted at the design weight; and

(2) V_{SF} is the computed stalling speed with flaps fully extended at the design weight.

(3) If an automatic flap load limiting device is used, the airplane may be designed for the critical combinations of airspeed and flap position allowed by that device.

(c) In determining external loads on the airplane as a whole, thrust, slipstream, and pitching acceleration may be assumed to be zero.

(d) The flaps, their operating mechanism, and their supporting structures, must be designed to withstand the conditions prescribed in paragraph (a) of this section. In addition, with the flaps fully extended at V_F, the following conditions, taken separately, must be accounted for:

(1) A head-on gust having a velocity of 25 feet per second (EAS), combined with propeller slipstream corresponding to 75 percent of maximum continuous power; and

(2) The effects of propeller slipstream corresponding to maximum takeoff power.

8. Section 23.347 is amended by designating the existing text as paragraph (a) and by adding a new paragraph (b) to read as follows:

§ 23.347 Unsymmetrical flight conditions.

* * * * *

(b) Acrobatic category airplanes certified for flick maneuvers (snap roll) must be designed for additional asymmetric loads acting on the wing and the horizontal tail.

9. Section 23.349(a)(2) is revised to read as follows:

§ 23.349 Rolling conditions.

* * * * *

(a) * * *

(2) For normal, utility, and commuter categories, in Condition A, assume that 100 percent of the semispan wing airload acts on one side of the airplane and 75 percent of this load acts on the other side.

* * * * *

10. Section 23.369(a) is revised to read as follows:

§ 23.369 Rear lift truss.

(a) If a rear lift truss is used, it must be designed to withstand conditions of reversed airflow at a design speed of—

$V = 8.7 \sqrt{(W/S)} + 8.7$ (knots), where

W/S = wing loading at design maximum takeoff weight.

* * * * *

11. Section 23.371 is revised to read as follows:

§ 23.371 Gyroscopic and aerodynamic loads.

(a) Each engine mount and its supporting structure must be designed for the gyroscopic, inertial, and aerodynamic loads that result, with the engine(s) and propeller(s), if applicable, at maximum continuous r.p.m., under either:

(1) The conditions prescribed in § 23.351 and § 23.423; or

(2) All possible combinations of the following—

(i) A yaw velocity of 2.5 radians per second;

(ii) A pitch velocity of 1.0 radian per second;

(iii) A normal load factor of 2.5; and

(iv) Maximum continuous thrust.

(b) For airplanes approved for aerobatic maneuvers, each engine mount and its supporting structure must meet the requirements of paragraph (a) of this section and be designed to withstand the load factors expected during combined maximum yaw and pitch velocities.

(c) For airplanes certificated in the commuter category, each engine mount and its supporting structure must meet the requirements of paragraph (a) of this section and the gust conditions specified in § 23.341 of this part.

§ 23.391 [Amended]

12. Section 23.391 is amended by removing paragraph (b) and removing the designation of "(a)" from the remaining text.

13. A new § 23.393 is added to read as follows:

§ 23.393 Loads parallel to hinge line.

(a) Control surfaces and supporting hinge brackets must be designed to withstand inertial loads acting parallel to the hinge line.

(b) In the absence of more rational data, the inertial loads may be assumed to be equal to KW, where—

(1) K = 24 for vertical surfaces;

(2) K = 12 for horizontal surfaces; and

(3) W = weight of the movable surfaces.

14. Section 23.399 is revised to read as follows:

§ 23.399 Dual control system.

(a) Each dual control system must be designed to withstand the force of the pilots operating in opposition, using individual pilot forces not less than the greater of—

(1) 0.75 times those obtained under § 23.395; or

(2) The minimum forces specified in § 23.397(b).

(b) Each dual control system must be designed to withstand the force of the pilots applied together, in the same direction, using individual pilot forces not less than 0.75 times those obtained under § 23.395.

15. Section 23.415 is amended by revising paragraphs (a)(2) and (c) to read as follows:

§ 23.415 Ground gust conditions.

