1-43

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_{SI}.

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_{S0} 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_{S0} 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_{S0} 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:

(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 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_{SSB} 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]

BILLING CODE 4910–13–M