(a) * * *

(2) If pilot forces less than the minimums specified in § 23.397(b) are used for design, the effects of surface loads due to ground gusts and taxiing downwind must be investigated for the entire control system according to the formula:

$H = K c S q$

where—

H = limit hinge moment (ft.-lbs.);

c = mean chord of the control surface aft of the hinge line (ft.);

S = area of control surface aft of the hinge line (sq. ft.);

q = dynamic pressure (p.s.f.) based on a design speed not less than $14.6 \sqrt{(W/S)} + 14.6$ (f.p.s.) where W/S = wing loading at design maximum weight, except that the design speed need not exceed 88 (f.p.s.);

K = limit hinge moment factor for ground gusts derived in paragraph (b) of this section. (For ailerons and elevators, a positive value of K indicates a moment tending to depress the surface and a negative value of K indicates a moment tending to raise the surface).

* * * * *

(c) At all weights between the empty weight and the maximum weight declared for tie-down stated in the appropriate manual, any declared tie-down points and surrounding structure, control system, surfaces and associated gust locks, must be designed to withstand the limit load conditions that exist when the airplane is tied down and that result from wind speeds of up to 65 knots horizontally from any direction.

16. Section 23.441 is amended by revising paragraph (a)(2) and adding a new paragraph (b) to read as follows.

§ 23.441 Maneuvering loads.

(a) * * *

(2) With the rudder deflected as specified in paragraph (a)(1) of this section, it is assumed that the airplane yaws to the overswing sideslip angle. In lieu of a rational analysis, an overswing angle equal to 1.5 times the static sideslip angle of paragraph (a)(3) of this section may be assumed.

* * * * *

(b) For commuter category airplanes, the loads imposed by the following additional maneuver must be substantiated at speeds from V_A to V_D/M_D. When computing the tail loads—

(1) The airplane must be yawed to the largest attainable steady state sideslip angle, with the rudder at maximum deflection caused by any one of the following:

(i) Control surface stops;

(ii) Maximum available booster effort;

(iii) Maximum pilot rudder force as shown below:

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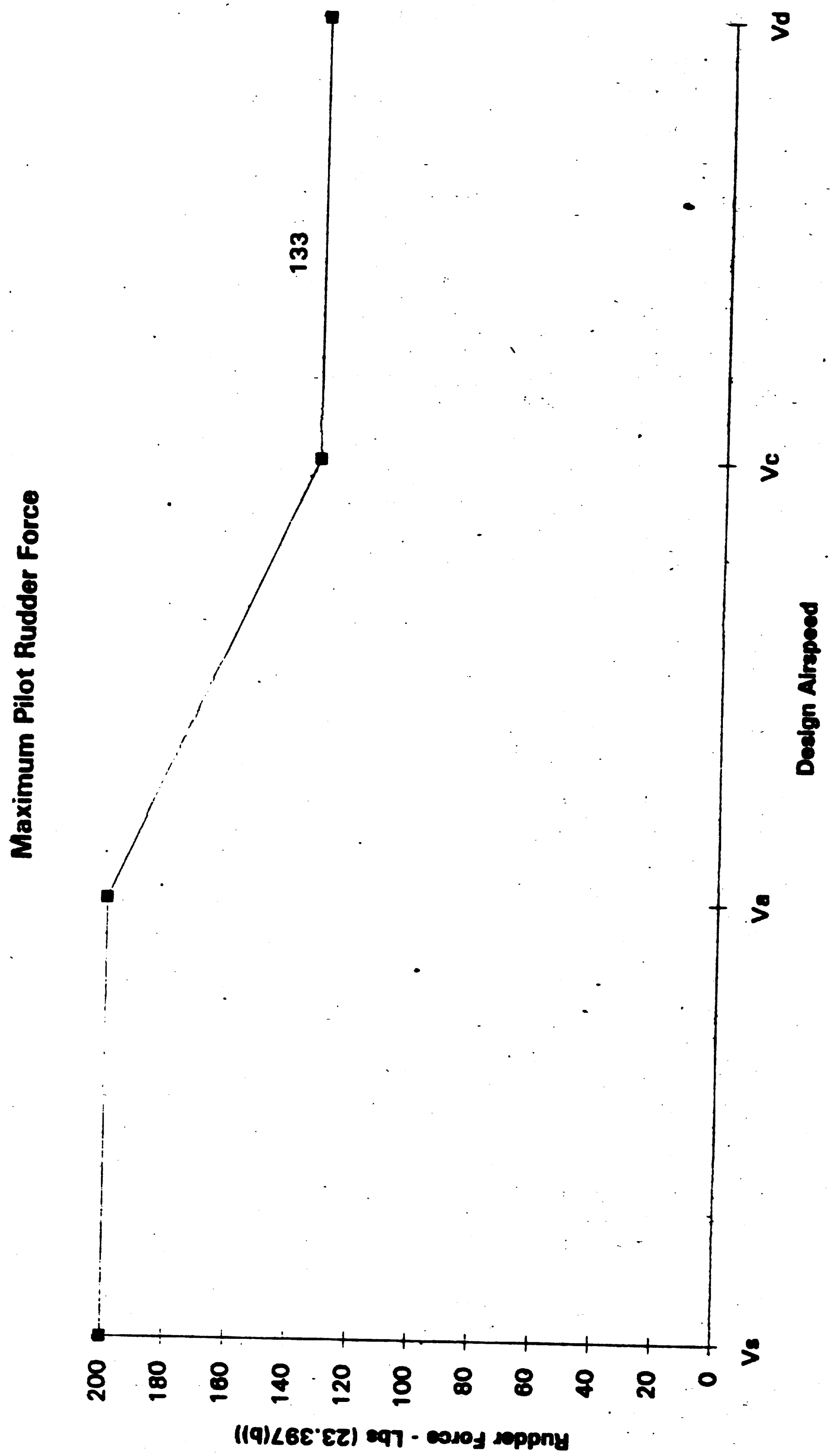

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(2) The rudder must be suddenly displaced from the maximum deflection to the neutral position.

* * * * *

17. Section 23.443(c) is revised to read as follows:

§ 23.443 Gust loads.

* * * * *

(c) In the absence of a more rational analysis, the gust load must be computed as follows:

$$L_{vt} = \frac{K_{gt}\ U_{de}\ V\ a_{vt}\ S_{vt}}{498}$$

Where—

L_{vt}=Vertical surface loads (lbs.);

$$k_{gt} = \frac{0.88\ \mu_{gt}}{5.3 + \mu_{gt}} = \text{gust alleviation factor;}$$

$$\mu_{gt} = \frac{2W}{\rho c_t\, g\, a_{vt} S_{vt}} \frac{K}{l_{vt}}^{2} = \text{lateralmassratio;}$$

U_{de}=Derived gust velocity (f.p.s.);

ρ=Air density (slugs/cu.ft.);

W=the applicable weight of the airplane in the particular load case (lbs.);

S_{vt}=Area of vertical surface (ft.^{2});

$\bar{c}_t$=Mean geometric chord of vertical surface (ft.);

a_{vt}=Lift curve slope of vertical surface (per radian);

K=Radius of gyration in yaw (ft.);

l_{vt}=Distance from airplane c.g. to lift center of vertical surface (ft.);

g=Acceleration due to gravity (ft./sec.^{2}); and

V=Equivalent airspeed (knots).

18. The center heading "AILERONS, WING FLAPS, AND SPECIAL DEVICES" that appears between §§ 23.445 and 23.455 is revised to read "Ailerons and Special Devices".

§ 23.457 [Removed]

19. Section 23.457 is removed.

20. Section 23.473 is amended by revising paragraphs (c)(1) and (f) to read as follows:

§ 23.473 Ground load conditions and assumptions.

* * * * *

(c) * * *

(1) The airplane meets the one-engine-inoperative climb requirements of § 23.67(b)(1) or (c); and

* * * * *

(f) If energy absorption tests are made to determine the limit load factor corresponding to the required limit descent velocities, these tests must be made under § 23.723(a).

* * * * *

21. Section 23.497 is amended by adding a new paragraph (c) to read as follows:

§ 23.497 Supplementary conditions for tail wheels.

* * * * *

(c) If a tail wheel, bumper, or an energy absorption device is provided to show compliance with § 23.925(b), the following apply:

(1) Suitable design loads must be established for the tail wheel, bumper, or energy absorption device; and

(2) The supporting structure of the tail wheel, bumper, or energy absorption device must be designed to withstand the loads established in paragraph (c)(1) of this section.

22. Section 23.499 is amended by adding new paragraphs (d) and (e) to read as follows:

§ 23.499 Supplementary conditions for nose wheels.

* * * * *

(d) For airplanes with a steerable nose wheel that is controlled by hydraulic or other power, at design takeoff weight with the nose wheel in any steerable position, the application of 1.33 times the full steering torque combined with a vertical reaction equal to 1.33 times the maximum static reaction on the nose gear must be assumed. However, if a torque limiting device is installed, the steering torque can be reduced to the maximum value allowed by that device.

(e) For airplanes with a steerable nose wheel that has a direct mechanical connection to the rudder pedals, the mechanism must be designed to withstand the steering torque for the maximum pilot forces specified in § 23.397(b).

§ 23.521 [Amended]

23. Section 23.521 is amended by removing paragraph (c).

24. Section 23.561 is amended by revising paragraph (b) introductory text; by revising paragraphs (d)(1); and by adding a new paragraph (e) to read as follows:

§ 23.561 General.

* * * * *

(b) The structure must be designed to give each occupant every reasonable chance of escaping serious injury when—

* * * * *

(d) * * *

(1) * * *

(i) The most adverse combination of weight and center of gravity position;

(ii) Longitudinal load factor of 9.0g;

(iii) Vertical load factor of 1.0g; and

(iv) For airplanes with tricycle landing gear, the nose wheel strut failed with the nose contacting the ground.

* * * * *

(e) Except as provided in § 23.787(c), the supporting structure must be designed to restrain, under loads up to those specified in paragraph (b)(3) of this section, each item of mass that could injure an occupant if it came loose in a minor crash landing.

25. Section 23.571 is amended by revising the heading, the introductory text, and paragraph (a), to read as follows:

§ 23.571 Metallic pressurized cabin structures.

For normal, utility, and acrobatic category airplanes, the strength, detail design, and fabrication of the metallic structure of the pressure cabin must be evaluated under one of the following:

(a) A fatigue strength investigation in which the structure is shown by tests, or by analysis supported by test evidence, to be able to withstand the repeated loads of variable magnitude expected in service; or

* * * * *

26. Section 23.572 is amended by revising the heading; by revising paragraph (a) introductory text; and by revising paragraph (a)(1) to read as follows:

§ 23.572 Metallic wing, empennage, and associated structures.

(a) For normal, utility, and acrobatic category airplanes, the strength, detail design, and fabrication of those parts of the airframe structure whose failure would be catastrophic must be evaluated under one of the following unless it is shown that the structure, operating stress level, materials and expected uses are comparable, from a fatigue standpoint, to a similar design that has had extensive satisfactory service experience:

(1) A fatigue strength investigation in which the structure is shown by tests, or by analysis supported by test evidence, to be able to withstand the repeated loads of variable magnitude expected in service; or

* * * * *

27. Section 23.573 is amended by removing the reference in paragraph (b) "§ 23.571(c)" and adding the reference "§ 23.571(a)(3)" in its place; by removing paragraph (c); and by revising the introductory text of paragraph (a)(5) to read as follows:

§ 23.573 Damage tolerance and fatigue evaluation of structure.

(a) * * *

(5) For any bonded joint, the failure of which would result in catastrophic loss of the airplane, the limit load capacity must be substantiated by one of the following methods—

* * * * *

28. A new § 23.574 is added to read as follows:

§ 23.574 Metallic damage tolerance and fatigue evaluation of commuter category airplanes.

For commuter category airplanes—

(a) *Metallic damage tolerance.* An evaluation of the strength, detail design, and fabrication must show that catastrophic failure due to fatigue, corrosion, defects, or damage will be avoided throughout the operational life of the airplane. This evaluation must be conducted in accordance with the provisions of § 23.573, except as specified in paragraph (b) of this section, for each part of the structure that could contribute to a catastrophic failure.

(b) *Fatigue (safe-life) evaluation.* Compliance with the damage tolerance requirements of paragraph (a) of this section is not required if the applicant establishes that the application of those requirements is impractical for a particular structure. This structure must be shown, by analysis supported by test evidence, to be able to withstand the repeated loads of variable magnitude expected during its service life without detectable cracks. Appropriate safe-life scatter factors must be applied.

29. A new § 23.575 is added to read as follows:

§ 23.575 Inspections and other procedures.

Each inspection or other procedure, based on an evaluation required by §§ 23.571, 23.572, 23.573 or 23.574, must be established to prevent catastrophic failure and must be included in the Limitations Section of the Instructions for Continued Airworthiness required by § 23.1529.

30. Section 23.607 is revised to read as follows:

§ 23.607 Fasteners.

(a) Each removable fastener must incorporate two retaining devices if the loss of such fastener would preclude continued safe flight and landing.

(b) Fasteners and their locking devices must not be adversely affected by the environmental conditions associated with the particular installation.

(c) No self-locking nut may be used on any bolt subject to rotation in operation unless a non-friction locking device is used in addition to the self-locking device.

31. Section 23.611 is revised to read as follows:

§ 23.611 Accessibility provisions.

For each part that requires maintenance, inspection, or other servicing, appropriate means must be incorporated into the aircraft design to allow such servicing to be accomplished.

32. Section 23.629 is amended by revising the introductory text of paragraph (a); by redesignating existing paragraphs (b) and (c) as paragraphs (c) and (b); by revising the introductory text of newly redesignated (b); by revising newly redesignated paragraph (c); by revising paragraph (d)(3)(i); by revising paragraphs (g) and (h); and by adding a new paragraph (i) to read as follows:

§ 23.629 Flutter.

(a) It must be shown by the methods of paragraph (b) and either paragraph (c) or (d) of this section, that the airplane is free from flutter, control reversal, and divergence for any condition of operation within the limit V-n envelope and at all speeds up to the speed specified for the selected method. In addition—

* * * * *

(b) Flight flutter tests must be made to show that the airplane is free from flutter, control reversal and divergence and to show that—

* * * * *

(c) Any rational analysis used to predict freedom from flutter, control reversal and divergence must cover all speeds up to 1.2 V_D.

(d) * * *

(3) * * *

(i) Does not have a T-tail or other unconventional tail configurations;

* * * * *

(g) For airplanes showing compliance with the fail-safe criteria of §§ 23.571 and 23.572, the airplane must be shown by analysis to be free from flutter up to V_D/M_D after fatigue failure, or obvious partial failure, of a principal structural element.

(h) For airplanes showing compliance with the damage tolerance criteria of § 23.573, the airplane must be shown by analysis to be free from flutter up to V_D/M_D with the extent of damage for which residual strength is demonstrated.

(i) For modifications to the type design that could affect the flutter characteristics, compliance with paragraph (a) of this section must be shown, except that analysis based on previously approved data may be used alone to show freedom from flutter, control reversal and divergence, for all speeds up to the speed specified for the selected method.

§ 23.657 [Amended]

33. Section 23.657 is amended by removing paragraph (c).

§ 23.673 [Amended]

34. Section 23.673 is amended by removing paragraph (b) and the paragraph designation "(a)" for the remaining paragraph.

35. Section 23.725 is amended by revising the equation in paragraph (b) to read as follows:

§ 23.725 Limit drop tests.

* * * * *

(b) * * *

$$W_e = W \frac{[h + (1 - L)\, d]}{(h + d)}$$

* * * * *

36. Section 23.755 is amended by removing paragraph (b), and by redesignating paragraph (c) as paragraph (b) and revising it to read as follows:

§ 23.755 Hulls.

* * * * *

(b) Watertight doors in bulkheads may be used for communication between compartments.

37. Section 23.865 is revised to read as follows:

§ 23.865 Fire protection of flight controls, engine mounts, and other flight structure.

Flight controls, engine mounts, and other flight structure located in designated fire zones, or in adjacent areas that would be subjected to the effects of fire in the designated fire zones, must be constructed of fireproof material or be shielded so that they are capable of withstanding the effects of a fire. Engine vibration isolators must incorporate suitable features to ensure that the engine is retained if the non-fireproof portions of the isolators deteriorate from the effects of a fire.

38. Section 23.925 is amended by revising paragraph (b) to read as follows:

§ 23.925 Propeller clearance.

* * * * *

(b) *Aft-mounted propellers.* In addition to the clearances specified in paragraph (a) of this section, an airplane with an aft mounted propeller must be designed such that the propeller will not contact the runway surface when the airplane is in the maximum pitch attitude attainable during normal takeoffs and landings.

* * * * *

39. Appendix A is amended by revising the heading, section A23.1, paragraphs A23.11 (c)(1) and (d), and Table 2; and by adding a new Figure A7 to the end of the Appendix to read as follows:

Appendix A to Part 23 Simplified Design Load Criteria

A23.1 *General.*

(a) The design load criteria in this appendix are an approved equivalent of those in §§ 23.321 through 23.459 of this subchapter for an airplane having a maximum weight of 6,000 pounds or less and the following configuration:

(1) A single engine excluding turbine powerplants;

(2) A main wing located closer to the airplane's center of gravity than to the aft, fuselage-mounted, empennage;

(3) A main wing that contains a quarter-chord sweep angle of not more than 15 degrees fore or aft;

(4) A main wing that is equipped with trailing-edge controls (ailerons or flaps, or both);

(5) A main wing aspect ratio not greater than 7;

(6) A horizontal tail aspect ratio not greater than 4;

(7) A horizontal tail volume coefficient not less than 0.34;

(8) A vertical tail aspect ratio not greater than 2;

(9) A vertical tail platform area not greater than 10 percent of the wing platform area; and

(10) Symmetrical airfoils must be used in both the horizontal and vertical tail designs.

(b) Appendix A criteria may not be used on any airplane configuration that contains any of the following design features:

(1) Canard, tandem-wing, close-coupled, or tailless arrangements of the lifting surfaces;

(2) Biplane or multiplane wing arrangements;

(3) T-tail, V-tail, or cruciform-tail (+) arrangements;

(4) Highly-swept wing platform (more than 15-degrees of sweep at the quarter-chord), delta planforms, or slatted lifting surfaces; or

(5) Winglets or other wing tip devices, or outboard fins.

* * * * *

A23.11 *Control surface loads.*

* * * * *

(c) * * *

(1) Simplified limit surface loadings for the horizontal tail, vertical tail, aileron, wing flaps, and trim tabs are specified in figures 5 and 6 of this appendix.

(i) The distribution of load along the span of the surface, irrespective of the chordwise load distribution, must be assumed proportional to the total chord, except on horn balance surfaces.

(ii) The load on the stabilizer and elevator, and the load on fin and rudder, must be distributed chordwise as shown in figure 7 of this appendix.

(iii) In order to ensure adequate torsional strength and to account for maneuvers and gusts, the most severe loads must be considered in association with every center of pressure position between the leading edge and the half chord of the mean chord of the surface (stabilizer and elevator, or fin and rudder).

(iv) To ensure adequate strength under high leading edge loads, the most severe stabilizer and fin loads must be further considered as being increased by 50 percent over the leading 10 percent of the chord with the loads aft of this appropriately decreased to retain the same total load.

(v) The most severe elevator and rudder loads should be further considered as being distributed parabolically from three times the mean loading of the surface (stabilizer and elevator, or fin and rudder) at the leading edge of the elevator and rudder, respectively, to zero at the trailing edge according to the equation:

$$P(x) = 3(\overline{w})\frac{(c-x)^2}{c_f^2}$$

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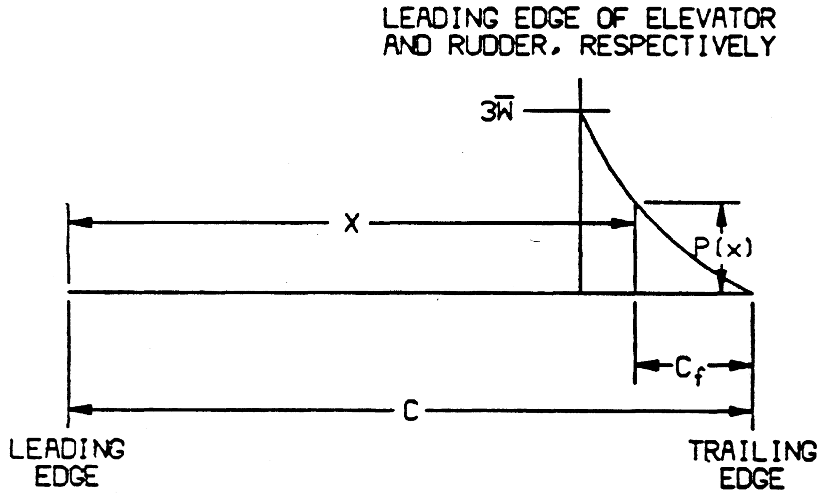

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Where—

P(x)=local pressure at the chordwise stations x,

c=chord length of the tail surface,

c_f=chord length of the elevator and rudder respectively, and

$\overline{w}$=average surface loading as specified in Figure A5.

* * * * *

(vi) The chordwise loading distribution for ailerons, wing flaps, and trim tabs are specified in Table 2 of this appendix.

(d) *Outboard fins.* Outboard fins must meet the requirements of § 23.445.

* * * * *

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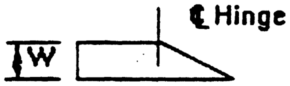
Table 2 - Average limit control surface loading

AVERAGE LIMIT CONTROL SURFACE LOADING			
SURFACE	DIRECTION OF LOADING	MAGNITUDE OF LOADING	CHORDWISE DISTRIBUTION
Horizontal Tail I	a) Up and Down	Figure A5 Curve (2)	See Figure A7
	b) Unsymmetrical Loading (Up and Down)	100% $\bar{w}$ on one side of airplane ℄ 65% $\bar{w}$ on other side of airplane ℄ for normal and utility categories. For acrobatic category see A23.11(c)	
Vertical Tail II	Right and Left	Figure A5 Curve (1)	Same as above
Aileron III	a) Up and Down	Figure A6 Curve (5)	(C) 
Wing Flap IV	a) Up	Figure A6 Curve (4)	(D) 
	b) Down	.25 x Up Load (a)	
Trim Tab V	a) Up and Down	Figure A6 Curve (3)	Same as (D) above

NOTE: The surface loading I, II, III, and V above are based on speeds V_A min and V_C min.

The loading of IV is based on V_F min.

If values of speed greater than these minimums are selected for design, the appropriate surface loadings must be multiplied by the ratio $\left(\frac{V_{selected}}{V_{minimum}}\right)^2$.

For conditions I, II, III, and V the multiplying factor used must be the higher of

$$\left(\frac{V_A \text{ sel.}}{V_A \text{ min.}}\right)^2 \text{ or } \left(\frac{V_C \text{ sel.}}{V_C \text{ min.}}\right)^2$$

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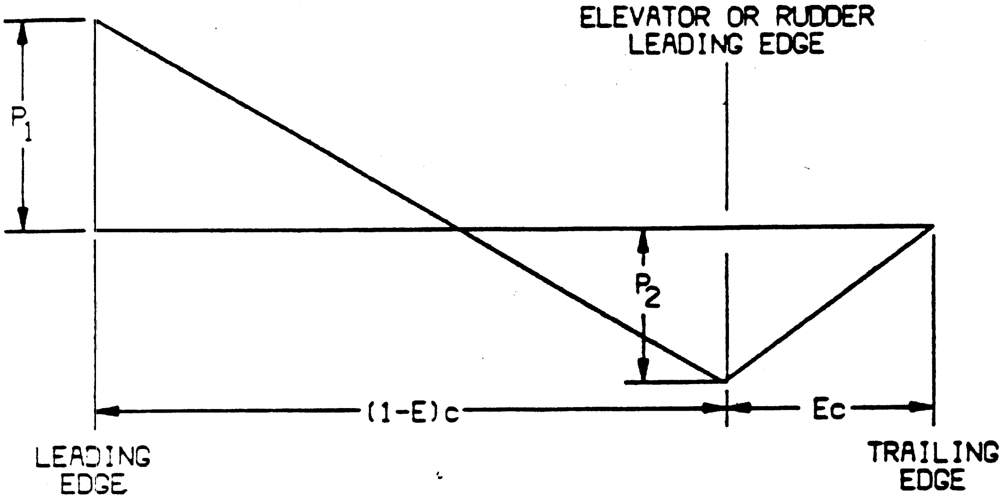
* * * * *

Figure A7.—Chordwise Load Distribution for Stabilizer and Elevator or Fin and Rudder



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$$P_1 = 2(\overline{w})\frac{(2-E-3d')}{(1-E)}$$

$$P_2 = 2(\overline{w})(3d'+E-1)$$

where:

$\bar{w}$=average surface loading (as specified in figure A.5)

E=ratio of elevator (or rudder) chord to total stabilizer and elevator (or fin and rudder) chord.

d'=ratio of distance of center of pressure of a unit spanwise length of combined stabilizer and elevator (or fin and rudder) measured from stabilizer (or fin) leading edge to the local chord. Sign convention is positive when center of pressure is behind leading edge.

c=local chord.

Note: Positive values of $\bar{w}$, P_1 and P_2 are all measured in the same direction.

Issued in Washington, DC, on January 29, 1996.

David R. Hinson,

Administrator.

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